Federal Court  Cour fédérale

**Date: 20160916**

**Docket: T-1353-13**

**Citation: 2016 FC 1047**

**Ottawa, Ontario, September 16, 2016**

**PRESENT: The Honourable Mr. Justice Roy**

**BETWEEN:**

**ARCTIC CAT INC. AND**
**ARTIC CAT SALES, INC.**

**Plaintiffs/Defendants**
**by counterclaim**

**and**

**BOMBARDIER RECREATIONAL**
**PRODUCTS INC.**

**Defendant/Plaintiff**
**by counterclaim**

**PUBLIC JUDGMENT AND REASONS**

**(Confidential Judgment and Reasons issued September 16, 2016)**

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**PUBLIC JUDGMENT AND REASONS**

[1] This action for infringement (section 54 of the *Patent Act*, RSC, 1985, c. P-4, hereinafter *Patent Act*) is concerned with some claims found in Canadian Patent No 2,322,738, to which we refer as the 738 Patent. In essence, Arctic Cat Inc. and Arctic Cat Sales Inc. allege that four engines, used by Bombardier Recreational Products Inc. (BRP) in more than 125 000 snowmobiles sold in Canada in the last few years, infringe one or more of five asserted claims (3 of the five asserted claims are dependent on another independent claim such that there are in fact eight claims in play in this case). The Defendant argues that it does not practice the Patent-in-suit. Even if it did, it would argue that the 738 Patent would have to be invalid for anticipation (lack of novelty) or obviousness (lack of inventiveness), is overbroad and the person presented as the inventor is not, such that the Plaintiffs as the assignees do not have the standing required to enforce the Patent. As for appropriate damages if a valid claim has been infringed, the parties remain at a considerable distance from one another. The trial took place over a period of 25 days.

[2] This action for infringement of a patent originated as a counterclaim to an action for infringement launched by BRP against AC with respect to patents held by BRP that have a different subject-matter, one which is not concerned with engines. The Patent bears the title "Two-cycle Engine with temperature-Controlled Ignition Timing". By order dated July 25, 2013, Prothonotary Aronovitch determined that the whole matter be severed from the original action and that it be pursued separately. As a result, AC became the Plaintiff in the action for infringement, and BRP became the Defendant in that action and counterclaimed that the asserted claims of the 738 Patent were, at any rate, invalid and void.

[3] Over and above the damages sustained by the patentee which would come from a declaration that its valid patent has been infringed, the Plaintiffs seek a permanent and interlocutory injunction restraining BRP from infringing the asserted claims of the 738 Patent, together with an order for the destruction of all vehicles that infringe its Patent. Exemplary, aggravated and punitive damages, with pre and post judgment interests are also sought.

## I. *The parties*

[4] One Plaintiff, Arctic Cat Inc., is a recreational vehicle manufacturer founded in the early 1960s by Edgar Hetteen, who has been described as the grandfather of the snowmobile industry. Arctic Cat Inc. currently produces snowmobiles and other recreational vehicles destined for the United States, Canada, and markets around the world.

[5] The other Plaintiff, Arctic Cat Sales, Inc., is a wholly owned subsidiary of Arctic Cat, Inc. that is responsible for the sale of Arctic Cat snowmobiles to independent third-party dealers in Canada. Both Arctic Cat, Inc. and Arctic Cat Sales, Inc. (collectively, Arctic Cat or AC) are incorporated pursuant to the laws of the U.S. State of Minnesota and have a head office located at 601 Brooks Avenue South in Thief River Falls, Minnesota. Both are also Defendants by counterclaim in view of the allegations of invalidity made by the Defendant.

[6] The Defendant and Plaintiff by counterclaim, Bombardier Recreational Products Inc. (BRP), is a public company incorporated pursuant to the *Canada Business Corporations Act*, RSC 1985, c C-44. Like Arctic Cat, BRP is a recreational vehicle manufacturer. It traces its

lineage back to the 1940s with the first “autoneige” designed by Joseph Armand Bombardier, as well as the Ski-Doo mark snowmobiles that began production in the 1960s. Bombardier acquired Lohnwerke GMbH, which manufactures Rotax engines, in 1970.

[7] BRP now employs people in approximately 20 different countries and sells six different lines of products, including Ski-Doo snowmobiles, in the United States, Canada, and elsewhere in the world. BRP’s head office is located at 726 rue Saint-Joseph in Valcourt, Québec.

## II. *Two-stroke engine operation*

[8] Before tackling the 738 Patent, a brief description of the operation of the two-stroke engine could prove to be useful. Evidence to that effect was led at trial.

[9] In his testimony, Dr. Checkel, the expert retained by AC, elaborated at length on the general operation of two-stroke engines, so named because they complete five basic processes (specifically intake, compression, combustion, expansion and exhaust) in two strokes (one up, one down) of the reciprocating piston typically found inside an engine cylinder. A four-stroke engine, by contrast, requires four reciprocating piston strokes to complete these same five basic engine processes.

[10] In both cases, the piston is typically attached to a connecting rod and crank shaft, the latter of which is in turn attached to an engine flywheel used to deliver output power from the engine. This is normally paired with a cylinder head that closes off the top of the engine, forming

a chamber between it and the piston inside the cylinder. The objective is to ignite the mixture of air and fuel compressed into that chamber while the piston is close to its highest point in the cylinder (commonly called “top-dead-centre” or “TDC”). The mixture then burns as the piston passes through the TDC position and begins to move downwards, increasing the pressure and imparting more energy into the downward-moving piston than was required for the upward-moving piston to compress that mixture before combustion. The net energy gain is then delivered to the vehicle through the flywheel.

[11] The ability of two-stroke engines to provide energy output in this manner on each engine cycle allows for the engine to be lighter and more compact than four-stroke engines for a given power level. They have thus proven popular for small vehicles like motorcycles, all-terrain vehicles and snowmobiles. However, two-stroke engines must also accomplish the five processes listed above in only two piston strokes, rather than the four afforded to four-stroke engines.

[12] On small vehicles like snowmobiles, the engines typically accomplish this task through the combination of cylinder ports rather than valves for the intake and exhaust processes, pre-compression in the crank shaft case, and an exhaust expansion chamber. These extra features allow the engine to accomplish both the intake and compression processes as the piston moves up towards the cylinder head on the first stroke. After the combustion process occurs as the piston passes the TDC position, the engine accomplishes the remaining expansion and exhaust processes as the piston moves down towards its lowest point in the cylinder (bottom dead centre or BDC) on the second stroke.

[13] While the piston is at the BDC position, the intake ports in the upper part of the cylinder are exposed, and the mixture of air and fuel from the crank shaft case is forced through the ports in the cylinder wall. This pushes out remaining combustion products through the exhaust ports and into an expansion chamber that forms part of the engine's exhaust system. That chamber, if sized (or “tuned”) correctly, creates an exhaust pressure wave at the right instant to prevent the new mixture of air and fuel from being forced out of the chamber alongside these remnants before the exhaust ports close as the piston moves back up the cylinder. Proper tuning varies with current conditions, including engine speed and the temperature inside the chamber itself. When done correctly, however, this process provides an important power boost to the engine.

[14] Traditionally, engines have used carburetors to manage the mixture of air and fuel at the engine intake. As explained by Dr. Bower, the mechanical engineer expert retained by BRP, a carburetor is a mechanical fuel admission device that does not rely on a controller or electronic input. These devices have been progressively replaced with direct fuel injection technology, which injects fuel directly into the chamber above the piston at the start of compression rather than drawing it into the cylinder along with the air.

[15] Dr. Checkel explained that the amount of power a two-stroke engine produces is typically controlled using a valve (the throttle), which is used to restrict the air flowing into the engine during intake. Knowing how hard the engine is working compared with its maximum capability (engine load) is useful for engine control purposes.

[16] The precise timing of the ignition in each engine cycle would be instrumental for engine power, efficiency, durability and controlling exhaust emissions in both two-stroke and four-stroke engines. If combustion occurs too late in the cycle, the engine produces lower output power, more waste heat, and is generally less efficient. If it occurs too early in the cycle, the engine is doing more work to complete the compression process, similarly reducing engine power output and efficiency, and increasing undesirable exhaust emissions.

## III. *The 738 Patent*

### A. *An overview / Disclosure*

[17] Before considering more closely the 738 Patent, some basic information about the Patent should be stated:

- The inventor is Greg L. Spaulding, an employee of AC, and he testified at trial.
- The Patent was open to public inspection on May 25, 2001.
- The Patent was issued on February 18, 2003, having been filed on October 10, 2000.
- The Patent signals as priorities December 1, 1999 for U.S. Patent 09/452,657 and May 10, 2000 for U.S. Patent 09/568,449.

[18] Originally, AC was asserting a large number of the 47 claims found in the Patent-in-suit. However, by the time the matter came for trial, the number of claims asserted had been reduced to 5.

[19] The title given to the Patent is not particularly illuminating: Two-cycle Engine with exhaust temperature-controlled Ignition Timing. The abstract of the Patent states:

> A two-cycle internal combustion engine has an ignition timing that varies with engine speed. A plurality of ignition patterns (the relationship between ignition timing and engine speed) are used. The engine exhaust gas temperature is sensed and is used to determine the particular engine pattern used at a particular time.

[20] Evidently, this invention is concerned with engines and, more specifically, the two-cycle, or two-stroke, internal combustion engine. In the two-stroke engine, it is possible to vary the point at which the fuel-air mixture is ignited within the cylinder in which the piston is operating, such that the optimization of the engine operation will be provided. The invention under consideration would allow for the selection of different "ignition patterns" based on the exhaust gas temperature. There are two ways of using the exhaust gas temperature according to the Patent. Three of the five asserted claims are dealing with the selection of ignition patterns based on the exhaust gas temperature. They will be referred to collectively as the "selection claims". There are also two claims that refer to the selection of the ignition pattern from a plurality of basic ignition patterns, the basic ignition pattern selected being modified based on the sensed exhaust gas temperature. They will be known as the "modifications claims". The background of the invention provides some information and it reads:

> <u>Background of the Invention</u>
>
> The present invention is directed to a two-cycle internal combustion engine and the operation of such an engine. Such engines are used, for example, to drive various vehicles such as snowmobiles, motorcycles, personal watercraft and others.
>
> The operation of such engines is based on the ignition of a compressed fuel-air mixture within a cylinder, with the resulting expansion of the ignited mixture driving a reciprocating piston

> located in the cylinder. The reciprocating movement of the piston then is used to drive the vehicle powered by the engine.
>
> It is desirable to vary the point during the reciprocation cycle of the piston at which the fuel-air mixture is ignited, i.e. a point between “bottom dead center” and "top dead center”, to provide optimum operation of the engine. Thus, as one example the optimum point of ignition during acceleration can differ from that for a normal running operation. Because the piston usually is driven by a rotating crank shaft, the ignition point often is expressed in terms of degrees of advancement with respect to top dead center, in other words the position with respect to degrees of rotation of the rotating crank shaft ahead of the top dead center position.
>
> Typically, different engine operating speeds, which usually are expressed in revolutions per minute, will be associated with different engine conditions. For example, higher engine speeds often are associated with acceleration. Thus, it has been considered that the point of ignition during the reciprocation cycle of the piston should be varied, depending on the engine operating speed at the particular time, and engine ignition control systems can be programmed to vary the ignition point depending on the engine speed.
>
> Other factors can affect the optimum ignition timing. For example, an engine operating shortly after start-up may require a different relationship between ignition timing and engine speed (hereinafter “ignition pattern”) than an engine that has been operating from some time. Consideration has been given in the past to a system that allows the user to switch between two different ignition patterns. This has not been completely satisfactory in optimizing engine performance.

[21] Under the title “Summary of the Invention” in the disclosure part of the specification, one finds the replication of the claims. The only paragraph worth reproducing is the following, at page 2 of the 738 Patent:

> Summary of the Invention
>
> The present invention seeks to provide a two-cycle engine that enjoys improved performance by selecting from a plurality of relationships between ignition timing and engine speed (ignition

> patterns) based on exhaust gas temperature. In one aspect of the present invention, individual ignition patterns cover ranges of exhaust gas temperature of about 50C. The sensitivity of the control system increases as the temperature range decreases. In another aspect of the present invention the exhaust gas temperature is determined by use of a sensor that is in contact with the exhaust gas, for example in an exhaust pipe. In a further aspect of the invention, a capacitor discharge ignition system is used to control the ignition timing of a spark plug. Yet another aspect of the invention provides for a default ignition pattern when there is a malfunction of the temperature sensor.

On its face, the invention is centered on various ignition patterns that will be selected based on the exhaust gas temperature, or will be modified based on exhaust gas temperature, that will have been detected by an appropriate sensor. The ignition patterns are merely the relationships between ignition timing and the engine speed, expressed in revolutions per minute (RPMs). For different engine speeds there could be different ignition timings. The piston, in a two-stroke engine, will move towards the top of the cylinder and, at some point, the air-fuel mixture will be ignited, the explosion thus created generating energy that will send the piston back toward the bottom of the cylinder. Through the operation of a rotating crankshaft that is activated by the piston going to the bottom of the cylinder (bottom dead center), the vehicle moves. The ignition patterns are selected according to the Patent with a view to optimize the operation of the engine in different conditions. That point is described in terms of the degrees of rotation of the crankshaft ahead, or possibly after, the piston has reached the top of the cylinder (top dead center).

[22] Before reaching the claims, the disclosure presents in five tables (A to E) data that are each representing an ignition pattern. For a given engine speed (RPMs) there is an angle which is the number of degrees before top dead center. The angle may vary with different RPMs. In the

ignition patterns depicted in the five tables, there is an angle that corresponds to different RPMs, from 1000 to 8800 RPMs. Each of the tables presents an ignition pattern that is a function of a range of different exhaust gas temperature. In this particular case, the temperatures are presented in ranges, Table A covering a range of 0 to 250 C, and the other tables operating in increments of 50 C (250 to 300, 300 to 350, 350 to 400) until one reaches 400 and higher. As long as the temperature of the exhaust gas remains within a range, it will be that ignition pattern that will control. Thus, as the RPMs change, a different ignition point, representing a different angle, will be chosen in a particular table.

[23] I have reproduced Table E from the 738 Patent. This is an example of an ignition pattern. The table applies once the temperature of the exhaust gas has reached at least 400 degrees. Other ignition patterns are said to apply for different temperature ranges:

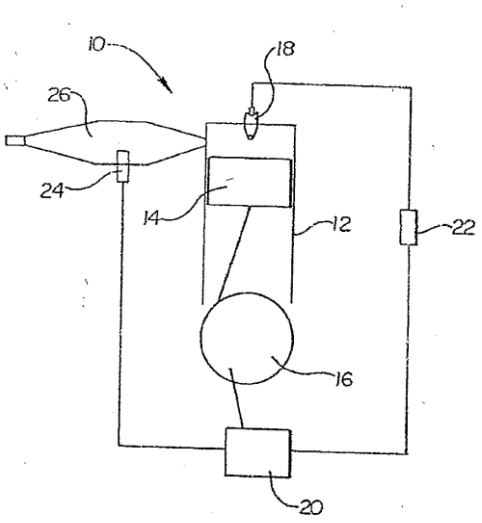
E: Exhaust Temperature 400C or higher

| RPM | Angle |
|---|---|
| 8800 | 11.0 |
| 8600 | 11.0 |
| 8400 | 11.0 |
| 8200 | 11.5 |
| 8000 | 13.0 |
| 7750 | 15.0 |
| 7250 | 19.0 |
| 7000 | 20.0 |
| 6500 | 22.0 |
| 6000 | 24.0 |
| 5000 | 24.0 |
| 4000 | 20 |
| 3000 | 10 |
| 2000 | 10 |
| 1000 | 8 |
| 0 | 8 |

An ignition point will correspond to the angle, the number of degrees before top dead center at a particular RPM. Hence, at 8000 RPMs, the angle will be 13º, which means that the ignition source will ignite the mixture air-fuel at 13 degrees before TDC. The angle differs for different RPMs for temperature above 400C, as the table shows. Similarly, the angle may be different for different exhaust gas temperature ranges. In table A, for temperature lower than 250C, the angle before TDC is 10 at 8000 RPMs. Once the exhaust gas temperature leaves a particular range, it is a new ignition pattern that kicks in.

[24] The specification refers to figures found after the claims. Figure 1, reproduced here, is a rather rudimentary drawing of a two-cycle engine, where 10 is the engine itself, 12 the cylinder, 14 the piston, 16 the crankshaft, 18 the ignition source (like a spark plug), 20 the controller for the ignition of the ignition source, 22 the coil through which a spark plug could be activated, 24 the exhaust gas temperature sensor and 26 is the exhaust pipe (at p 3 of the disclosure, it referred to “exhaust pipe 28”; that is manifestly an error).

***Fig. 1***




[25] Figures 2 and 3 illustrate examples of the control of the ignition timing. Figures 4 to 8 are graphs illustrating different ignition patterns. The graphs do not appear to correspond precisely to tables A to E found at pages 7 to 9 of the specification. Nevertheless, each is presented as an ignition pattern covering a particular temperature range. Neither the tables nor the figures provide information concerning what these patterns are supposed to achieve in order to optimize the operation of an engine. There is no information either about the diagnosis that comes from sensing the temperature.

[26] As a matter of first impression, the ignition pattern is at the heart of the invention. Tables A to E present numbers that correspond to ignition points for various RPMs once the exhaust gas temperature has reached a particular range. When considering figures 4 to 8, they are no more than the graphical representation of the ignition patterns. The ignition point is found at the

intersections of the speed of the engine and the number of degrees before top dead center for a particular exhaust gas temperature range. It is the collection of those points that is represented graphically. An ignition pattern is never one point. The pattern is simply the relationship between the engine speeds and the degrees of advance before top dead center, the ignition timings, for different temperature ranges. Figures 4 to 8 and tables 1 to 5 present in different formats the same information: an ignition pattern is composed of various ignition points; there is no pattern if there is one ignition point according to the tables and figures 4 to 8. That fundamental concept is not altered if is added how open the throttle is in a given case (two of the asserted claims are said to be "three dimensional" in that the ignition pattern is the relationship of degrees in advance of top dead center, engine speed and throttle opening).

B. *The claims at issue*

[27] From the 47 claims found in the 738 Patent, AC is now asserting five claims: claims 11 and 16, the "modification claims", as well as claims 33, 40 and 47, the selection claims. Claims 11 and 16 are related to each other in that claim 11 is the engine claim to claim 16's method claim of the same engine. The same is true of claims 40 and 47. They are in fact the mirror image of one another and conclusions reached by the Court regarding the engine would apply altogether to the method of operating. While claims 40 and 47, which are written in dependent form from claims 34 and 41, are specific to snowmobiles, claims 11 and 16 do not have that specificity. They are not limited to snowmobiles. Finally, claim 33 is the dependent claim of "method claim" claim 28, wherein the engine is a snowmobile engine. Although claims 40 and 47 are three dimensional, i.e. the ignition point varies with the speed of the engine and the throttle position, as

opposed to the ignition point varying only with the engine speed for the other three claims, that proved to be largely immaterial. The claims are reproduced in Annex "A". The asserted claims, together with their independent claims, are highlighted.

[28] It is not disputed that all the engine claims are with respect to a two-cycle engine comprising:

- a cylinder
- a piston
- an ignition source
- a controller
- a sensor.

Similarly, the method claims all include a method of operating a two-cycle engine comprising:

- Moving a piston in a cylinder
- Activating an ignition source in the cylinder during the compression movement
- Expelling exhaust gas from combustion
- Sensing a temperature of the exhaust gas

BRP does not contest that its engines on their accused snowmobiles comprise these elements. Indeed, BRP does not contest that its engines have all of the elements presented at Figure 1 of the 738 Patent (reproduced at para 24 of these reasons). That is not where the debate is situated.

[29] There are evidently differences between the claims and there are issues with respect to the construction of those claims. These will be reviewed later in these reasons. For now, an overview will suffice.

[30] Claims 11 and 16 will be examined together. According to them a plurality of "basic ignition patterns" must exist; out of that plurality of basic ignition patterns one will be selected

and that basic ignition pattern will be modified based on exhaust gas temperature. That is the reason why they have been referred to as “modification claims”. That modified basic ignition pattern becomes the ignition pattern. It is according to that ignition pattern that the activation of the ignition source by the controller will occur. Claims 11 and 16 are only concerned with the relationship of ignition timing and engine speed.

[31] The other three asserted claims are “selection claims” in that it is the selection of the ignition pattern out of a plurality of ignition patterns that is effected based on the exhaust gas temperature. Claim 33, which is dependent on claim 28, a method claim, is a selection claim. However, contrary to selection claims 40(34) and 47(41), the other two selection claims, claim 33(28) is two-dimensional, as are claims 11 and 16, as the throttle is not featured.

[32] As pointed out earlier, claims 40(34), 47(41) and 33(28) are all concerned with engines that are snowmobile engines. That is not the case for the modification claims 11 and 16.

## IV. *Foreign litigation*

[33] It has transpired, during the course of the trial, that there has been, and there continues to be, litigation in the United States concerning patents that relate to the Patent-in-suit in this case between the parties. This came to the attention of the Court through the cross-examination of witnesses involved in some manner in the other pieces of litigation.

[34] Thus, it appears that there is litigation in the Federal Court of Minnesota; however, the matter will not be heard for some time as it has not been set for trial. As for the litigation before the United States International Trade Commission, it was terminated in May 2015, following the withdrawal of the complaint filed by Arctic Cat Inc. in December 2014. As I understand it, Arctic Cat Inc. alleged that snowmobiles were imported in the U.S. that infringed certain claims of their U.S. patents. The allegation is no more.

[35] There would have also been some litigation between Polaris, another snowmobile manufacturer, and AC more than ten years ago.

[36] Having said that, I consider that litigation taking place elsewhere has no bearing on the case that must be decided in Canada on the basis of Canadian Law and the evidence put forth by the parties. At any rate, there is no foreign decision that has been rendered.

## V. *The witnesses*

[37] The parties relied on a number of witnesses to advance their position at trial. First and foremost, they each relied on one expert to discuss and put forth their theory of the case concerning the alleged infringement of the Patent and, by counterclaim, the alleged invalidity of the claims. The parties also produced experts with respect to the damages claimed in case a valid patent had been infringed. Each side had three other witnesses. I will begin with the non-experts and the evidence of the experts will be referred to, as needed, when their expertise is required.

A. *Brad Darling*

[38] Mr. Darling was AC's corporate representative. Mr. Darling has been working for Arctic Cat since 2000 and is currently the vice-president, general manager of the snowmobile division of Arctic Cat Inc., a position he has held since January 2011.

[39] Mr. Darling explained that Arctic Cat first became aware, and first believed, that BRP was infringing the 738 Patent in early 2012, following a review of all of Arctic Cat's patents by its new in-house counsel. This happened shortly after BRP launched its own patent lawsuit against Arctic Cat, but Mr. Darling was uncertain if the review of Arctic Cat's patents was done in order to retaliate, as suggested by BRP. Whether the Court's action was in retaliation or not is of no moment as far as this Court is concerned. The only relevant consideration is to establish that a valid patent has been infringed or not.

[40] It appears that AC approached BRP after it formed the opinion that its 738 Patent was infringed with a view to conclude a cross-licence arrangement. Obviously, the discussion did not produce an agreement.

[41] Mr. Darling explained the dealer distribution aspect of his position, which involved keeping track of competitive dealers and Arctic Cat dealers across Canada. This analysis is conducted based on model year, calendar year, and then snowmobile season. The takeaway from these surveys is that Arctic Cat is competitive in Canada within the dealer base of the competition in the industry (Polaris, Ski-Doo, and Yamaha). Mr. Darling testified that for the

2016 model year, Arctic Cat will produce 26,000 snowmobiles, down from just over 41,000 in 2005, before the recession. This corresponds to an industry-wide decline.

[42] AC relies on racing snowmobiles for marketing its product as well as to assist in research and development. The 738 Patent in particular started being used on racing models in the 2000 model year, and was used in consumer models starting with the 2001 model year. By 2008, the 738 Patent was being used on all of Arctic Cat's 600 and 800 two-stroke models. That "technology" was very well received in the industry, as it gave a remarkable advantage in terms of acceleration when "starting out of the gate".

[43] On cross-examination, Mr. Darling explained that he was not aware of the technology used for the first time in conjunction with a "hot button" on 1999 model year snowmobiles. He also wasn't aware of previous technology to manually adjust "tuning in the pipe". He confirmed that Suzuki had been Arctic Cat's sole supplier of engines until 2008.

[44] Is noteworthy that Mr. Darling did not testify concerning how AC is practicing its invention. No one did.

B. *Troy Halvorson*

[45] Mr. Halvorson has worked for Arctic Cat since 1997. In 2004, he became high performance product team manager, where he was responsible for the development of the Firecat models, among others. Mr. Halvorson is currently the snowmobile product manager at Arctic

Cat, a position he has held since April 2015. In that capacity, he helps to guide the product plan, which governs the development of new products over a five-year cycle generally.

[46] As was to become obvious later, the testimony of Mr. Halvorson, based largely on written material produced by AC, was offered for the purpose of comparing two snowmobiles manufactured by AC with a view to distinguish between model years 2005 and 2006 to lay the groundwork for the expert on damages.

[47] Thus, Mr. Halvorson explained that the F6 Firecat EFI EXT, the F6 Firecat EFI, and the F6 Firecat EFI Sno Pro were the available models listed on the specification sheet in model year 2005. “EFI” designates electronic fuel injection, while “EXT” designates a longer track than the F6 Firecat EFI (the base model) or the F6 Firecat EFI Sno Pro. An additional model, the F6 Firecat EFIR, was also available – the “R” designates that it had a reverse. All models are said to have the same engine specifications. He explained that the engines used in the 2006 models are the same as in the 2005 ones. However, the 2006 brochure lists an exhaust pipe temperature sensor (EPTS), introduced in the F6 for that model year. Another listed difference exists with respect to the shocks, with the 2005 using Arctic Cat gas internal floating piston shocks and the 2006 using Fox gas internal floating piston shocks. As for the 2005 F6 Firecat EFIR, it would have had the same specifications as the F6 Firecat EFIR from 2006 had it been listed in the brochure for model year 2005. Mr. Halvorson then provided two final differences between the 2005 and 2006 model years: a change in colour scheme, and Arctic Cat no longer offering the EXT model in 2006. Next, Mr. Halvorson explained that Arctic Cat did not list the electric start as available optional equipment in 2005, but did in 2006. However, the offering in 2006 did not

affect the price Arctic Cat charged its dealers for snowmobiles, as optional equipment was sold to customers by the dealers separately from the snowmobiles themselves.

[48] The witness did not offer any information about how the 2006 model year F6 snowmobile practiced the invention. In fact, surprisingly, Mr. Halvorson only referred to the addition of an exhaust pipe temperature sensor on the later engine.

[49] On cross-examination, Mr. Halvorson explained that knowledge of Arctic Cat's models of those years was quite limited, as is his knowledge of marketing material he did not develop. He confirmed that Arctic Cat purchased its engines for the Firecat models during those years from Suzuki. As for the specification sheets on the brochures, they were accurate to a point, as specifications could be changed by the time production started and errors could slip in.

[50] Mr. Halvorson explained that the reference to an exhaust pipe temperature sensor, which is to be found on the specification sheet but not in the brochure, could have been connected by a knowledgeable reader to "breakthrough performance regardless of temperature". It was not disputed by the witness that AC was promoting its suspension in 2006.

[51] It was established before the Court that the witness is a graduate of CalPoly (California Polytechnic State University) in what he described as industrial technology. Although he is not an engineer, and does not profess to be one, Mr. Halvorson has been employed by AC since 1997, yet he was incapable to give any explanation about the engine that is supposed to make a difference.

[52] The Court has no doubt whatsoever about the integrity of this witness: he was honest and forthcoming. He readily conceded that his knowledge about the engine was limited. Here are the important portions of the cross-examination which are found at pages 2441 to 2445:

> A. I don't hold a mechanical engineering degree.
>
> Q. Right. And you don't hold an electrical engineering degree either?
>
> A. No, I don't.
>
> Q. Okay. You mentioned the F6 Firecat EFI. EFI stands for electronic fuel injection. Correct?
>
> A. Correct.
>
> Q. Yeah. Do you know how electronic fuel injection works, generally speaking?
>
> A. Generally speaking, yes, I do.
>
> Q. So, what is the extent of your knowledge?
>
> A. In an older conventional system with carburetors, the fuel delivery system is based off of – is how the fuel flows into the carburetor into the engine. In an electronic fuel injection system, it's injected into the engine through electrical pulses that's supplied by – dictated by the computer, the ECU of a snowmobile.
>
> Q. Okay. And to control the electronic fuel injection of an ECU, do you know what are the inputs and outputs of that ECU?
>
> A. There are a lot of inputs and outputs, yes.
>
> Q. Would you be able to name them?
>
> A. Probably not all of them.
>
> Q. And would you know how the control of that electronic fuel injection works within the controller based on the inputs of the sensors and the outputs?
>
> A. I am not knowledgeable about how exactly it works.
>
> Q. And that's not your responsibility in any way?
>
> A. No, it is not.

…

So you mentioned you are not familiar with how the ECU works. Correct? You don't know the inner functionings of the ECU, the logic, the software?

A. Right. I – I don't – I know how a – I mean. I have an idea how a computer works. If I had to tell somebody how to build a computer, I would struggle.

Q. Yes. And you wouldn't be able to tell or help someone program the ECU of the ECUs used by Arctic Cat?

A. No.

Q. Back in 2005 or 2006?

A. I would not be able to tell them.

Q. So that EPTS, you don't know what it does?

A. Yes, I know what the EPTS does.

Q. It's connected to the ECU?

A. I know the electronic or the exhaust pipe temperature sensor measures the temperature of the exhaust.

Q. Right. And that signals input into the ECU?

A. It is a sensor that the ECU relies on for that information, yes.

Q. But beyond that, you don't know what the ECU does with that and how it accomplishes it?

A. Well, I – I don't know how it does it, no.

Q. Thank you.

Back in 2006, the model year 2006, equipped with the EPTS, again, that was a Suzuki engine. Correct?

A. Correct.

Q. Equipped with Kokusan ECUs? Does that ring any bells for you?

A. Yes.

Q. So that's K-O-K-U-S-A-N. And those were delivered with the engines. Correct?

A. You would have to define "delivered with the engine".

Q. So they were already installed on the engine or ready to be installed on the engine. That's how the engine came?

A. No.

Q. No, they were not. Were they shipped together with the engine for a given engine?

A. I have – they were part of a packet that would have been with the engine, but not directly with the engine.

Q. Right. So Engine A comes with Kokusan ECU A. Engine B comes with Kokusan ECU B. Would that be a correct description of how it happened?

A. I wouldn't – I wouldn't be able to answer that question.

Q. Okay. And you know nothing about the control logic of those ECUs, whether that was developed internally at Arctic Cat or elsewhere?

A. I don't.

[53] As can been seen, there was no evidence coming from Messrs. Darling and Halvorson, in spite of their long standing association with AC and, in the case of Mr. Halvorson, his degree in industrial technology, about the very engine which it is claimed produced contribution margins that were used by an expert in calculating damages. That left to Greg Spaulding, the named inventor, to provide the evidence on the invention.

C. *Greg Spaulding*

[54] Mr. Spaulding is currently the group leader for two-stroke engine design and development in Arctic Cat's engineering department. He has been with Arctic Cat since 1994. His group designs the components necessary to have an assembled engine, working with Suzuki Motor Corporation as the motorist to produce a prototype. His group then completes engine development, which includes designing and developing the exhaust pipe. Mr. Spaulding does not have an engineering degree, but his experience and expertise in the calibration of engines is not to be denied.

[55] The witness provided to the Court his view of the history of the invention. Mr. Spaulding explained that he had originally come up with the idea of optimizing ignition timing around 1996. It started with his idea of keeping engine RPMs at the starting line below the level where the clutch engages while opening up the throttle to get out of the starting line faster when the race starts. Mr. Spaulding contacted Suzuki, Arctic Cat's engine supplier, in order to implement this idea. However, the engine control units (ECUs) he received from Suzuki limited RPMs by producing fewer sparks. This also lowered the heat output to the exhaust pipe, thus reducing rather than improving starting line performance.

[56] Mr. Spaulding explained that he contacted Suzuki to propose limiting the RPMs by retarding engine ignition instead, thus transferring less energy to the piston and more to the exhaust pipe to increase temperature. As a result, he received additional systems that retarded ignition timing, but also continued to use the counterproductive spark removal method. Mr.

Spaulding then contacted Suzuki to specifically request the capacity to have ignition take place after top-dead-centre. This functionality was incorporated into the 1998 model year 440 ZR racer. However, Mr. Spaulding was not yet satisfied with the design, and so he did not implement that which would actually allow the driver to use this capability.

[57] Mr. Spaulding's next step in the development saw him move away from the RPM limiter idea towards a "two-map system" selected by a hot/cold switch, with the settings providing an optimized power curve for cold and hot exhaust pipe temperatures respectively. Arctic Cat implemented this new approach in the 1999 model year 440 ZR racer. Nonetheless, the cold map name continued to be called "Rev Limit Ignition Timing" in Suzuki's finalized engine specifications delivered to AC, the result of Mr. Spaulding's desire to avoid "confusing" Suzuki.

[58] Mr. Spaulding then explained that the following developmental step was to make the changes between maps automatic. He requested that Suzuki review the ignition timing curves that Arctic Cat was using for its hot/cold switch settings. Mr. Spaulding described the cold curve as allowing for better acceleration through faster pipe heating, and the hot switch as providing better performance and preventing "heat sagging" – the loss of performance in two-stroke engines that occurs in higher temperatures. Mr. Spaulding asked Suzuki if these curves could be selected automatically without a throttle position sensor, but Suzuki did not come up with any suggestions.

[59] The invention is described as "using exhaust gas temperature to optimize settings, ignition timing on a two-stroke engine". The term "optimize" refers, in a circular way, to "using

exhaust gas temperature to select the optimum ignition timing based on that internal temperature" (Transcript, p 2616, lines 5-14). Mr. Spaulding did not testify as to how the exhaust gas temperature was to be used, and to what effect. From his examination in chief, the Court is left with someone who was asking questions of Suzuki, the motorist, which would come back with possible solutions. Actually, the documentary evidence offered by AC consists of questions, usually sent by fax, to Suzuki. I have not been able to find what contribution to solutions was offered by AC, and Mr. Spaulding, towards answering the questions asked.

[60] Mr. Spaulding claimed that he came up with the idea of using exhaust gas temperature to select between the patterns, a method Arctic Cat implemented in the 2000 model year 440 ZR. Developmental problems included the fact that the temperature sensor they had selected would not function below and above certain temperatures. According to the testimony, Arctic Cat worked with Suzuki to develop a software logic that would get around the sensor tolerance range. However, no details of the cooperation were supplied.

[61] Mr. Spaulding explained that he was never specifically concerned with the logic or the sensors, only the intended results. His goal was to have the sensor "measure temperature to select timing patterns that were optimum for that particular temperature" (Transcript, p 2677, lines 9-18). He confirmed that in the case of the 2000 model, "optimize" referred to power (Transcript, p 2678, lines 12-14). The use of the pipe sensor to select between different ignition timing maps in the 2000 model year ZR 440 produced very good racing results with respect to starting line acceleration.

[62] The first consumer model to use the "technology" of selecting ignition patterns based on measured exhaust gas temperature for better engine control was the 2001 model year 500 ZR. The pipe sensor "technology" was not incorporated into models using 600 CC and 700 CC engines, including the F6 Firecat, until the 2006 model year because of costing issues with the pipe sensor. It remains very much unclear what the witness means by "technology". If technology is taken to mean "the study or use of the mechanical and applied sciences, the application of this to practical tests industry" (*The Canadian Oxford Dictionary*, Oxford University Press, 2001), the Court is hard pressed to find in the testimony anything resembling technology. We are left in the dark concerning how the temperature of the exhaust gas is used to adjust the ignition timing through different timing patterns or maps. Similarly, we are left in the dark about what benefit was to be obtained, other than speaking in terms of "optimization".

[63] Mr. Spaulding then explained that it was Mr. Ole Tweet, a vice-president at Arctic Cat, who suggested that the use of a sensor to select ignition patterns to be patented. Mr. Spaulding did not write the text of the Patent. He produced the sketch that became Figure 1 of the 738 patent by hand. As for Figures 2 and 3, which depict the software logic used in the 2000 model year 440 ZR, they came from Suzuki, as well as Figures 4 to 8.

[64] Finally, Mr. Spaulding explained that Kokusan, another Japanese company, the manufacturer of the Engine Control Unit [ECUs] used in Arctic Cat engines, actually wrote the control software. Kokusan then supplied the electronic components to Suzuki who then supplied the engines, with electrical systems, to Arctic Cat. Mr. Spaulding was quite clear about what he considers to be his invention. The development of the invention was around the use of different

ignition patterns. He ended up with a system that was described as “the exhaust gas temperature measurement by sensor to select ignition timing patterns that are optimised for engine operation of those internal pipe temperatures” (Transcript, p 2671). Throughout the development of the invention, the concept of changing ignition patterns remained central (Transcript, pp 2649, 2646, and 2670, among others).

[65] On cross-examination, Mr. Spaulding confirmed that the design of an engine meant designing its structure and parts. This was mainly done by Suzuki, although Arctic Cat provided its input on a regular basis during the design phase. Mr. Spaulding did not communicate with Suzuki for the development of the exhaust pipe technology on the 2000 model year ZR 440 engine, but rather Arctic Cat received a system that would measure exhaust gas temperature to select different timing patterns. The development and optimizing of those patterns was done by Mr. Spaulding himself at Arctic Cat.

[66] Mr. Spaulding also confirmed that the control logic, including the ability to select from maps, was already programmed into the ECU when Mr. Spaulding received it, and Mr. Spaulding played no part in programming it. The ignition timing values he had provided to Suzuki to install in the ECU were all common generic values. Mr. Spaulding then optimized the different maps while working on the finalized version of the tuned pipe, which he confirmed accounted for up to 70% of the engine power from a snowmobile engine like the ZR 440.

[67] Although Arctic Cat did not offer evidence about how its own engine may be practicing the invention, Mr. Spaulding was cross-examined on the use that was made of his invention,

starting in 2006. However, it became clear that the inventor did not have much to contribute. He was clearer about the history of the invention.

[68] The data found in the five tables in the 738 Patent, which represent five ignition patterns, were taken from the input values and not the actual values of the finalized engine specification.

[69] The matter of what constitutes the modification of the ignition patterns was also the subject of the cross-examination. The inventor was presented with the only paragraph in the disclosure which addresses the issue of modification of an ignition pattern (that corresponds with claims 11 and 16). There is in my view no ambiguity as to what was intended to modify an ignition pattern:

> A. I did not have any other way than a timing dial, D-58, to select?
>
> Q. A pattern and then –
>
> A. When developing the 2000 model 440 ZR--
>
> Q. Yes
>
> A. -- with my pipe sensor technology and a D-58 timing dial, the exhaust temperature selected the pattern. D-58 timing dial would simply take the patterns and shift them up or down.
>
> Q. Yes
>
> A. The measurement of the exhaust to select a pattern would still exist and function. The purpose of this was, and still is, because we still use this same dial, it, as an example, would be – because of tolerances and ignition components, manufacturing tolerances, is a specific timing value is the timing setting, meaning where do you check timing to make sure that your system is timed correctly, there can be a plus or minus 1-degree tolerance in a timing value by manufacturing tolerance.

> So the operator with a dial like this would be able to check his timing manually, assuming he understood how to do that. He found that, because of the tolerance it was 1-degree retarded, 1 degree advanced, you could turn this dial to make the timing setting correct per the specification. That's one purpose. (Transcript, p 2824)
>
> [My emphasis]

Clearly the pattern is modified in that it is changed, in the example given by the witness, by "shifting them up or down".

[70] It is striking that the inventor did not offer what his contribution to the invention was other than having general ideas and asking the motorist for solutions. Many times, the witness stated that it was a joint effort in the development of the engine, yet this assertion was not supported by the details of Mr. Spaulding's contribution. He simply pivots in announcing that he moved from "rev limiter" (limiting the RPMs) to the selection of maps. The evidence is at best murky (Transcript, pp 2653 to 2658). The witness even testifies that his thinking had evolved, but he did not advise the motorist for fear of Suzuki becoming confused. How was Suzuki to implement the two-pattern innovation remained unsaid: we are only told about faxes being sent to Suzuki, by AC in December 1997, asking for views on how to turn the manual 2-pattern evolution to something "done automatically somehow, without a T.P.S. Maybe RPM and time activated. What are your ideas?" (Exhibit P-57).

[71] It remains that the witness testified that, as the notion of changing ignition pattern automatically was being explored, he had the idea (Transcript, p 2669). But, what idea precisely? The record remained very thin about the actual contribution. There is no doubt that Mr.

Spaulding is a master calibrator with many years of experience. His contribution to an invention, his "system" which he described at page 2671 of the transcript as "the exhaust gas temperature measurement by sensor to select ignition timing patterns that are optimum for engine operation at those internal pipe temperature" is much more in doubt in view of the quality of the evidence proffered at trial.

[72] BRP also presented three witnesses, other than experts retained for the purpose of discussing patent infringement and validity, and damages incurred.

D. *Bernard Guy*

[73] Mr. Guy was trained as a mechanical engineer at the Université de Sherbrooke. He also holds a master's degree in business administration. Employed by BRP since 1987, he became vice-president responsible for sales and dealerships before being promoted to vice-president responsible for sales, marketing and customer service for North America.

[74] The witness explained that BRP is not a division of Bombardier since 2003. It is a stand-alone corporate entity. The market for snowmobiles was around 150,000 units in 2005, but has dropped to 90 to 100,000 units per year more recently. The Canadian share would be around 40 to 50,000 units. There are four major players: Yamaha, Polaris, AC and BRP. BRP holds 49% of the market in Canada and 43% in North America.

[75] He testified that the difference in price between snowmobiles does not come entirely from the high cost of engines. In some cases, a difference of $3700 between two snowmobiles of the same category could come in large part from the difference in shock absorbers (as much as $1000). At other times, the differences in price are much reduced.

[76] On cross-examination, focus was put on a document titled ‘Direct Injection Study’, dated June 2006. Mr. Guy confirmed that BRP was looking at consumers’ perceptions of direct injection technology, and, as a subset, any association with specific direct injection technology such as the Evinrude E-TEC. Mr. Guy agreed that the perceptions of disadvantage, even if only slight, in terms of reliability and durability, were issues that BRP needed to address. The strongest concerns were about price and the fact that direct injection was not proven in the snowmobile industry.

[77] The cross-examination established that BRP was concerned with durability, quality and reliability issues. When the initial 600 E-TEC engines were introduced into the market place, part of BRP’s advertising campaign promoted the engine as being virtually “hassle-free”. It appears that the 2009 roll-out was not completely successful. A market survey of June 2009 showed difficulties. Mr. Guy confirmed that this was after the 600 E-TEC rollout, and that a survey stated the Ski-Doo had lost from 5,000 to 8,000 sales due to durability, quality and reliability issues. Mr. Guy explained that he would need to validate the document further to be able to provide a specific opinion on what is a statistical projection. Mr. Guy explained that these statistics were based on statistical surveys of customers that are extrapolated for results on a bigger scale.

[78] The Court is left with little doubt that durability, quality and reliability were issues BRP was concerned about. BRP needed to avoid these types of issues on its 800 E-TEC model. BRP studies carefully client satisfaction. In spite of the equivocation of Mr. Guy, there would not be much doubt that reliability and durability were issues of concern for BRP.

E. *Steward Strickland*

[79] Mr. Strickland obtained a bachelor's degree in mechanical engineering from McGill University in 2000 and started working at BRP shortly thereafter. He is an "intellectual property engineer", currently one of two at BRP, a job that involves liaising between inventors at BRP and the outside agents who draft patent applications.

[80] The witness' job involves ensuring that BRP products do not infringe patents held by third parties. There is no doubt that BRP wanted to adjust the timing of its engines in connection with the temperature of the exhaust gas. Thus, Mr. Strickland was put to contribution. The first engine for which BRP proposed to use the exhaust gas temperature for the purpose of adjusting ignition timing was the 440 HO, in 2004. In conducting his patent clearance work, Mr. Strickland searches patent offices in an effort to locate relevant patents once he has been apprised of the issue raised by the project presented to him. Thus, using engine searches or other methods, he came across the 738 Patent; he also located US equivalent patents.

[81] There are four BRP engines at issue in this case: the 440 HO, 600 RS, 600 E-TEC and 800 E-TEC. Mr. Strickland explained that he was involved in the patent clearance search for the

440 HO in 2004, when a racing department engineer approached him about using exhaust pipe temperature sensors for the purpose of altering the ignition timing. The objective was to help racing engines get out of the gate faster.

[82] These patents, located by Mr. Strickland, are owned by AC and the witness considered that they were all within the same family of patents. Reviewing the file history of the US patents, he noticed the existence of past litigation involving AC to Polaris, another snowmobile manufacturer. Having been unable to locate a decision in the matter, the witness got in touch with an American counsel who had been involved in the litigation.

[83] The telephone conversation with the American attorney, which would have taken place late in 2004, led the witness to U.S. Patent 5,946,908 (908 Patent). While the witness wished to avoid infringing patents in place, he was also interested in locating prior art that could help deal with validity issues. According to the testimony, the American attorney stressed the 908 Patent as practicing something different than AC's patent: it teaches a base map from which a timing value is extracted, and the timing value is then corrected. One reads at page 1320 of the transcript:

> A. Well, that's – you know, these are my recollections and my understanding of what he was saying when I was writing it down. And basically, what he continued on to give me was a few more details.
>
> He also said preprogrammed maps elected by exhaust gas temperature was different to the preprogrammed than to calculate on the fly. And basically what he's mentioning there – and he was always making reference to this -- we see at the bottom of the page there's some U.S. Patent numbers. One of them ends with 908. He was making reference to that patent.

> He was saying, this patent shows – it was in the prior art at the time, it was publicly available. He was saying that this 908 Patent shows using a base map and correcting the base map with a correction factor, and that was different because it was being calculated all the time. The point – the ignition point from the base map was calculated and then manipulated with the correction factor, which was different than what was actually being claimed in the patents that were at suit at the time between Polaris and Arctic Cat.

[84] Content that the 908 Patent was different from the AC's patents, Mr. Strickland continued his investigation to ascertain that the 908 Patent could not be infringed:

> Q. We will pause for a moment here. So you said you had a lot of U.S. patents. So we see the numbers here. In terms of these patents, you were in the exercise of looking for alternative, I would say, or clearance search for the 440 HO. Did you look at those patents to see their status?
>
> A. Yes, at the time, I remember the – because once Chuck Segelbaum told us about the 908 Patent, he said, this is what was being practised and this is what was taught and protected in the patent. Well, obviously before going ahead and trying to avoid one patent by doing one thing in the next patent, well, I wanted to make sure that I wasn't going to infringe the second one. So yes, I looked at the status at the time of the 908 Patent.
>
> Q. What was the status?
>
> A. It had actually been expired. The assignee, which is Yamaha, they didn't pay one of the maintenance fees that had been due prior to that time, and thus the patent had expired.
>
> (Transcript, p 1323)

[85] Mr. Strickland was therefore testifying that the AC patents were not infringed if BRP sought to practice the 908 patent, which had expired by then.

[86] Following discussions within BRP, the witness testified that was chosen the option of a base map with corrective values. As explained at p 1335 of the transcript, the corrective factor would be added to the ignition timing point "previously gotten from the base ignition map." That was the suggestion advocated by Mr. Strickland (Transcript, p 1339).

[87] It is the witness' evidence that the suggestions were also implemented in the other accused engines, the 600 RS, the 600 HOE-TEC and the 800 HOE-TEC (Transcript, pages 1350-1351).

[88] On cross-examination, Mr. Strickland clarified that the American attorney made specific references to the US 908 Patent and that it was practiced by Polaris; BRP chose to base their system "on a base map with a correction factor method, that is what was taught by the 908 Patent." (Transcript, p 1371)

[89] The testimony about the practice of the 908 Patent was not seriously challenged at trial. The cross-examination concentrated instead on the location of the sensor for the exhaust gas temperature. The witness expressed his view that the 908 Patent teaches that the sensor can be directly in touch with the exhaust gases or it may be installed flush against the exhaust system, thus measuring the temperature indirectly.

[90] It is of course one thing to have an intellectual property engineer testify that BRP chose to practice the U.S. 908 patent which is claimed to be different than the 738 Patent with its

insistence on ignition patterns being either selected or modified through the use of the exhaust gas temperature. That was the task at hand for the next witness.

F. *Bruno Schuehmacher*

[91] Mr. Schuehmacher holds a Bachelor's degree in mechanical engineering from the École Polytechnique de Montréal. He has been working at BRP since 1993, and as a mechanical engineer in the engine calibration department since 1998. As such, he is in charge of calibrating snowmobile and two-stroke engines. Since the engines themselves are assembled by the Rotax division of BRP in Austria, his work consists of developing intake and exhaust systems, as well as software used by the control module of the engines.

[92] Mr. Schuehmacher explained that in response to environmental standards that were becoming increasingly strict, BRP developed a series of SDI (*semi-direct injection*) engines, introduced for the 2003 models. The SDI technology limits fuel loss through the exhaust pipe of a two-stroke engine by injecting fuel in the transfer port and not by using a carburetor. True direct injection resolves this issue completely but the technology is much more expensive. BRP acquired Johnson-Evinrude and its E-TEC direct injection technology around 2000-2001 and began developing it for use in its snowmobiles. This technology was marketed for the 2008 model year and the SDI technology was discontinued in 2009. However, another technology called "P-TEK", marketed for the first time in 2000, continued to be manufactured in small quantities with a carburetor managed by a control module.

[93] The witness explained how inputs are used in the control logic of the BRP engines. His evidence is that the same control logic was in use for the P-TEK engines (carburetors) as well as the 440 HO and 600 RS (direct injection). Base maps are basically ignition patterns. They are pre-determined ignition points for different engine speeds. For a given engine speed, or range of engine speeds, an ignition point is determined, usually at a point before the piston reaches the top of the cylinder (top dead center). The base maps provide the initial advance ignition timing. In the case of these engines, the four base maps, A, B, C and D, relate to the type of fuel to be used and, with respect to D, corresponds to the "preheat" map used solely in race models. Map C was never used.

[94] E, F, G, H, J and KxL are all corrections that are applied on the ignition timing selected from one of the four base maps, such that the logic is portrayed as:

> ((A or B or C or D)+E+F+G+H+J+KxL)
>
> where K is the correction made as a function of the exhaust gas temperature.

As can be seen from the equation, once one of the four base maps has been selected, a correction is to be applied on the ignition point that corresponds to the engine speed. One of the corrections will come from the temperature of the exhaust gas. It is worth reproducing the summary of the operation of the logic control for engines, in the words of the witness. That was never challenged. It must be taken by the Court as the operating logic for the BRP engines. As will appear later, the same logic will apply equally to the E-TEC engines.

> R. [TRADUCTION] First, the controller will have to select which basic spark advanced table to use to extract the ignition timing. Therefore, as explained, this will normally be A or B depending on whether it is a race application or not, or whether it's at the starting

> line warming up the tuned pipe; in that case it would be D, if I am not mistaken, that corresponded to the preheat. So based on the engine operating conditions, the basic table is chose. Knowing the point of operation for engine speed and throttle position, a base ignition timing is extracted and once this base ignition timing is extracted various corrections are added for the barometric pressure of the engine temperature, the engine break-in, the exhaust emissions temperature. Once these additions are made, the final ignition timing is determined, and that will be sent to the ignition coil to produce the spark.
>
> (Transcript, page 828)

[95] Mr. Schuehmacher then addressed the E-TEC engines, for which BRP used the control module and logic developed by Johnson-Evinrude. He explained that BRP merely added functions that did not exist in outboard but that are necessary for snowmobiles. BRP also integrated a number of other functions that exist in the P-TEK modules, including muffler temperature management. This work was done in collaboration with Johnson-Evinrude and, to a certain extent, Rotax.

[96] According to Mr. Schuehmacher, the inputs to the E-TEC module are essentially the same as those for the P-TEC module. However, there is also a "GPSTP" input that is for the temperature of the exhaust gas in the tuned pipe. This corresponds to a second temperature detector for exhaust gas in the tuned pipe rather than in the muffler. It is found in the 800 E-TEC, but not in the 600 E-TEC. Mr. Schuehmacher then explained that the spark advance of the 800 E-TEC module operates by selecting one of the four basis tables based on the combination of two distinct parameters: barometric pressure and fuel quality. Once the basic table is selected, the module will extract a spark advance according to the engine's rotational speed and the throttle position. To this value, the corrections extracted from the "Dynamic ignition timing correction

map" are added, including a correction based on the exhaust gas temperature sensor. This only applies when the throttle is open more than 70% or 80%, depending on the model of the snowmobile, and when the engine is at an operating speed greater than 7,800 revolutions per minute. Therefore, it is only when these conditions are met that the correction will apply according to the temperature detected.

[97] The Engine Control Module [ECM] of the E-TEC engines is programmed to determine the final ignition point by applying one or more correction(s) to a base ignition timing point extracted from one of the four base ignition timing maps. The corrections are determined based on engine speed, atmospheric pressure and muffler temperature (see BRPE-58/8-9), using the following formula:

> Ignition timing calculation: (A or B or C or D) + E + F + G
>
> where:
>
> • A, B, C or D is the ignition timing value extracted based on rpm and throttle position from the previously selected Base Ignition Timing Map;
>
> • E is the ignition timing correction value (Dynamic Ignition Angle Correction) for sensed EGT [exhaust gas temperature] and engine speed (rpm);
>
> • F is the ignition timing correction value for Altitude;
>
> • G is the ignition timing correction value for muffler overheat protection.

[98] Mr. Schuehmacher explained that according to the data collected from the trials conducted on BRP snowmobiles since 2005, situations in which there was a correction on the basis of the exhaust gas temperatures were very rare in practice since they correspond to high

throttle openings, greater than 70% and 80%, which requires a very high speed. The correction for the 800 E-TEC will only be used beyond 7,800 revolutions per minute. The correction based on the temperature of the exhaust gas therefore only applies 3% to 5% of the time. Mr. Schuehmacher added, however, that this data may vary according to engine power and the way it is used. In the 800 E-TEC, 3% corresponds to use on trails while 5% corresponds to use in the mountains. The 600 E-TEC, a more reliable engine, is generally only used on trails, and the correction also only applies less than 5% of the time it is used.

[99] On cross-examination, the witness was not challenged on the control logic that is used with respect to the accused engines. He was asked to provide examples of how the logic would actually operate in an attempt, presumably, to show that the logic followed by the four engines corresponds, in the end, to the teachings of the asserted claims of the 738 Patent.

[100] The witness was however steadfast. The logic of the four engines requires that an ignition point be extracted from the selected base map, to be corrected, including being corrected as a function of the temperature of the exhaust gas (Transcript, pp 1108 to 1123).

[101] Finally, the cross-examination confirmed that BRP was conscious of the existence of the patents owned by AC. Clearly, BRP wanted to avoid infringement and Mr. Schuehmacher concluded that, in his view, there was no infringement (Transcript, pp 1143 to 1146). Far from resiling from the view that BRP was not practicing the 738 Patent, BRP goes even further in stating that it took care to avoid infringement. This is not a case where the infringement is

justified *ex post facto*. BRP, knowing about the AC patents, sought to avoid being in violation of the monopoly.

[102] It is uncontradicted, on the record before the Court, that BRP's logic was to the effect that a base map would be selected according to some criteria (eg. Fuel quality), but not on the basis of the exhaust gas temperature.

[103] Once a map was selected, the ignition point corresponding to a particular engine speed (revolutions per minute) would be extracted for the purpose of applying to it a correction. That figure would then be corrected for different factors including as a function of the temperature of the exhaust gas. That logic is fundamentally the same for the four accused engines. The question then is, having constructed the claims asserted by AC, is there infringement?

[104] I have reviewed at significant length the testimonies offered by these witnesses. The evidence of Mr. Spaulding is important in order to understand what the invention is and whether it is his invention. Messrs. Strickland and Schuehmacher sought to establish how BRP was to avoid infringing the 738 Patent. This case boils down to determining first what logic is followed by the four accused engines. Second, the Court will have to determine what the invention consists of, through a construction of the claims, before comparing the invention to the logic followed by BRP with respect to its engines.

G. *The Experts*

[105] There have been four experts presented by the parties in this case. AC and BRP offered an expert each in order to assist with an understanding of how two-stroke engine operates and how to construct this Patent.

[106] For AC, Dr. David Checkel is a professional mechanical engineer; he is the holder of a Ph.D. in engineering from the University of Cambridge. He has taught at the University of Alberta's Department of Mechanical Engineering for close to 30 years. He is now retired.

[107] For BRP, Dr. Glenn Bower was also trained as a mechanical engineer. He holds a Ph.D. earned at the University of Wisconsin-Madison. He is currently a Senior Scientist at the University of Wisconsin-Madison Engine Research Center and Faculty Associate in the University of Wisconsin-Madison Mechanical Engineering Department.

[108] Two other experts were retained by the parties to assist with the assessment of damages. The matter of damages was not bifurcated in this case and the case on damages was heard irrespective of the decision on infringement and validity. Both experts on damages also testified in the sister case T-2025-11.

[109] For AC, Mr. Andrew N. Carter offered his expertise. He has a Bachelor of Science degree from the Rose-Hulman Institute of Technology. He also holds a Master of Business Administration from the University of Chicago’s Graduate School of Business.

[110] Dr. Keith R. Ugone, for BRP, was trained in economics. His B.A. in Economics was received from the University of Notre Dame. His M.A. in Economics is from the University of Southern California. His Ph.D was earned at Arizona State University.

[111] Mr. Carter and Dr. Ugone have for some time provided advice to clients through, in the case of Mr. Carter, a firm where he is the head of the expert testimony practice, while Dr. Ugone is a managing principal at Analysis Group, Inc. where he specializes in the interpretation of financial and economic data.

VI. *Credibility of experts*

[112] The qualifications of the experts were never doubted. Nevertheless AC chose to dedicate a number of its allocated 60 pages for its memorandum of facts and law to challenging the credibility of the two experts retained by BRP in this case.

[113] As for Dr. Bower, an expert in mechanical engineering, AC reproaches him that he lacked impartiality and acted as an advocate for the party having retained his services.

[114] There is no doubt that expert witnesses have "an overriding duty to assist the Court impartially on matters relevant to his or her area of expertise" (Section 1 of the *Code of Conduct for Expert Witnesses before the Federal Courts*, adopted pursuant to Rule 52.2 of the *Federal Courts Rules*, SOR/98-106). Section 2 of the Code is even more explicit:

| | |
|---|---|
| **2** This duty overrides any duty to a party to the proceeding, | Cette obligation l'emporte sur toute autre qu'il a envers une |

| | |
|---|---|
| including the person retaining the expert witness. An expert is to be independent and objective. An expert is not an advocate for a party. | partie à l'instance notamment envers la personne qui retient ses services. Le témoin expert se doit d'être indépendant et objectif. Il ne doit pas plaider le point vue d'une partie. |

Given the particular role played by expert witnesses and their duty to assist the Court impartially, a number of questions came from the bench throughout their testimony for the purpose of clarifying what was often left either ambiguous or unclear, at least in the eyes of the Court. That was true of the experts retained by BRP as well as those retained by AC.

[115] In my view, having reviewed their lengthy reports and listened very carefully to the testimony of the four experts in this case including the testimony of Dr. Bower, I was left with the firm conviction that Dr. Bower was certainly no more an advocate for BRP than were Dr. Checkel and Mr. Carter for AC.

[116] It must be acknowledged that experts are appearing in the context of trials where the parties have different points of view. They have formed an opinion which, evidently, will be consistent with the theory of the case advanced by a party. I thought this was the idea captured by the Supreme Court of Canada in *White Burgess Langille Inman v Abbott and Haliburton Co.*, 2015 SCC 23, [2015] 2 SCR 182 [*White Burgess Langille Inman*]. It is certainly true that the expectation is that the expert's opinion must be impartial, independent and unbiased. However, these concepts are qualified in view of the context in which an expert is testifying:

> 32 Underlying the various formulations of the duty are three related concepts: impartiality, independence and absence of bias. The expert's opinion must be impartial in the sense that it reflects an objective assessment of the questions at hand. It must be

> independent in the sense that it is the product of the expert's independent judgment, uninfluenced by who has retained him or her or the outcome of the litigation. It must be unbiased in the sense that it does not unfairly favour one party's position over another. The acid test is whether the expert's opinion would not change regardless of which party retained him or her: P. Michell and R. Mandhane, "The Uncertain Duty of the Expert Witness" (2005), 42 Alta. L. Rev. 635, at pp. 638-39. These concepts, of course, must be applied to the realities of adversary litigation. Experts are generally retained, instructed and paid by one of the adversaries. These facts alone do not undermine the expert's independence, impartiality and freedom from bias.

It is certainly not infrequent for experts to hold different opinions. This is exemplified again in the recent case of *R. v Borowiec*, 2016 SCC 11, where two experts came to diametrically different views on whether a mother charged with the offence of infanticide had a disturbed mind. Different opinions do not show a lack of impartiality. It is common place that experts disagree.

[117] In the case at hand, AC complained that Dr. Bower did not satisfy some of the specific requirements of section 3 of the Code of Conduct. Here, AC seems to refer to their view that Dr. Bower ought to have disclosed "literature and other materials specifically relied on in support of the opinion." As I have explained elsewhere in this judgment, there was no such derogation from the Code, as what M. Bower was faulted for did not fall in the category of literature and other materials.

[118] AC was also complaining about a peripheral role that may be played by the expert on a project at the University he is associated with, where one of the sponsors would be BRP. He is also faulted for having acted in a case in the United States involving Polaris, another snowmobile

manufacturer, and Arctic Cat in a matter about the American equivalent of the 738 Patent. Neither one of these two allegations was particularly convincing. They did not go to the impartiality, independence and lack of bias as described by the Supreme Court. Having considered the reports produced in this case by the expert and his demeanour in the witness box, he was candid and forthcoming, perhaps more so than Dr. Checkel; there was never any doubt that the assessment done was objective, or that the view expressed was not the product of his independent judgment, uninfluenced by who has retained him. He showed that willingness to explain his assessment, including his careful and complete review of claims. He never hesitated to engage with questioners and the Court. Dr. Bower was no less impartial and independent than Dr. Checkel or Mr. Carter. I would not impugn their integrity on the basis that they have a point of view that differs from that of Dr. Bower and, for that matter, Dr. Ugone. The same is true in reverse. They are all experts who have come to a conclusion and I have no indication that their position is tailor made.

[119] AC contended that bias was demonstrated by the fact that Dr. Bower found prior art that would invalidate the 738 Patent. However, the main pieces of prior art in this case were identified more than ten years ago by BRP as it was attempting to avoid being in violation of the 738 Patent. That, in and of itself, is a laudable objective and no one should be faulted for having conducted research that I found to be diligent. The fact that, once retained, Dr. Bower would conduct further research is not to be decried. Quite the opposite. One should expect that research is conducted to find what is the extent of the prior art. It would be quite a different matter if Dr. Bower had found prior art that would have been counterproductive from his stand point, yet he would have hidden that fact from the Court. The Court did not find that it was particularly

impressive that “Dr. Checkel’s construction is independent of the asserted prior art. In fact, he did not recall looking at the asserted prior art in the preparation of his report on claim construction and infringement.” (AC’s Memorandum of facts and law, at para 190)

[120] In fact, the hesitation shown by Dr. Checkel to define and explain what “ignition pattern”, the central concept in this patent, signaled an intention to stick to a pre-determined scenario. On more than one occasion, Dr. Checkel showed reluctance to engage on that most important concept, as if the issue could be avoided. The Court was left with the impression the expert was walking some sort of a fine line from which he was reluctant to depart.

[121] AC tried to make hay out of the obvious change of heart on the part of Dr. Bower about the required qualifications of the person skilled in the art (Posita). It is certainly true that he expressed a different view in a report he authored in the US case of *Polaris v Arctic Cat* some 13 years ago. As he candidly testified at trial, he had forgotten about the particulars of his involvement which actually never resulted in him testifying as the case was settled out of court. Contrary to what is argued by AC, he did not prove himself to be willing to ignore his own evidence as much as he had forgotten about that evidence.

[122] As I will try to show in the section of these reasons dedicated to determining the features of the person skilled in the art, the better view is that now defined by Dr. Bower. In my view, the knowledge that is required in order to practice the 738 Patent requires more than the experience of a cell technician. If the inventive concept is that which is defined by AC, it is simply unlikely that a person of skill in the art does not have the skills of a mechanical engineer. If, on the other

hand, what is needed is an engine calibrator, that would fit the definition of the Posita offered by Dr. Checkel where academic credentials are not required. I have concluded that the person to whom the patent is addressed is not merely a calibrator.

[123] It follows that the Court is of the view that the definition of the Posita offered by Dr. Bower in this case does not render him less qualified, less objective or less independent. I have come to the conclusion that his credibility, and the weight of his evidence, should not be discounted simply on the basis that he has changed his mind on the definition of the Posita. As noted earlier, he had forgotten about the Polaris litigation and, in my view, revising one's view is not to be held against the expert unless there is a nefarious purpose that can be inferred. That has not been shown in this case. AC has contended that the change of heart, or opinion, was that the expert showed a willingness to change his opinion based on who retains his services. I disagree. In the U.S. case *Polaris v AC*, Polaris was in the same position as BRP is in that it is in the opposite camp compared to AC. In a sense, Polaris and BRP appear to be in the same camp, as the conversation between Mr. Strickland and a U.S. attorney for Polaris would attest. The fact that Dr. Bower would define differently the Posita cannot reflect a predilection for changing his mind depending on who hires him when, in fact, the two clients are in a similar predicament.

[124] I should add, parenthetically, that it is somewhat ironic that AC would insist that much on the difference between the positions taken by Dr. Bower in this case and in the U.S. litigation involving Polaris.

[125] As was brought to the attention of the Court, AC resisted strenuously answering any question relating to the U.S. litigation, including whether the matter did not proceed because Polaris designed around the U.S. Patents 082 and 566. One of the reasons given was that these two patents are not equivalent to the Patent-in-suit and the claims differ in number and in language (examination of corporate representative Donn Eide, March 20-21, 2014). Without knowing more about the U.S. litigation involving the witness, it is not possible to ascertain fully what would have been an appropriate definition of a Posita in U.S. litigation. Indeed, it is always a perilous exercise to try to compare requirements in two different pieces of litigation conducted in two different countries operating on different laws and sets of rules.

[126] The Court found Dr. Bower to be generally clearer than Dr. Checkel in his explanations. Dr. Checkel was mistaken in a number of respects in his report; as with Dr. Bower, I would not hold that against him. Mistakes happen. On the other hand, he hesitated answering questions which appeared to be straight forward, indicating at times that he had misunderstood the question asked. Furthermore, the claims construction exercise conducted by Dr. Bower was much more fulsome than the cursory examination done by Dr. Checkel. Dr. Bower was precise and the construction accounted for the words used in the claims.

[127] It must be said, however, that both experts were operating with a Patent that had a lot to be desired. They each had a theory as to what was intended by the invention and, to some extent, that is to be expected in a case that ends up before the Court. In other words, the simple fact that the matter needs to be litigated is a significant indication that there is a fundamental disagreement. This Court did not hold that Dr. Checkel and Dr. Bower were not experts; this

Court did not conclude that their evidence ought not to be admissible; this Court rather concludes that the experts dealt with a difficult patent that was lacking in details and precision and their integrity ought not to be impugned. At the end of the day, it is this Court's assessment that the evidence offered by Dr. Bower was closer to the language of the Patent and it was consistent with the prior art that had been identified.

[128] Advocating for a party and advocating for an opinion firmly held are two different things. The advantage enjoyed by Dr. Bower over Dr. Checkel, in my view, is that Dr. Bower's opinion stayed close to the text of the Patent, accounted for all the terms of the claims and did not do violence to the text. Furthermore, the relevant prior art was consonant with the view he expressed in his reports and testimony.

[129] AC made the same kind of argument with respect to Dr. Ugone's evidence. He was retained by BRP to assess the damages suffered by AC were the Court to find in favour of the Plaintiffs. Here, the argument boils down to a disagreement with the testimony offered by Mr. Carter, the expert retained by AC. AC suggested that Dr. Ugone was reluctant to help the Court. As a matter of fact, Dr. Ugone was no more reluctant to help the Court than was Mr. Carter. On the issue of damages, these two experts arrived at conclusions that could hardly have been more apart.

[130] Concerning Dr. Ugone, he was accused of being inconsistent in his methods and reluctant to help the Court.

[131] As will be shown in the part of these reasons dealing with damages, neither one of the experts was in the end of much assistance to the Court. One of the three methodologies offered by Dr. Ugone may have been the basis, with some significant adjustments, to serve as the basis of the notional negotiation. However, none of the four methods devised by Mr. Carter was of any assistance. Even his report was less than instructive and his methods were rather crude, lacking in sophistication or theoretical underpinnings. I have concluded that it is largely because of the Patent-in-suit which would have made very difficult to assess damages without more information on the actual practice of the Patent. I would not have retained any criticism against Dr. Ugone. If some assistance could have been derived from the experts' evidence on damages, Dr. Ugone's evidence at least provided a method that could have provided some guidance.

[132] Until the end, it remained unclear what the impact of the invention had, or could have had, on the profitability of the accused snowmobiles. This is a vital feature of a case on damages. That is largely a function of the lack of information that was generated on the basis of a patent such as the 738 Patent. Mr. Carter, who was relying on his view of the profitability of the AC snowmobile, not the accused engines, never offered how the AC snowmobile was practicing the invention, including what systems were directly influenced by the said Patent. Instead, he fell back on the vague notion of the contribution margin between snowmobiles. As is well known, it is only the damages that are incurred "by reason of the infringement" (subsection 55(1) of the *Patent Act*) that can be compensated. Mr. Carter had to contend with an invention that consisted of the use of exhaust gas temperature in order to adjust the ignition timing to optimize the performance of a snowmobile engine, which includes increasing power, making adjustments for fuel, incorrect carburation or fuel delivery and, generally speaking, avoid damage to the engine. However, the Patent does not indicate how the exhaust gas temperature is to be used in order to

attain such goals and the evidence does not show whether any of those goals were attained by either the AC engine or the accused engine. AC did not lead evidence on the use it made of its invention. In other words, what was the value generated by the invention? It is, therefore, unsurprising that the experts on damages were attempting to be creative to establish some basis for the awarding of damages. The paucity of information resulted in their testimony lacking a strong foundation.

[133] In the end, this is a case where the experts provided the Court with as much assistance as they could muster in view of the Patent-in-suit. There should not be any undue reflection on their testimony. In my view, AC's contention against both Dr. Bower and Dr. Ugone is no more than a disagreement with the views expressed by these two experts. As put by the Supreme Court in *White Burgess Langille Inman*, above, this is the reality of the adversary system of justice that experts, even when well qualified, may well reach conclusions that are not consistent with one another. It is for the trial judge to use the expertise offered to decide which view carries more weight. In a patent case, we have at least the benefit of the text of the patent which is elucidated with the assistance of experts.

[134] Counsel for AC put it appropriately in their memorandum of facts and law when stating that "[t]he patent agent is free to draft in this manner with the hope of drafting one claim that is valid and of sufficient scope to protect the invention" (para 82). The point was captured by Pigeon J. in *Burton Parsons Chemicals, Inc v Hewlett-Packard (Canada) Ltd*, [1976] 1 SCR 555 [*Burton Parsons*]:

> It is stressed in many cases that an inventor is free to make his claims as narrow as he sees fit in order to protect himself from the

> invalidity which will ensue if he makes them too broad. From a practical point of view, this freedom is really quite limited because if, in order to guard against possible invalidity, some area is left open between what is the invention as disclosed and what is covered by the claims, the patent may be just as worthless as if it was invalid. Everybody will be free to use the invention in the unfenced area. It does not seem to me that inventors are to be looked upon as Shylock claiming his pound of flesh. In the present case, there was admittedly a meritorious invention and Hewlett-Packard, after futile attempts to belittle its usefulness, brazenly appropriated it.

[135] Here, AC was faced with the same kind of dilemma. If the claims must be construed with the ignition pattern being central to the invention that leaves potentially an unfenced area where someone avoids using ignition patterns in the manner described in the claims. On the other hand, if the ignition pattern is to be read down, if not outright ignored, there is prior art that will be invoked to argue that the claims are invalid. That was the context in which the two experts testified. That was the conundrum faced by the Plaintiffs.

## VII. *Person of skill in the art*

[136] As with other patent cases, this case requires that the person of skill in the art (Posita) be defined, that is the hypothetical person who will consider the patent and to whom it is addressed.

[137] It would seem that the definition of the Posita, given by the Canadian group of the Association internationale pour la protection de la propriété intellectuelle (AIPI), received a measure of attention. Hughes J., of this Court, referred to it in *Merck & Co v Pharmascience Inc*, 2010 FC 510, 85 CPR (4th) 179. Stratton in his *Annotated Patent Act* (Bruce Stratton, Carswell),

gives it as the definition of the term in the section called Words and Phrases Judicially Considered. It reads:

> In Canada, the "person of ordinary skill in the art" is the hypothetical person to whom the patent is addressed. This may be a single individual or a group representing different disciplines, depending on the nature of the invention. The person of ordinary skill in the art is deemed to be unimaginative and uninventive, but at the same time is understood to have an ordinary level of competence and knowledge incidental to the field to which the patent relates (i.e. the common general knowledge) and to be reasonably diligent in keeping up with advances. The common general knowledge is that knowledge generally known by persons skilled in the relevant art at the relevant time. Accordingly, it can include knowledge passed amongst people in the field, including information that is not in published form. Likewise, not everything that has been published is within the common general knowledge.

[138] That same hypothetical person has been described, in the context of the kind of person for whom an invention would be obvious, in a more colourful way in *Beloit Canada Ltd v Valmet Oy* (1986), [1986] FCJ No 87 (CA) at p 294:

> The test for obviousness is not to ask what competent inventors did or would have done to solve the problem. Inventors are by definition inventive. The classical touchstone for obviousness is the technician skilled in the art but having no scintilla of inventiveness or imagination; a paragon of deduction and dexterity, wholly devoid of intuition; a triumph of the left hemisphere over the right. The question to be asked is whether this mythical creature (the man in the Clapham omnibus of patent law) would, in the light of the state of the art and of common general knowledge as at the claimed date of invention, have come directly and without difficulty to the solution taught by the patent. It is a very difficult test to satisfy.

[139] I do not wish to suggest that the definitions are to be applied without any nuance and in an overly rigid fashion. But the basic idea is that a person, or group representing possibly different disciplines, has an ordinary level of competence and knowledge, which includes

reasonable diligence in keeping up with developments in the field. That person, or team, is said to be unimaginative and uninventive, neither a genius nor an idiot, just an ordinary competent person (see *Mailman v Gillette Safety Razor Co of Canada*, [1932] SCR 724).

[140] Although the parties do not disagree on the general description of who may constitute the Posita, including that the notion could include a small team, they disagree on what would be the qualifications of the Posita in the case at hand.

[141] By requiring less formal education, AC would end up with a class where education is replaced by at least ten years of appropriate experience working on engine control projects. It is not so much that the mechanic with ten years' experience is part of a team as the experience is presented as a substitute for the formal training and experience.

[142] In his initial report (June 15, 2015, exhibit P-2), Dr. Checkel, the expert retained by AC, stated that "[t]he person skilled in the art would be expected to have mechanical engineering and knowledge of basic electrical circuity", before requiring further familiarity "with how electronic control devices (typically a microprocessor) could be programmed and interfaced with sensors and control systems." (para 28). Unexpectedly, Dr. Checkel would broaden the class in his last sentence at paragraph 29, dealing precisely with the person skilled in the art by stating that "the required skills could also have been developed with less formal education and more years (likely at least ten years) of appropriate experience working on engine control projects." In his second report (August 26, 2015, exhibit P-60), Dr. Checkel took issue with the definition of the Posita given by Dr. Bower, the expert retained by BRP, who would require, as part of the team, that

there be someone with formal education and experience, i.e. a bachelor's degree in mechanical engineering with two to three years of experience in the development, design and performance of two-stroke engine control systems (Exhibit D-40, June 15, 2015).

[143] It seems that Dr. Checkel's criticism stems in part from his desire to be inclusive. Thus, he writes that "[t]he definition is overly restrictive because it does not allow for the possibility of persons with less formal education and more practical experience" (P-60, para 14). His focus is on people commonly found in the engine development and calibration departments of medium size companies that manufacture off-road and recreational vehicles, as well as in the smaller companies that specialize in developing engine controls and in adapting or calibrating engines for specific applications (P-60, para 14). However, it is not so much that Dr. Bower excludes from the team those who would have less formal education; rather he advances that the formal education is needed on the team. Dr. Checkel seems to acknowledge that the Posita "would likely have an appropriate university or college degree and two to four years of experience" (P-2, para 29), yet he contends that someone with less formal education would not only be part of the team Dr. Bower is relying on, but "more years appropriate experience working on engine control project" (P-2, para 29) would suffice.

[144] It is not easy to follow Dr. Checkel in his justification for having a Posita without formal training. He argues for inclusiveness, which is not excluded by Dr. Bower, because "it is important to consider the common general knowledge and the state of the art from the view point of such a person" (P-60, para 15). However, this cannot justify excluding the degreed mechanical engineer. In his first report, Dr. Checkel accepts that the Posita would likely have an appropriate

university degree with some years of experience but concludes that a substitute could be at least ten years of "appropriate" experience. What constitutes that "appropriate" experience remains unknown. In his second report, he argues for inclusiveness, which is a red-herring, and justifies his choice by stating that the common general knowledge and the prior art must be considered from the view point of the person of experience, but without formal training. This is considering the issue upside down.

[145] With respect, what is being described by Dr. Checkel is not the hypothetical person to whom the patent is addressed. It is trite to point out that a patent is for an invention, and that an invention is defined precisely in the *Patent Act*:

| | |
|---|---|
| "invention" | "invention" |
| "invention" means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter; | « invention » Toute réalisation, tout procédé, toute machine, fabrication ou composition de matières, ainsi que tout perfectionnement de l'un d'eux, présentant le caractère de la nouveauté et de l'utilité. |

[146] Stephen J. Perry and Andrew Currier capture well in their Canadian Patent Law, 2nd Edition, Lexis Nexis, the connexion between the knowledge required of the Posita in relation with the invention:

> §15.7 It is therefore incumbent upon the court, when construing a patent, to do so from the perspective of the person skilled in the art. The person skilled in the art has been identified as a person to whom the patent specification is specifically addressed and who is likely to have a practical interest in the subject matter of the invention, and as a person with practical knowledge and experience of the kind of work in which the invention was intended to be used. It has been held in at least one case that

> knowledge can be gained through practical experience or education.
>
> [Emphasis in the original]

[147] Repeatedly during his testimony, Dr. Checkel was referring to the Posita as the one setting up the controls for new engines (see for example, at pages 3016 and 3025). The 738 Patent is concerned with an inventive concept, something new, and not merely what is needed from an experienced technician to set up the controls, to calibrate the engine. Indeed, limiting the experience to snowmobiles would not be appropriate as the Patent is directed to two-cycle internal combustion engines and their operation.

[148] In effect, it would seem that AC contends that the Posita is the person who sets up the controls and calibrates the engine. The invention, they say, is using the exhaust gas temperature to optimize the ignition timing of a two-stroke engine. The optimization is presented as getting the best power, although the 738 Patent does not profess such limitation. As the Background of the Invention states, “as one example the optimum point of ignition during acceleration can differ from that of a normal running operation”.

[149] The difficulty with the contention is that the 738 Patent is proposing more than simply calibrating an engine to optimize its power. It is certainly true that the Patent states that the optimum operation of the engine may require different optimum points of ignition during acceleration. However, the Patent goes well beyond acceleration and power.

[150] The optimization may relate to the engine operating shortly after start-up, where the engine is still cold, requiring different relationships between ignition timing and engine speed.

[151] In fact, the Patent is concerned with the fact that "[d]ifferent engine operating conditions may result in different ignition patterns being desirable". The exhaust gas temperature is to be "used to evaluate operating conditions" (Pages 3 and 4 of the 738 Patent). The sensed gas temperature could be used to indicate the kind of fuel used, setting the ignition timing pattern accordingly. The Patent goes on to state that the adjusted timing pattern would avoid damage to the engine.

[152] Actually, the Patent speaks even in terms of the gas temperature being "useful in indicating some problems in engine performance, e.g. incorrect carburetion or fuel delivery". (p 5)

[153] As can be seen, performance is not limited to acceleration or power. In order to be that person to whom the Patent is addressed, there is a need to determine what the exhaust gas temperature is indicating, what is the diagnosis that comes in order to address the problems in engine performance, to avoid damages to the engine. The appropriate calibration follows the diagnosis. It depends on what needs to be accomplished. Is the gas temperature to be used in indicating engine performance such as carburation or fuel delivery? Is the sensed temperature indicative of the type of fuel used? Should the temperature be used to evaluate the operating conditions?

[154] The 738 Patent is silent as to how the exhaust gas temperature can be used to identify problems. It is also silent as to how that information is used to solve the problems. What timing pattern is appropriate to avoid incorrect carburation or fuel delivery is not described. How such problem is detected using sensed exhaust gas temperature is left to the person skilled in the art. That is, it seems to me, a further indication that a mechanical engineer is needed to practice the invention. This Patent is addressed to someone who does more than the calibration of engines which entails deciding on the values needed for ignition timing at different engine speeds. It is the knowledge needed to be the addressee that is missing to the Posita proposed by AC.

[155] It is one thing to develop engine controls, to « be aware of the structures and mechanisms involved in operating two-stroke engines » (P-60); it is quite another to appreciate and understand that which purportedly is new and useful art, process, machine, manufacture or composition of matter. Dr. Bower's point of view, expressed more fully at paragraph 14 of his response to Dr. Checkel's infringement report (Exhibit D-45, August 28, 2015), is more conversant with the 738 Patent. The formal training would bring with it knowledge broader than experience acquired while working on certain types of engines.

[156] Reacting to the report of Dr. Bower (P-40) where he requires that the team include someone with a bachelor's degree in mechanical engineering with two or three years of experience in the development, design and performance of two-stroke engine control systems (para 55), Dr. Checkel suggests, as indicated earlier, that Dr. Bower's definition is overly restrictive "because it does not allow for the possibility of persons with less formal education and more practical experience" (exhibit P-40, para 14).

[157] Dr. Checkel's wish to be inclusive is certainly laudable. Thomas Alva Edison had thousands of patents in his name and he did not benefit from formal education. However, no one will dispute that he was the exception, not the rule. He is the mechanical genius of the *Gillette* case. Actually, Dr. Bower does not exclude from the team those with less formal education: he wants for someone on the team to have the mechanical engineering degree.

[158] I accept Dr. Bower's evidence that formal training, which evidently carries the theoretical bases in the field, will assist in having the proper understanding of injection timing, injection quantity, admission of air, and configuration of the tuned pipe. The 738 Patent, if it is to be practiced as indicated in its disclosure, requires someone with a mechanical engineering degree.

[159] This is not to suggest that it would be impossible for someone with many years' experience, who would be self-taught, some sort of autodidact, to fully understand the 738 Patent. Dr. Checkel wants to allow for the possibility that these be included. However, such is not the test. It is not an attempt to include people who work generally in the area that must guide the Court, but rather a determination of the person to whom the Patent is addressed. This is a Patent that is concerned with the logic used to operate a two-stroke engine and, as we saw throughout the trial, this is not an easy area to master. As captured nicely in the *Annotated Patent Ac*t of Bruce Stratton, "the notional skilled person should be a person who understands, as a practical matter, the problem to be overcome, how different remedial devices might work and the likely effect of using them". (Annotation under section 28.3, at page 1-200.11). It seems to me that what is required here is not so much someone who could produce calibration, for instance, but rather someone who can fully appreciate the specifications and work with them. In

*Consolboard Inc v MacMillan Bloedel (Saskatchewan) Ltd*, [1981] 1 SCR 504, Dickson J. wrote at page 523:

> The persons to whom the specification is addressed are "ordinary workmen", ordinarily skilled in the art to which the invention relates and possessing the ordinary amount of knowledge incidental to that particular trade. The true interpretation of the patent is to be arrived at by a consideration of what a competent workman reading the specification at its date would have understood it to have disclosed and claimed.

[160] The 738 Patent does not claim calibration. An appropriate calibration would result from a proper use of the Patent, but it will result from an appropriate understanding of what the invention is about. The testimony of Mr. Troy Halvorson, an employee of AC, can illustrate somewhat the difficulty encountered if one is tempted to go to a lower denominator in order to define the class of persons to whom the 738 Patent could be addressed without having the formal education included on the team.

[161] My view that the Posita needs to have an engineering degree is strengthened by the comment made by Dr. Checkel in his report responding to the allegations of invalidity made by BRP (P-60). As Dr. Checkel was discussing as normal operating conditions which could be remedied, he reckoned that many factors would have to be taken into account:

> 73. I disagree with Dr. Bower's opinion that the 738 Patent is indefinite relative to the term "a first ignition pattern". In Paragraphs 74 to 83, the Bower report examines claim language related to using the exhaust gas temperature to sense undesired operation conditions or undesired engine operation. At paragraphs 81-82, Dr. Bower points out that, using exhaust temperature alone, it could be difficult to tell whether operation was normal or abnormal. I agree that using exhaust temperature alone is not adequate for diagnosing abnormal operation. However, the Detailed Description of the 738 Patent does not say the abnormal conditions will be "determined" by exhaust gas temperature alone.

> Instead, the Detailed Description, (at page 5, lines 21-30), uses the phrases "… sensed exhaust gas temperature may be indicative …" and "… sensed exhaust temperature also may be useful in indicating …" This distinction illustrates that the exhaust gas temperature is to be used as one factor along with the other measurements in determining when an abnormal operating condition exists that can be accommodated or alleviated by selecting an alternate ignition pattern.
>
> [My emphasis]

[162] Surely, even a good calibrator would need to follow the lead of a mechanical engineer to produce the appropriate diagnosis. The issue is not so much that the good calibrator should be excluded as it is that the skills of the mechanical engineer with some experience must be part of the team. These skills cannot be replaced.

[163] That same point was made by Dr. Checkel in his testimony-in-chief (Transcript, pp 160 to 162). Dr. Checkel appears to be satisfied for the experienced person to set up engines controls. However, once something new appears, where repetition is not an asset, he seems to agree that the engineering degree is preferable:

> For that, it's still useful to be a Cambridge-educated research experienced engineer. So I wouldn't get the guy who has done a series of re-calibrations on new product lines for the same V8 engine, but a different intake manifold every year. I wouldn't ask him to do that without advising him, but I would like him as part of the team of people if I'm going to do it on a new project. He has more experience on setting up engine controls and doing the tests on the equipment that he uses than I do. I have more experience on developing new equipment you need for measuring something that just hasn't been done before.
>
> (Transcript, p162, lines 18 to 28 and p 163, line 1)

[164] Finally, I was also concerned by what appeared to be the motivation behind the class as defined by Dr. Checkel to qualify as a Posita. At paragraph 15 of his second report (P-60), Dr. Checkel suggests that "[m]any of the practitioners of the art involved in this field would fall outside of Dr. Bower's definition and it is important to consider the common general knowledge and state of the art from view-point of such a person." It is not completely clear what is meant by Dr. Checkel. If that means that the experience, information and methods available to solve problems are added as the person with appropriate experience working on engine control projects is part of a team, as proposed by Dr. Bower, that would evidently be acceptable. The common general knowledge would be the accumulation of the common knowledge of the persons coming from different disciplines that are complimentary. I am not convinced, however, that the statement made by Dr. Checkel is not for the purpose of limiting the common general knowledge and prior art. We should not define the Posita with a particular result in mind, with 20-20 hindsight. If there is a lack of knowledge to understand fully the patent, then it would be difficult to conclude that he or she is in fact the patent's intended audience. That seems to be a description endorsed by the Supreme Court in *Free World Trust v Électro Santé Inc*, 2000 SCC 66, [2000] 2 SCR 1024 (*Free World Trust*):

> The courts have traditionally protected a patentee from the effects of excessive literalism. The patent is not addressed to an ordinary member of the public, but to a worker skilled in the art described by Dr. Fox as
>
> a hypothetical person possessing the ordinary skill and knowledge of the particular art to which the invention relates, and a mind willing to understand a specification that is addressed to him. This hypothetical person has sometimes been equated with the "reasonable man" used as a standard in negligence cases. He is assumed to be a man who is going to try to achieve success and not one who is looking for difficulties or seeking failure.
>
> (Fox, supra, at p 184)

It should be remembered that the person skilled in the art is not only the person to whom the patent is addressed, but he or she is also the person who constructs or uses the invention once the monopoly has expired (*Whirlpool Corp v Camco Inc*, 2000 SCC 67, [2000] 2 SCR 1067).

[165] It follows that, given the Patent under review, the person of skill in the art, constituted of a person or a team of persons, must have formal training in mechanical engineering (bachelor's degree at least) together with some practical experience in the development and design of two-stroke engine control designs. Having heard 19 days of evidence on a Patent, I do not see how a Posita without an engineering degree could be the person to whom the patent is addressed. It remains true that persons with lesser formal training or experience could be valuable members of a team working on new two-stroke engines, but the 738 Patent could not be exclusively addressed to them.

[166] In reaching my conclusion, I have taken fully into consideration that Dr. Bower changed his position from 12 years ago. Dr. Checkel could not convince me that in view of the 738 Patent, the person to whom the specification is addressed does not have to be equipped with the formal education of a mechanical engineer. The breadth of knowledge required by the 738 Patent calls for more than ten years "of appropriate experience working on engine control projects." The demonstration that the targeted audience for the 738 Patent is that experienced worker on engine control projects has not been made. More is needed to understand the specification and what is disclosed and claimed.

VIII. *Claims construction*

[167] Before considering the allegations of infringement of the claims in issue or their validity, the Court must construe the claims. That construction, which is a question of law, is done with the assistance of the person skilled in the art as of the date of the publication of the patent application (*Whirlpool* at para 45). Hence, it would be inappropriate to consider the claims with the current understanding of processing power of nowadays computers that has grown exponentially over the years. The invention came about at a time when computing power was much more limited than now and where trade-offs as to the use of the capability of controllers was more prevalent.

[168] It is not for the expert to construe the claims, that being a question of law. Professor David Vaver puts it humorously in his book *Intellectual Property*, 2nd Ed, Irwin Law (2011):

> Yet a patent's meaning is ultimately a question of law, often decided by a judge who may not be skilled in any art or science, let alone the relevant one. He may be closer in initial understanding to the shop floor worker of yore than the trained scientist or engineer of today, but even experienced judges with science backgrounds admit they are often at sea outside their discipline. The litigants and their experts must then instruct the judge in the relevant art or science. They may in fact do it so well that, although they may all agree on what a claim means to them or to a skilled reader, the judge will end up disagreeing with them all.
>
> [p 347]

Furthermore, the claim construction is not done with an eye to deciding whether there has been infringement or whether the patent is invalid. These are issues that come later in the analysis. It cannot be allowed to become results-driven (*Whirlpool* at para 49).

[169] This case boils down to the construction that must be given to a relatively small number of phrases in five claims: 11, 16, 33, 40 and 47. Most of the essential elements of the claims are not in dispute. The two-cycle engine which is the subject of the 738 Patent consists of a number of elements common to these engines: cylinder, piston, crankshaft, spark plug (or variant), sensor, exhaust pipe, coil and controller are all accepted as being part of the engine.

[170] The phrases to be interpreted will be found in independent claims in the case of three of the five asserted claims. Claim 40 depends on claim 34 while method claims 33 and 47 are dependent on claims 28 and 41 respectively. Claims 11 and 16 do not require resort to independent claims as they are self-contained.

[171] It bears repeating that engine claims 11 and 40(34) have corresponding method claims 16 and 47(41). Method claim 33 stands alone. It follows that the analysis, for all intents and purposes, is concerned with only two sets of claims: 11 and 16 and 40(34), 47(41) and 33(28).

A. *"Ignition Pattern"*

[172] As indicated numerous times during the trial of this case, the words "ignition pattern" are at the heart of the Patent and the asserted claims. That is because "ignition pattern" is given a particular meaning which, as we shall see, excludes being composed of one ignition point, and because all of the claims require that the ignition point be ignited according to an ignition pattern. Put another way, everything seems to turn around an ignition pattern in more ways than one. The words are not defined as such in the claims, but indications as to their meaning can be

found in the specification (*Western Electric Co v Baldwin International Radio of Canada*, [1934] SCR 570). Although the abstract cannot be used in claims construction (*Laboratoires Servier v Apotex Inc*, 2009 FCA 222), it illustrates in this case the centrality of the so-called "ignition pattern": "The engine exhaust gas temperature is sensed and is used to determine the particular ignition pattern used at a particular time". In the five claims under review, there are references to that concept.

[173] The purposive construction that must preside in claims construction allows that, if the language of the claims is not clear, reliance can be had to the disclosure. In this case, the claims are silent as to what is meant by "ignition pattern". Both experts relied on disclosure to assist in the understanding of the term. I agree.

[174] What, in my view, emerges from the disclosure is a clear understanding of what the Patent means by "ignition pattern". At page 1 of the specification, the inventor states that "an engine operating shortly after start-up may require a different relationship between ignition timing and engine speed (herein of the "ignition pattern") …" At the top of the following page, one can read that "[t]he present invention seeks to provide a two-cycle engine that enjoys improved performance by selecting from a plurality of relationships between ignition timing and engine speed (ignition patterns) based on exhaust gas temperature". A few pages later, the disclosure informs the reader that "the various combinations of ignition timings and particular engine speeds thus will form a particular ignition pattern". Obviously, an ignition pattern refers to the relationship that exists between at least the ignition timing and the speed at which the engine turns. The Patent also specifies that a pattern is composed of various combinations of

ignition timings and engine speeds. Thus, the normal meaning of “pattern” is confirmed in that one combination of an ignition timing and an engine speed does not a pattern make. It requires various combinations of timings and speed. The claims will make that requirement even more explicit.

[175] The five claims asserted by AC (together with the independent claims where appropriate) all refer to “ignition patterns”. They all indicate that the activation of the ignition source will take place “according to an ignition pattern in which an ignition point during the compressing movement varies with operation speed of the engine.” Claims 33 (28), 40 (34), and 47 (41), the selection claims, all further indicate the “different ignition patterns having different relationships between ignition point and engine speed”. Given that these claims require that there be a selection of one ignition pattern out of a plurality of ignition patterns, that signals that the ignition patterns must all be different from each other. Consistent with the disclosure, these phrases in the claims all make the difference between an ignition point, which is the result of the combination of one ignition timing with a particular engine speed, and the ignition pattern that will contain that ignition point. In the case of claims 40(34) and 47(41), the ignition pattern would include a third dimension such that the ignition point varies not only with the engine speed, but also with the throttle position. Thus, the selection of one ignition pattern will be from a number of different patterns according to the Patent.

[176] Dr. Checkel ultimately agreed that an ignition pattern must be composed of more than one single relationship between ignition timing and one RPM (Transcript, pp 386 to 389, in relation to claims 33 (28), 40(34), and 47(41) and pages 3123-3124 in relation to claims 11 and

16). Nevertheless, with or without the agreement, a close examination of the disclosure and the claims leads inexorably to the conclusion.

[177] One does not have a pattern if there is one single relationship between one ignition timing and one engine speed. That is an ignition point, not an ignition pattern. Where the specification illustrates what is meant by "ignition pattern", the Patent itself refers to tables that comprise various engine speeds and the number of degrees before top dead centre in tables A to E (which are the ignition timing values). The data presented in tables A to E show five ignition patterns that could be used at various exhaust gas temperatures. Figures 4 to 8 show, in a graphical form, those relationships of engine speeds and ignition timings at different exhaust gas temperatures. These figures are said to represent the ignition patterns for 250C and lower, 250 to 300C, 300 to 350C, 350 to 400C and 400C and higher respectively (p 7). In other words, each figure is a pattern and the pattern is not a single point. It is rather the collection of points which will constitute one pattern. The Patent never refers to one ignition point, the point at which the fuel-air mixture will be ignited in the cylinder, as being an ignition pattern.

[178] As the Patent teaches, "the exhaust gas temperature is used to evaluate operating conditions and thus determine which of two or more ignition patterns should be selected for engine operation" (p 4). Hence, not only must a pattern be composed of more than one ignition point, but there needs to be more than one ignition pattern as it is a pattern that is selected on the basis of the temperature of the exhaust gas. As presented in the disclosure, the ignition pattern must be composed of combinations of different engine speeds (and throttle positions in some claims) and different ignition timings, as once an ignition pattern has been selected, on the basis

of the exhaust gas temperature, the pattern is used to control the ignition point. The relationships between the ignition timings and the engine speeds constitute the pattern, whether the ignition pattern is selected on the basis of exhaust gas temperature or an ignition pattern, designated in claims 11 and 16 of the Patent as "basic", is modified based on exhaust gas temperature. It does not matter whether the ignition pattern, the one according to which the controller will activate the ignition source at the appropriate ignition point, is selected or modified on the basis of exhaust gas temperature. What counts is that, in the end, there must be an ignition pattern according to which the controller will activate the ignition source. The ignition pattern is the chosen cornerstone of the Patent.

[179] The 738 Patent, in the asserted claims, refers to "ignition pattern" as well as to "ignition point". Obviously, there must be a difference between the two, with the ignition point being in the ignition pattern. A construction that would conclude that a single ignition point, which is a relationship between one ignition timing and one engine speed, constitutes also an ignition pattern would be ignoring the text of the Patent and the language of the claims. As the Supreme Court said in *Free World Trust*, above:

> 40. The primacy of the claims language was already rooted deeply in our jurisprudence and should, I think, be affirmed again on this appeal.

The Court cannot redraft claims. BRP, and other persons interested in the 738 Patent, were entitled to rely on the words used. The language of the claims counts, as it defines the monopoly.

[180] Three of the five asserted claims require that the ignition pattern be selected based on sensed exhaust gas temperature. Thus, claims 33(28), 40(34) and 47(41) can be examined

together. Indeed, the only difference between claims 28 and 41, two method claims, is that the ignition point varies with the engine speed in claim 28 and also with the throttle position, in claim 41, a difference that is immaterial in the construction of the claims for the purpose of this case. Claims 11 and 16 are, as already noted, the engine claims and the method claim concerned with the modification of an ignition pattern based on temperature of the exhaust gas. There are five phrases, other than "ignition pattern", deserving of attention.

B. *Controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compressing movement varies with operation speed of the engine [and throttle position]. (claims 33(28), 47(41) and 16)*

> *A controller for activating the ignition source ..., the controller activating the ignition source according to an ignition pattern in which an ignition point during the compressing movement varies with the operation speed of the engine [and throttle position]. (claims 40(34) and 11)*

[181] The exhaust gas temperature may be used for a number of purposes. AC suggests that the Patent is focused on power and acceleration. The specification speaks in terms of detecting the type of fuel or some problems with engine performance, or even the failure of a temperature sensor. It also speaks in terms of the different condition of an engine shortly after start-up as compared to the condition of an engine operating for some time. What the invention seeks to achieve is the optimum operation of the engine writ larger than what AC proposes, which is achieved by varying the point at which the fuel-air mixture is ignited during the cycle of the piston. As the disclosure states at p 4, "the exhaust gas temperature is used to evaluate operating conditions and thus determine which of two or more ignition patterns should be selected for engine operation". Focusing on power and acceleration is limiting unduly what the Patent states

and asserts. However, it does not matter for our purposes what use is made of the exhaust gas temperature for the goal of achieving the optimum operation. Actually, the 738 Patent does not provide any indication other than the temperature of the exhaust gas can be used to optimize the operation of the engine.

[182] What the three selection claims are about is the sensing of gas temperature that takes the engine to use different ignition patterns. Once an ignition pattern is selected as a function of the exhaust gas temperature ("selecting the ignition pattern from a plurality of different ignition patterns based on the sensed exhaust gas temperature", in claims 33(28) and 47(41) and "the particular ignition pattern used by the controller being selected based upon the sensed exhaust gas temperature", in claim 40(34)), the ignition timing will vary within that ignition pattern depending on the engine speed (and the throttle position). Once the temperature of the exhaust gas, which is used to evaluate operating conditions that will require a different ignition pattern, changes, the ignition pattern changes.

[183] It follows that the words "controlling the activation of the ignition source according to an ignition pattern", which can be found with slight grammatical adjustments in the five claims under review, find their natural meaning. They simply mean that the ignition source, which may be a spark plug or some other source, will ignite the fuel-air mixture by finding the ignition timing in the ignition pattern, appropriate for the operating conditions of the engine as detected by the temperature of the exhaust gas, that corresponds to the speed of the engine (and the throttle position). That must be so because it is the various combinations of ignition timings and particular engine speeds that form an ignition pattern. What is essential is that the activation of

the ignition source is done from an ignition pattern which is comprised of more than one ignition point. The extraction of one point that is ignited comes after the ignition pattern has been selected based on temperature or a basic pattern has been modified based on temperature. It is the ignition pattern from which the ignition point will be chosen; the ignition pattern from which the ignition point is taken is selected based on exhaust gas temperature. Put another way, the effect of the exhaust gas temperature is always on an ignition pattern, never directly on one ignition point.

[184] This phrase confirms a number of propositions:

a) An ignition pattern must be different from an ignition point because the ignition point is said to be in the ignition pattern ("according to an ignition pattern in which an ignition point").

b) The different ignition points in an ignition pattern vary with engine speed (and throttle position): this is consonant with tables A to E and figures 4 to 8.

c) The activation of the ignition source is done according to the ignition pattern. That connection and the fact that the controller will have to select the point in the pattern that corresponds to engine speed (and throttle position) confirm that the selection of the ignition point is as stated in the ignition pattern. An ignition pattern is selected based on the exhaust gas temperature, or the basic ignition pattern is modified based on gas temperature; but once the ignition pattern is chosen, the ignition point appropriate for the engine speed (and throttle position) at that moment will be taken according to the ignition pattern. The ignition pattern is not only used to choose an ignition point: the ignition point is actually chosen according to the ignition pattern. There are no further intervening steps in the process according to the claims. Once again, this is perfectly consistent with the gist, the pith and substance of the Patent as written. The whole Patent is geared

> towards ignition patterns composed of more than one ignition point. From that one ignition pattern will be selected the appropriate timing point for the speed (and the throttle position) until the temperature of the exhaust gas changes. What is important to note is that the effect of the sensed exhaust gas temperature is on the ignition pattern itself. Once the temperature changes, the ignition pattern will have to change. Either a pattern will be selected based on the temperature, or the final ignition pattern, the one according to which the appropriate ignition point will be ignited, will be modified based on the temperature. Either way, it is not an ignition point that is corrected for temperature, according to the claims: it is the selection of the pattern that is affected by the exhaust gas temperature and it is from that pattern of more than one ignition point that the appropriate one, according to the engine speed (and the throttle position) will be ignited.

[185] Evidently, ignition patterns according to which the controller will activate the ignition source at a particular ignition point will change when the exhaust gas temperature changes. That is the nature of the invention. It is worth repeating that the inventor states in his summary of the invention that improved engine performance is enjoyed by selecting from a plurality of ignition patterns based on exhaust gas temperature. By changing ignition patterns, it is advanced that better performance is achieved. What is inescapable is the centrality of ignition patterns. That is a whole pattern that is either selected or modified, never one ignition point.

C. *The ignition pattern being selected from a plurality of different ignition patterns.*

[186] This phrase is found using slightly different formulations in the selection claims 33(28), 40(34) and 47(41). It is the gravamen of the selection claims.

[187] An ignition pattern cannot be selected from other ignition patterns if the other patterns are not in existence. There is no dispute that the patterns are pre-programmed. Actually, the claims speak in terms of a plurality of different ignition patterns, which suggests a non-infinite number of patterns that already exist. Certainly, "plurality" implies more than one, maybe a large number. But it does not connote an infinite number. More importantly perhaps, it signifies that the plurality of ignition patterns must be antecedent to a selection that will be made on one basis: the temperature of the exhaust gas. It is therefore apposite to examine this phrase with another one found in the three claims.

D. *The particular ignition pattern used by the controller being selected based upon the sensed exhaust gas temperature.*

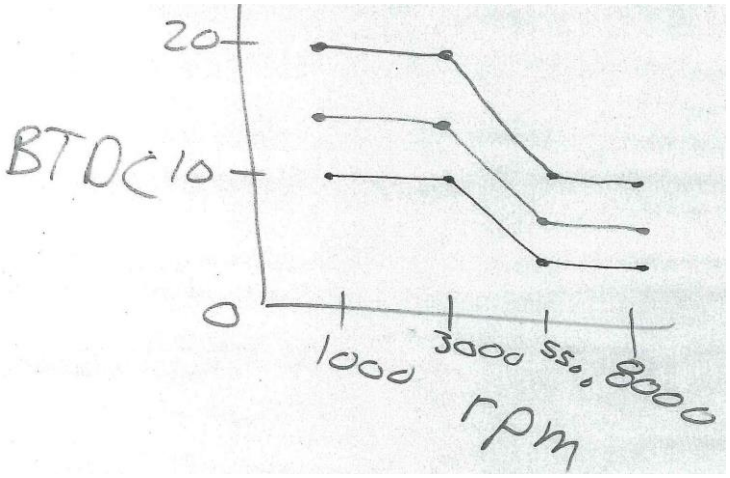
[188] Evidently, there are two different ideas captured by the two clauses: first there is the requirement that there be more than one ignition pattern; there cannot be a selection of a pattern without having more than one from which to select. Second, the selection of the ignition pattern will be done on the basis of the temperature of the exhaust gas but, once again, it is a pattern that will be selected on the basis of exhaust gas temperature, nothing else. With great respect, the contention of AC according to which "the phrase in the claims of the 738 Patent means that the sensed exhaust gas temperature must be a factor in the selection of which ignition point is used at a given engine speed" is only accurate if is included the intermediate step of the selection of the ignition pattern. It is true that, ultimately, the ignition point will reflect sensed exhaust gas temperature. However, what is neglected is the fact that it is because the ignition pattern, from which the ignition point is drawn, that it can be said that temperature is a factor in the selection of the ignition point. It is fundamental to the 738 Patent that the ignition point be drawn from an

ignition pattern composed of more than one ignition point. The 738 Patent's logic requires that ignition patterns be available for selection on the basis of the exhaust gas temperature. The Patent is silent as to whether the pattern will stay in place until another one will replace it when different gas temperature has been sensed. However, that would appear to be implied. Inexorably, many different ignition points would be activated from the same ignition pattern, varying with the engine speed variations, until a new ignition pattern is put to contribution for different temperatures.

E. *The different ignition patterns having different relationships between ignition point and engine speed.*

[189] Once again, the three selection claims have basically that same clause. This phrase appears to be self-explanatory. The different ignition patterns must have different rapports between ignition point and engine speed: otherwise, there is no difference between ignition patterns, they are the same.

[190] In its written submissions, AC argues that this phrase must have a different meaning from a phrase found in the same claims which is referred to as "ignition point varying with engine speed or throttle position" (AC's memorandum of fact and law, para 106) and seems to suggest that "step changes" in ignition patterns might somehow pose a challenge. Basically, the so-called "step changes" occur where the shape of the ignition curve or pattern does not change. The ignition curve simply moves up and down. An illustration is found at P-37:




[191] Counsel wrote at paragraph 108:

> When the shape of the ignition pattern does not change, i.e. the values of the ignition timing have a consistent change with engine speed, the magnitude of the values may be different but the relationships are not, i.e. a so-called step change in ignition patterns. This would be different ignition patterns but does not constitute ignition patterns having different relationships between ignition point and engine speed.

Counsel is right to say that the two phrases must mean something different. And they do. It seems to me that the two phrases address fundamentally different issues. The phrase under review is straight forward: it requires that ignition patterns be different. The other one deals with something different. It does not compare ignition patterns, but rather it addresses the characteristics of one ignition pattern. The complete clause must be read, not only a few words. Here the complete clause reads "… an ignition pattern in which one ignition point during the compression movement varies with operation speed of the engine [and the throttle position of the engine]".

[192] Basically, the invention states that the ignition point in an ignition pattern varies with RPMs and throttle position. That is not a startling proposition. If the point does not vary with engine speed and throttle position there is only one point for every RPM. It is not different from what is disclosed in the specification. Thus, ignition points vary with engine speed and throttle position in order to have more than one ignition point, the very nature of an ignition pattern.

[193] The phrase under review is not concerned with the ignition points in one ignition pattern. Instead, the phrase is simply there to specify what constitutes different ignition patterns given that one must be selected out of a plurality of patterns based on temperature of the exhaust gas.

[194] I fail to see how the step change in ignition patterns would not meet the test of the phrase under consideration. It suffices that the ignition points be different between ignition patterns, or curves, to have different relationships. There is certainly a different relationship between ignition point and engine speed between the curves on P-37 reproduced at paragraph 190. Thus, for instance, one curve at P-37 has 10º before top dead center at 3000 RPMs while it has 20 º on another curve at 3000 RPMs. That is a different relationship between the two, one being 10º before top dead center at 3000 RPMs and the other one being 20º before top dead center at 3000 RPMs. That is all that is required by that phrase. The relationship between ignition point and engine speed, 10º before top dead center at 3000 RPMs and 20º before top dead center at 3000 RPMs, is manifestly different. What is required is that the patterns have different relationships between each other. These patterns have different relationships between ignition point and engine speed. That serves the purposive construction of claims as the inventor was merely signalling that there must be a difference between patterns. At any rate, the Plaintiffs chose not to

pursue the matter of the step change in ignition patterns during their oral submissions. It is less than clear what argument the inventor was trying to derive from its own Patent by limiting the kinds of differences that justify satisfying the requirement of a plurality of ignition patterns. Actually, Mr. Spaulding testified about pattern shifts (see para 69, *supra*). Surely, an ignition pattern modified by 2º, for whatever reason, would be a different pattern. Nothing in the 738 Patent suggests otherwise.

F. *The ignition pattern being selected from a plurality of different basic ignition patterns. (Claims 11 and 16)*

[195] There are two asserted claims (claims 11 and 16) that refer to a basic ignition pattern being modified on the basis of the temperature of the exhaust gas temperature.

[196] There is in fact only one issue that differentiates the selection claims from the modification claim. In both cases, the activating of the ignition source is done according to an ignition pattern in which an ignition point varies with the operation speed of the engine. However, as the selection claims were operating on the basis of an ignition pattern being selected from a plurality of ignition patterns based on the temperature of the exhaust gas, the ignition pattern in claims 11 and 16 is the result of a basic ignition pattern being selected from a plurality of basic ignition patterns, but modified based on exhaust gas temperature. Put simply, in one case one ignition pattern is selected from a plurality of ignition patterns on the basis of gas temperature while, in the other, a basic ignition pattern is chosen from a plurality of basic ignition patterns, on a basis that is left unsaid, but the selected basic ignition pattern is then

modified based on exhaust gas temperature. But, it is the basic ignition pattern that is modified based on exhaust gas temperature, nothing else.

[197] The same comments made earlier about "plurality" apply equally to claims 11 and 16. There is not an infinite number of basic ignition patterns, just a plurality. Equally true is that there is more than one basic ignition pattern. The focus is rather on what is the construction to put on "basic ignition pattern".

[198] There is common ground as to what is meant by "basic ignition patterns": it is referring to the patterns that are in existence, before they are modified. At page 2987 of the transcript , Dr. Checkel describes what is being modified:

> The witness: I guess the biggest description change is that we now have a plurality of basic ignition patterns. So, we've selected already some sort of basic ignition pattern without knowing about exhaust gas temperature. And now, we're making a modification to the ignition curve or ignition map based on exhaust gas temperature.
>
> And if I was calibrating the engine, I would say, okay, here is my base map, what am I going to do when I sense exhaust gas temperature. I will typically have something in another table with exhaust gas temperature which I add to it. So in the end, we have got a basic pattern that we've selected, one of them, and now we are making a modification using exhaust gas temperature. So I will produce some sort of a table of offsets for exhaust gas temperature or some sort of map.

The basic ignition patterns (there is a plurality of them) are the initial patterns. Because they will be modified and do not constitute the ignition pattern that will eventually be in use, the inventor chose, presumably, to qualify the ignition pattern by adding the word "basic". The word helps differentiate what we start with, the basic ignition pattern, from what is being used to activate the

ignition source. What is important to note is that it is the pattern that is modified. That implies that the various combinations of ignition timings and engine speeds, or some of them, that form an ignition pattern, are modified before there will be the activation of the ignition source according to that new pattern resulting from the modification (using the exhaust gas temperature) of the selected basic ignition pattern.

[199] The logic of claims 11 and 16 is rather straight forward. First, there are different basic ignition patterns: the claims teach the Posita that there is a plurality of them. Second, the activation of the ignition source is done according to an ignition pattern as is the case with the other asserted claims: evidently, the ignition pattern used to activate the ignition source is not the basic ignition pattern. Third, this is confirmed by the claims stating that "the basic ignition pattern used by the controller is being modified based upon the sensed exhaust gas temperature"; the basic ignition pattern becomes the ignition pattern according to which the ignition point is activated once the pattern has been modified based on the exhaust gas temperature. That is what the Patent is teaching. If other changes are made once the basic ignition pattern has been selected and modified based on exhaust gas temperature, these are not taught by the Patent.

G. *The basic ignition pattern used by the controller being modified based upon the sensed exhaust gas temperature. (Claims 11 and 16)*

[200] As seen in the preceding paragraph, it is the basic ignition pattern that is modified in order to get to the pattern according to which the activation will take place. The ignition point is taken by the controller once the basic ignition pattern has been selected from a plurality of basic ignition patterns, and the chosen basic ignition pattern has been modified. That would appear to

exclude the possibility that there be further changes to the basic ignition pattern once it has been selected from a plurality of basic ignition patterns. It has been suggested by AC that it merely "provides an initial approximation for the ignition timing, from which the final value for ignition timing can be arrived at by making modifications or calculations" (AC's memorandum of facts and law, para 92). The Patent is silent concerning the elements that may end up constituting the basic ignition patterns. Modifications or calculations may well be made in the creation of basic ignition patterns to account for different issues. But it is overstating the case to suggest that the plurality of basic ignition patterns are merely an initial approximation for the ignition timing. The Patent requires that there be a plurality of these basic ignition patterns from which one will be selected on the basis of factors that are unknown. The final value for ignition timing will not come from the basic ignition pattern: it will come from the ignition pattern that emerges from the modifications to the basic ignition pattern based on the sensed exhaust gas temperature. It is the various combinations of ignition timings and engines speeds that form the basic ignition pattern that has been selected, which are then modified to become a new combination of timings and engine speeds. Once the basic ignition pattern has been selected, it is not an initial approximation. All that is needed is for the pattern to be modified based on exhaust gas temperature. That is what the Patent is teaching. If other changes are made to the pattern once the basic ignition pattern has been selected and modified based on exhaust gas temperature, these are not taught by this Patent.

[201] The language of claims 11 and 16 may be convoluted. If there is some ambiguity as to what is meant by modification, the specification may help confirm that it is the "basic" ignition pattern that is modified using the exhaust gas temperature, not an ignition point:

> It also is possible to use the sensed temperature readings to modify a particular timing pattern that can be selected from a plurality of patterns. For example, the user may be able to select a timing pattern from a plurality of timing patterns using a switch or the like, and the sensed temperature readings can be used to modify the selected patterns appropriately. [p 5]

It is an ignition pattern that emerges from the modification made on the basis of the sensed gas temperature, not ignition timing. The ignition timing will come from that modified ignition pattern when the controller activates the ignition source. Claims 11 and 16 are making it clear that the ignition pattern, just before the modification using gas temperature, is the basic ignition pattern.

[202] The Patent is not concerned with the importance, the magnitude, of the changes to the basic ignition timing. It is concerned however with the logic that operates. In claims 11 and 16, as in the other asserted claims, the logic goes through the ignition patterns from which one ignition point will emerge. It is true that the selected basic ignition pattern can be modified through a change to one single point, as argued by AC. Indeed, basic ignition patterns may differ only slightly. That, however, simply means that there are different basic ignition patterns helping constitute the plurality of such patterns.

[203] In essence, the difference between the selection claims (40, 33 and 47) and the modification claims (11 and 16) is the use that is made of the gas temperature. While the gas temperature is used to select the ignition pattern according to which the activation source will be operating in three claims, the gas temperature can also be used to modify the basic ignition pattern according to which the ignition source will be activated. In both sets of claims, the

activation of the ignition source is made according to an ignition pattern. And an ignition pattern is never a single ignition point. It will be found in the ignition pattern.

[204] Similarly, AC is right that claims 11 and 16 do not limit the factors to be used on the selection of the basic ignition pattern from the plurality of the basic ignition patterns. In fact, it does not matter. However, when one is selected, the basic ignition pattern selected is modified based upon the sensed exhaust gas temperature. It is that basic ignition pattern modified based upon sensed exhaust gas temperature that becomes the ignition pattern according to which is activated by the controller the ignition source.

[205] The posture taken by the Plaintiffs throughout the trial has been largely to react to the positions adopted by the Defendant, in spite of the fact that AC has the burden of convincing the Court that its construction of the claims and its allegation of infringement of its Patent are preferable. That was particularly the case in the construction of its own claims. One would have thought that the Plaintiffs had a general theory of what their Patent is doing and what their claims are accomplishing.

[206] Nevertheless, what emerges from the construction of the claims is a recurring theme. The ignition pattern is always composed of more than one ignition point. There is always one ignition pattern that emerges from a plurality of ignition patterns. In the case of the modification claims, it will be basic ignition patterns from which one will be selected; once selected, the basic pattern is modified based on exhaust gas temperature. In the case of the selection claims, one of a plurality of ignition patterns will be selected on the basis of the exhaust gas temperature. The gas

temperature operates *ex ante*, i.e. before the ignition pattern is put to contribution; in both cases, the claims refer to one ignition pattern being available for the ignition of the fuel-air mixture. Given that the ignition pattern must be composed of more than one ignition point, the claims provide that the activation of the ignition source by the controller will be performed according to the ignition pattern that has been selected or modified. For various engine speeds will correspond various ignition timings (in three-dimensional ignition systems will be added, a third variable, the throttle position), these various combinations forming a particular ignition pattern. Evidently, the controller will have to select the appropriate ignition point for a particular engine speed.

## IX. *Infringement*

[207] The Plaintiffs in the case contend that the Defendant violated, and continues to violate, some claims of its Canadian Patent bearing No 2,322,738 (the 738 Patent).

[208] For the reasons that follow, I find that the asserted claims, once properly construed, have not been infringed by BRP. If one of the claims has been found to have been infringed because of a different construction put on that claim, I would find that the claim thus constructed would be invalid by reason of obviousness.

[209] Section 27 of the *Patent Act* makes it plain that the claims must define "distinctly and in explicit terms the subject-matter of the invention" for which a monopoly is claimed for 20 years. The specification serves a purpose in that it must correctly and fully describe the invention and

its operation or use. The specification must also explain the principle of the machine together with "the best mode in which the inventor has contemplated the application of that principle".

[210] Once has been deciphered out of the morass of words that constitutes the 738 Patent what the inventor purports to call an invention, it will be possible to compare it to the logic of the engines used by BRP and decide whether or not there is infringement.

[211] AC will prevail if any of its five asserted claims is ruled valid. Section 58 of the *Patent Act* says that much:

> When, in any action or proceeding respecting a patent that contains two or more claims, one or more of those claims is or are held to be valid but another or others is or are held to be invalid or void, effect shall be given to the patent as if it contained only the valid claim or claims.
>
> Lorsque, dans une action ou procédure relative à un brevet qui renferme deux ou plusieurs revendications, une ou plusieurs de ces revendications sont tenues pour valides, mais qu'une autre ou d'autres sont tenues pour invalides ou nulles, il est donné effet au brevet tout comme s'il ne renfermait que la ou les revendications valides.

(See also *Teva Canada Ltd v Pfizer Canada Inc*, 2012 SCC 60 at para 47, [2012] 3 SCR 625)

[212] If it is sufficient that only one claim be ruled valid for AC to prevail, the Plaintiffs must show on the other hand that BRP's engines include all of the essential elements of the asserted claims. In *Free World Trust*, above, the Court could not have been any clearer:

> 31 The appeal thus raises the fundamental issue of how best to resolve the tension between "literal infringement" and "substantive infringement" to achieve a fair and predictable result. There has been considerable discussion of this issue in Canada and

> elsewhere, which I will discuss briefly in support of the following propositions:
>
> …
>
> (f) There is no infringement if an essential element is different or omitted. There may still be infringement, however, if non-essential elements are substituted or omitted.

[213] The burden of proving infringement is of course on the shoulders of the Plaintiffs (*Monsanto Canada Inc v Schmeiser*, 2004 SCC 34 at para 29, [2004] 1 SCR 902). Thus, to summarize, AC must show on a balance of probabilities that every essential element of at least one asserted claim has been infringed, that is that BRP has put into practice the invention.

[214] In this case and on this record, AC has failed its burden. The 738 Patent has not been infringed because essential elements of the claims are missing.

[215] There is no doubt that BRP was aware of the existence of the Patent-in-suit. Indeed, it took significant steps to avoid infringing the AC patent. That is not, of course, dispositive of the issue as it is certainly possible to infringe on a patent inadvertently. However, such is not the case here.

[216] Once properly constructed, the claims all turn on the use of ignition patterns. Ignition patterns are central to each of the five claims. In every one of the five asserted claims, the controller is activating the ignition source according to an ignition pattern. That ignition pattern must be constituted by more than one combination of ignition timings and particular engine speeds, and one of those combinations will be chosen to be ignited. It does not matter that the

claim is one presented as a modification claim (11 and 16), or selection claim (33(28), 40(34) and 47(41)), each one requires that the ignition point be taken from an ignition pattern that comprises more than an ignition point.

[217] The difference between the two types of claims comes from the manner in which one arrives at the ignition pattern from which the ignition point will be taken. In the case of the so-called “selection claims”, will be chosen from a plurality of ignition patterns the one ignition pattern that will correspond to the temperature of the exhaust gas at that moment. The exhaust gas temperature is used to select the ignition pattern that will be deemed to be appropriate. The Patent simply states that the purpose is to provide optimum operation of the engine by using the optimum ignition timing. The “modification claims” stipulate that a basic ignition pattern is selected from a plurality of basic ignition patterns; that selected basic ignition pattern is then modified based on the sensed exhaust gas temperature to become the ignition pattern. The ignition source, in both the “selection claims” and the “modification claims”, is then activated by the controller according to that ignition pattern. One ignition point is taken from “the various combinations of ignition timings and particular engines speeds” that “form a particular ignition pattern” (738 Patent, p 3).

[218] This case is concerned with the ignition control logic found on two BRP semi-direct injection engines, namely the 440HO and 600RS models, and two BRP direct injection engines, namely the 600ETEC and 800ETEC models. These are the engines AC considers as infringing its Patent.

[219] All four engines share a number of similar features. Chief among them is the incorporation of an exhaust gas temperature sensor used as an input to adjust ignition timing. The basic outline of their engine control logic is substantially the same, and whatever differences there may be has no bearing on the case.

[220] In all cases, the engine control unit begins by selecting an ignition table based on factors other than sensed exhaust gas temperature. It then extracts a single point from the chosen table, to which it applies a correction value based on a number of factors that may include sensed exhaust gas temperature. After the engine control unit adds the correction value to the point extracted from the ignition table, to reach the final value, it triggers the spark plug.

[221] There are even greater similarities in the manner the engine control unit carries out this process in the 440HO and 600RS models, (Transcript, Bruno Schuehmacher at 835:1-17) and the 600ETEC and 800ETEC models (Transcript, Bruno Schuehmacher at 887:24-888:4) respectively. BRP has thus chosen to group these models into two separate categories, and Arctic Cat for its part does not stray very far from this classification scheme. As such, I will begin by outlining the specific engine control logic used in the 440HO and 600RS semi-direct injection engines, before turning to the common logic shared by the 600ETEC and 800ETEC direct injection models.

A. *The 440 HO and 600 RS engines*

[222] As stated above, the 440HO and 600RS engines use substantially similar engine control logic. In both cases, the engine control unit is programmed with four distinct base ignition tables (i.e. maps) for use during different engine operating conditions. These correspond to premium fuel, racing fuel, transient conditions, and conditions with a preheat function, respectively (Transcript, Bruno Schuehmacher at 838:22-839:12; CADET Report, BRPE-136, P-15). However, one of these four tables was never implemented in the 440HO engine, such that the engine is effectively programmed with only three separate tables.

[223] With respect to the 440HO and 600RS engines, the engine control unit begins by selecting one of these four base maps based on a preheat switch and fuel quality; the exhaust temperature does not figure in that decision (Transcript, Bruno Schuehmacher, at pages 814:17-816:19, 819:15-23, 828:11-18; Bower Infringement Report, D-45 at para 53, 88-89; BRP 04068 Racing MY2006 Software Description Rev01, P-14 at 31, 47-50; CADET Report, BRPE-136, P-15; CADET Report, BRPE-1119, D-11). After selecting a base map, the engine control in both engines extracts a single numerical value (i.e. point) from that map, according to engine speed and throttle position (Transcript, Bruno Schuehmacher, at pages 828:20-22, 834:18-835:8).

[224] Next, the engine control unit applies various correction values to the point so extracted from the map (Transcript, Bruno Schuehmacher at pages 828:22-829-1, 835:5-17; Bower Infringement Report, D-45 at paras 54-56). These values are calculated in the same way in both

the 440HO and 600RS models, and are based on factors such as altitude, engine "knock", and exhaust gas temperature, according to the formula:

> (A or B or C or D) + E + F + G +H + J + K*L
>
> (Transcript, Bruno Schuehmacher at pages 814:17-815:14, 822:1-823:18, 824:28-828:3; Racing MY2006 Software P2 (Mandate), BRPE-0215, D-9, "Ignition" at 4).

In this formula, A, B C and D are the values extracted from the base maps; E, F, G, H and J are corrections applied to the value extracted from A, B, C or D. "K" corresponds to the ignition timing correction for "Tuned Pipe Temperature", and is the only sensor input based on exhaust gas temperature (Transcript, Bruno Schuehmacher, at pages 827:8-828:3; Racing MY2006 Software P2 (Mandate), BRPE-0215, D-9, "Ignition" at 3, 7). Once the engine control unit has added all applicable correction values to the extracted point, it triggers the spark plug according to the final value.

[225] The engine control unit repeats this whole process several times per second. However, the base maps remain unmodified, as they are saved unchanged in the engine control unit's read-only memory.

B. *The 600 ETEC and 800 ETEC Engines*

[226] The control logic of the 600 ETEC and 800 ETEC engines is substantially the same, with the main exception that the 800 ETEC selects between one of two separate dynamic correction tables based on altitude (Transcript, Bruno Schuehmacher at pages 914:21-915:2).Other differences between both engines are the addition of a second exhaust gas temperature sensor

located in the tuned pipe of the 800 ETEC Summit and Back Country models, as well as the operational voltage of the fuel injectors. These features have no bearing on this case as they have no effect on the logic.

[227] Both the 600 ETEC and 800 ETEC engines use an engine control unit programmed in a similar manner to the 440HO and 600RS models. Both contain four base maps, which correspond to low-octane/low-altitude, high-octane/low-altitude, low-octane/high-altitude, and high-octane/high-altitude, respectively (Transcript, Bruno Schuehmacher at pages 896:22-898:22; EGT Sensor Ignition Correction Maps Structure – 600/800 MXZ ETEC 2011 & 800 Summit, P-10; Bower Infringement Report, D-45 at paras 77-78, Figure 24).

[228] As in the 440HO and 600RS engines, the engine control unit in the ETEC engines is programmed to first select from among these four base maps, this time according to fuel quality and altitude (Transcript, Bruno Schuehmacher at pages 922:3-923:2; Bower Infringement Report, D-45 at paras 97-103, 106; BRP Demonstrative, D-49). Exhaust gas temperature again plays no part at this stage. The engine control unit then extracts a single point from that map based on engine speed (and throttle position) in both the 600ETEC and 800ETEC models (Transcript, Bruno Schuehmacher at pages 899:21-26 and at pages 923:3-923:8).

[229] Next, the engine control unit is programmed to apply corrections values to the extracted point that correspond to a number of factors. Unlike the 440HO and 600RS engines, however, these factors do not always include sensed exhaust gas temperature. Rather, the engine control unit is only programmed to apply such a correction if the throttle is open beyond a certain level

(either 70% or 80%, depending on the engine), and if the engine is operating at high speeds (Transcript, Bruno Schuehmacher, at pages 908:19-910:7). In any event, once the engine control unit has determined the full set of correction values, it adds them to the extracted point and uses the final value obtained to trigger the spark plug.

[230] As before, the engine control unit repeats this entire process several times per second. The four base maps remain unmodified once again, as they are stored in the control unit's read-only memory.

C. *Analysis*

[231] It is uncontroversial that BRP wished to use the temperature of the exhaust gas of its snowmobiles to be factored in arriving at the combination of ignition timing and engine speed that will be deemed optimal for the engine of its snowmobiles. It is also clear, in my view, that BRP does not resort to ignition patterns in the way the 738 Patent teaches. To put it bluntly, BRP does not select an ignition pattern based on exhaust gas temperature and it does not modify an ignition pattern based on exhaust gas temperature. The exhaust gas temperature is used in the BRP engines once the ignition point is extracted. It is the ignition point that is corrected by the use of exhaust gas temperature. It is always the ignition point which has been extracted that is corrected, as opposed to the 738 Patent where the whole pattern is either selected based on exhaust gas temperature, or the basic ignition pattern is turned into the ignition pattern once the ignition pattern has been modified based on the gas temperature. It is out of the pattern selected

based on exhaust gas temperature or modified based on gas temperature that an ignition point will emerge according to the 738 Patent. Not so with respect to the BRP engines.

[232] Two essential elements of the asserted claims are critical to the resolution of this matter. First, before the controller can activate the ignition source, according to an ignition pattern, it is the ignition pattern as a whole that is selected or modified. In both cases, it is at that stage, before there can be the activation of the source, that the sensed exhaust gas temperature is used. Put bluntly, the 738 Patent states that the effect of the exhaust gas temperature is on ignition patterns, not the ignition point. Second, because an ignition pattern must always be composed of more than one ignition point, the controller will have to activate the ignition source by choosing between more than one ignition point.

[233] Is also relevant to the analysis the fact that the ignition patterns must be different and their number cannot be infinite. Similarly, the ignition points in one pattern cannot be all identical in that ignition points vary with operation speed (and throttle position). The Patent makes it impossible that there be one pattern composed of one ignition point.

[234] BRP operates its accused engines in a manner very different than the invention. The evidence of Bruno Schuehmacher is clear and it has not been challenged to any extent at trial; furthermore, AC did not offer evidence of its own that could be seen as disputing the control logic of the BRP engines.

[235] In essence, BRP uses base maps from which one ignition point will be selected. In the case of the 440 HO and 600 RS accused engines, the base maps refer to the operating conditions of the engines (racing fuel, premium fuel and preheat). The 600 E-TEC and 800 E-TEC accused engines use four different base maps (low-octane/low-altitude, high-octane/high-altitude, low-octane/high altitude, high-octane/low-altitude). These maps are selected on the basis of conditions that have nothing to do with the exhaust gas temperature. There is no selection of a map based on exhaust gas temperature. It is rather the type of fuel and the altitude that are the controlling factors, together with the possibility of using a map that corresponds to a time when the engine is pre-heating with respect to the 440 HO and the 600 RS engines. There is not either a base map that is modified based on exhaust gas temperature. The base maps in the BRP logic remain the same; they do not change.

[236] On the basis of the selected base maps, the BRP engines extract one combination of ignition timing and engine speed, the ignition point that corresponds to the engine speed in the selected base map. That point, and that point only, will be the subject of corrections. One of those corrections to the extracted ignition point will be based on the sensed exhaust gas temperature. However, that correction will occur with respect to the 600 E-TEC and the 800 E-TEC only when the throttle is open beyond a certain level (>70%), which will generate high speeds.

[237] The ignition point extracted from the base map is corrected and it is only once the correction of that one point has been completed that the controller activates the ignition source.

[238] As can be seen, the BRP engines do not have a controller that activates the ignition source once an ignition pattern has been selected or a basic ignition pattern has been modified to become an ignition pattern. It is essential to the 738 Patent that the ignition source be activated according to an ignition pattern, selected or modified based on exhaust gas temperature, which must have more than one ignition point. The BRP control logic extracts the ignition point much earlier in the process and then corrects it, using the sensed gas temperature, among a number of possible corrections.

[239] Furthermore, the use of the sensed exhaust gas temperature is different. As already seen, BRP adjusts the ignition point as a function of the gas temperature: it is the ignition point that is adjusted on the basis of the exhaust gas temperature. AC, on the other hand, uses the exhaust gas temperature for a different purpose. In the case of the selection claims, the ignition pattern that will be used is selected from a plurality of different ignition patterns on the basis of the sensed gas temperature. It is the combination of ignition points that is selected, not a particular point that is corrected based on the sensed gas temperature. Similarly, the modification claims see the use of the exhaust gas temperature to take place with respect to an ignition pattern, not a single point having been extracted from the ignition pattern. The basic ignition pattern is modified using the sensed exhaust gas temperature in order to become the ignition pattern from which an ignition point will be taken.

[240] AC argued that BRP's base maps are in fact identical to its basic ignition patterns in the two modification claims. In my view, nothing rides on that controversy. Assuming that the base maps of one are the basic ignition patterns of the other, it remains that it is the selected basic

ignition pattern as a whole that is modified based on the exhaust gas temperature, not one ignition point extracted from the selected basic ignition pattern (or the selected base map).

[241] Furthermore, contrary to what is asserted at paragraph 118 of AC's memorandum of facts and law, the 738 Patent specifies that the activating of the ignition source is according to an ignition pattern that has been either selected from other ignition patterns based on gas temperature, or is the result of modifications based on the gas temperature to a basic ignition pattern (which has been selected from a plurality of basic ignition patterns). Instead, AC suggests that it suffices that an ignition pattern be used; presumably the suggestion is put forth to create the impression that, as long as there is an ignition pattern used somewhere in the process, that will be enough to satisfy the requirement that the activating of the ignition source is according to an ignition pattern.

[242] Such suggestion, or argument, ignores the meaning of the word "according" ("as stated by", "in a manner corresponding to" as defined in the Oxford Canadian Dictionary, Oxford University Press Canada, 2001) and, more importantly, it does not accord with the very structure of the claims and the disclosure of the Patent. The activating of the ignition source will have to be according to the ignition pattern left following its selection based on temperature or the modification of the selected basic pattern also based on temperature which comprises more than one ignition point. To put it simply, the controller must select one ignition point after the pattern from which it will be taken has been selected or modified on the basis of the temperature of the gas. On the contrary, the control logic of the BRP engines rests on the activating of the ignition source of the point which will have been corrected: the base map (or ignition pattern) is never

corrected or modified based on exhaust gas temperature. The BRP engines do not operate with the controller activating the ignition source according to an ignition pattern by finding one point out of many. The base maps are neither selected nor modified based on the exhaust gas temperature. Only the one ignition point taken from a base map is modified. BRP is not activating the ignition source according to an ignition pattern, but rather according to an ignition value that has been corrected based on the gas temperature.

[243] It was suggested, without providing much clarity, that there is no real difference between the control logic of the 738 Patent and the BRP accused engine because, in the end, the same result is attained. The Court declines to follow such an argument. The humorous epigram about bald men in *Free World Trust*, above, seems to me to dispose of that type of argument:

> 32 Based on the foregoing principles, I conclude that the appellant's arguments must be rejected. As stated, the ingenuity of the patent lies not in the identification of a desirable result but in teaching one particular means to achieve it. The claims cannot be stretched to allow the patentee to monopolize anything that achieves the desirable result. It is not legitimate, for example, to obtain a patent for a particular method that grows hair on bald men and thereafter claim that anything that grows hair on bald men infringes. I turn then to the first of the propositions listed above.
>
> [My emphasis]

The language of the claims leads to one conclusion. The 738 Patent is not only about the sensed exhaust gas temperature being used to arrive at an optimum ignition point. Is central to the Patent that it is the ignition pattern, not an ignition point, that is either selected or modified using exhaust gas temperature. This is not a minor or inconsequential device and it provides a measure of precision and certainty. As already noted, BRP was aware of the existence of the 738 Patent. It is impossible, in my view, to give a purposive construction of the words of the claims without

recognizing the centrality of the "ignition pattern". As Pratte J. wrote in *Eli Lilly & Co v O'Hara Manufacturing Ltd* (1989), 26 CPR (3d) 1 (CA):

> A Court must interpret the claims; it cannot redraft them. When an inventor has clearly stated in the claims that he considered a requirement as essential to his invention, a Court cannot decide otherwise for the sole reason that he was mistaken.

The same concern found echo in *Free World Trust,* above:

> 49 … The involvement in claims construction of the skilled addressee holds out to the patentee the comfort that the claims will be read in light of the knowledge provided to the court by expert evidence on the technical meaning of the terms and concepts used in the claims. The words chosen by the inventor will be read in the sense the inventor is presumed to have intended, and in a way that is sympathetic to accomplishment of the inventor's purpose expressed or implicit in the text of the claims. <u>However, if the inventor has misspoken or otherwise created an unnecessary or troublesome limitation in the claims, it is a self-inflicted wound.</u>
>
> [My emphasis]

[244] The testimony of the inventor and the specification of the 738 Patent all point firmly to the importance of the ignition patterns. That cannot be ignored. Indeed, the asserted claims are perfectly in line with the specifications.

[245] The requirement in the claims that the ignition source be activated according to the ignition pattern emerging from the selection or modification based on exhaust gas temperature is reflected not only in the Patent's title (Two-cycle Engine with Exhaust Temperature-Controlled Ignitions Timing), but also in the specification ("[t]he controller then selects an ignition pattern based on the exhaust gas temperature information. The selected pattern then is used to control the ignition advance based on the engine operating speed." (p 4, lines 23 to 25)).

[246] There is nothing that I have been able to find in the 738 Patent to show that an ignition pattern can be a single ignition point or that it allows for an ignition point to be extracted before the ignition pattern has been either selected or modified based on exhaust gas temperature. The Patent unequivocally speaks of patterns selected or modified. The difference between the Patent and what is practiced by BRP is not only one of degrees but one of nature. The Patent operates on the basis of ignition patterns while BRP extracts an ignition point early in the process.

[247] Fundamentally, once one reckons that a pattern must always have more than one ignition point, and that the activation of the ignition source is done according to that pattern ("used to control the ignition advance based on the engine operating speed"), it is easy to see the distance with the BRP engines that extract one ignition point, not a pattern, that is then corrected. No pattern is selected or modified based on gas temperature and the ignition point is not selected from an ignition pattern selected or modified based on exhaust gas temperature.

[248] Accordingly, the Court must conclude that the five asserted claims have not been infringed.

## X. *Invalidity*

[249] If I am wrong in the conclusion that the 738 Patent has not been infringed in the case at bar, I would have to consider if the 738 Patent is valid. BRP claims it is not. Given the considerable effort that was expended at trial, a short examination of the issue might be of assistance.

[250] BRP carries the burden of convincing the Court, on a balance of probabilities, that the 738 Patent is invalid (*Whirlpool Corp v Camco Inc*, 2000 SCC 67 at para 75, [2000] 2 SCR 1067). Here, BRP advanced the grounds of anticipation and obviousness in asserting that the Patent-in-suit is invalid.

[251] In order to have to examine the arguments about the validity of the 738 Patent, it would have to be, as contended by BRP, that the Court has been wrong in its conclusion that the term "ignition pattern" requires that there be more than one combination of ignition timing and particular engine speed. In other words, an ignition pattern could be composed of only one such combination. Earlier Dr. Checkel, the expert retained by AC, was reluctant to engage on the use that is made of the ignition pattern.

[252] In his ultimate oral submission to the Court, counsel for AC argued that the person skilled in the art "knows is what values I'm getting out at the other end. That's what matters to the skilled person" (Transcript, February 2, 2016, p 225: 4 to 6). Counsel went on to argue that the patent allows for an equation that will produce an ignition point for a given RPM at a particular exhaust gas temperature:

> And I disagree that the definition is only for a single patent (pattern). The definition if you accept what I say that an equation is a definition, you can put in different values and you always get to the same place. You always get to the same defined value. That is a defined relationship of two variables. If I input my temperature I have a defined relationship across my engine speed. I have it defined by my equation. It doesn't have to be laid out like this.
>
> (Transcript, February 2, pp 226-227)

[253] As I understand it, the position that has finally emerged is that the 738 Patent allows for ignition patterns to be the result of an equation, what has been referred to as the "virtual relationships". That ignition pattern, the defined relationship of two variables, sees the temperature being inputted; there is a contribution of information such that an ignition point is activated by the ignition source. As counsel for AC asserted:

> MR. CRINSON: Let me try to persuade you to look at it --
>
> JUSTICE ROY: By all means
>
> MR. CRINSON: -- look at it from, again, from the point of view of the person skilled in the art.
>
> If the proposition is that you fire or ignite the engine – using a whole ignition pattern, that's what the proposition is. The person skilled in the art knows that's not what happens and knows that's never what happens.
>
> Because a person skilled in the art knows that you always use a single value frame. You can't fire at all the of the ignition timing values. You can't.
>
> The person skilled in the art knows that for each engine cycle there's a single ignition point. That's what a person skilled in the art knows, but when you look at a – the pattern –patent, sorry.
>
> (Transcript, February 2, 2016, p 229)

[254] It is somewhat ironic that AC would have in my view to use a different Posita than the one it has defined for the Court to make the argument. Be that as it may, the person skilled in the art can certainly assist in reading a patent, but he cannot substitute words or concepts. The Patent says what it says and, in this case, there must be a plurality, not an infinity, of ignition patterns or a plurality of basic ignition patterns from which an ignition pattern, composed of more than one ignition point, will emerge; furthermore, it is the pattern that is selected based on the exhaust gas temperature, or it is the basic ignition pattern that is modified based on the exhaust gas

temperature. It is only once the ignition pattern has been selected, or the selected ignition pattern has been modified, based on exhaust gas temperature, that the controller will activate the ignition source. Clearly, the controller will activate the ignition source according to the ignition pattern chosen as a function of the exhaust gas temperature by selecting the point that corresponds to the ignition timing at a particular RPM. The notion that a whole ignition pattern is ignited was never part of the 738 Patent. However, the 738 Patent teaches that an ignition point is selected from an ignition pattern. And, where an ignition pattern would cover a range of temperatures, as indeed displayed in the 738 Patent, it is likely that many ignition points will be selected from the same pattern, as the engine speed varies without the temperature reaching a different range. How the invention is practiced 17 years later, if at all, is unknown. There is actually no hard evidence in this case that AC is actually practicing its own invention. At any rate, applying today's computation capacity to the 738 Patent is inappropriate. I am afraid the Posita "knows is what values I'm putting out at the other end. That's what matters to the skilled person" line of argument runs afoul of the "bald man" analogy (para 243 of these reasons). To quote again from *Free World Trust*, "(t)he claims cannot be stretched to monopolize anything that achieves the desirable result. It is not legitimate, for example, to obtain a patent for a particular method that grows hair on bald men and thereafter claim that anything that grows hair on bald men infringes".

[255] Nevertheless, the question is whether that theory around the 738 Patent proposed by AC would make it anticipated or obvious in view of at least two prior art documents.

A. *Anticipation*

[256] BRP confines its argument on anticipation to two pieces of prior art: a Japanese application published on June 16, 1989, bearing number 562-310-959 [Application 959] and the U.S. Patent 5946 908 [U.S. Patent 908].

[257] As I understand the argument, the 959 application would anticipate the three independent claims that give rise to the dependent selection claims 40, 33 and 47. BRP reckons that the 959 application does not cover the essential element that is part of these three claims, that is that the engine of the three claims is a snowmobile engine.

[258] BRP relies on U.S. Patent 908 to argue that the modification claims (claims 11 and 16) are anticipated where the claims are not limited by a dependent claim specific to snowmobiles.

[259] There does not appear to be any disagreement concerning the law of anticipation. The controlling authority, *Apotex Inc v Sanofi-Synthelabo Canada Inc*, 2008 SCC 61, [2008] 3 SCR 265 [*Sanofi-Synthelabo*], requires that there be (1) prior disclosure, that is that "the prior patent must disclose subject matter which, if performed, would necessarily result in infringement of that patent" (para 25), and (2) enablement, "which means that the person skilled in the art would have been able to perform the invention" (para 26), where the person skilled in the art would "be willing to make trial and error experiments to get it to work." (para 27).

[260] The 959 Japanese application is a rather difficult document to read, perhaps because of the translation from Japanese, with the patent applicant being the Suzuki Motor Company, the same company with whom the inventor, Mr. Greg Spaulding, would have developed what he considered to be his invention. It was published ten years before the priority date of December 1999, on June 16, 1989.

[261] Application 959 is concerned with the relationship of ignition timing (advance timing compared to top dead centre) or, as the Application says, to the lag speed of the engine, and temperature of the exhaust gas temperature. Basically, when the revolutions per minute reach a higher level, the ignition timing will be advanced based on the exhaust gas temperature.

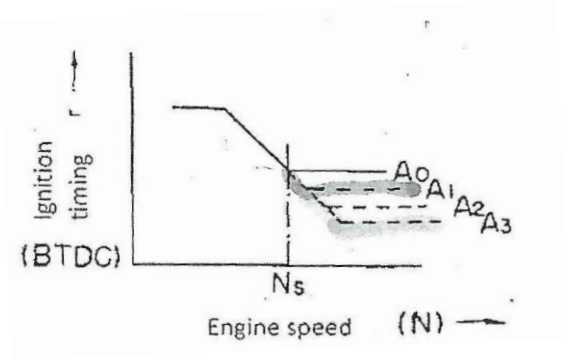
> Based on this configuration, the control circuit 16 controls the ignition timing of engine 2 to match the standard ignition timing A based on the engine speed N detected by the tachometer 12 as shown in Figure 2. In the high speed zone at or above the prescribed engine speed N, the ignition timing is controlled according to the exhaust gas temperature state of engine 2 detected by the exhaust temperature sensor 14 to match timings $A^1 \sim A^3$, which are further to the lag-side compared to the standard ignition time A
>
> (Application 959, p 4)

It is clear in my view that the Application is proposing that it is the various combinations of ignition timings and particular engine speeds that are moved in response to the sensed exhaust gas temperature; it is the ignition curve, or the ignition pattern, that moves:

> So in the high speed zone at or above the prescribed engine speed N, the ignition timing is controlled according to the exhaust gas temperature state of engine 2 detected by the exhaust temperature sensor 14 to match timing $A^1 \sim A^3$, which are further to the lag side compared to the standard ignition time A. In other words, when at or above the prescribed engines speed N, the standard ignition is varied from $A^o$ incrementally to timings $A^1 \sim A^3$, which are further

> to the lag side compared to the standard ignition time A, according to the ignition circuit 18 that causes the ignition plug 6 to fire at the aforementioned timings $A^1 \sim A^3$, which are further to the lag-side.
>
> (Application 959, p 4)

This is illustrated by figure 2, which is part of the Application:




Although quite rudimentary, figure 2 shows that the ignition curve is moving in accordance with the temperature of the exhaust gas.

[262] U.S. Patent 908 is also concerned with using the exhaust gas temperature. It provides for a "control routine" that calls for a basic control signal (the control value) that will come from a map; that control value comes from a map that is a function of throttle opening and engine speed; the temperature of the exhaust gas, calculated as the difference between the desired wall temperature of the exhaust pipe and the actual temperature of the wall, is measured by a sensor; the logic requires that a corrective map be used to establish the corrective value, which will then correct the value that had been extracted from the map; the processor, or controller, calculates the actual timing at which the spark plug should be fired so as to obtain the desired wall temperature (Patent 908, column 8).

[263] For a reason that remains unknown, BRP argued that Application 959 anticipates the independent claims, i.e. claims 34, 28 and 41. That may be so, but these are not the claims in play in this case. The claims asserted are rather claims 40, 33 and 47 as they all require that an essential element be that the engine is that of a snowmobile. No effort was made to even argue that the claims in suit are anticipated. It would appear that the real purpose of claiming anticipation was to argue that it constitutes a solid basis for arguing obviousness. At any rate, Application 959 does not anticipate any of the asserted claims.

[264] BRP contends that U.S. Patent 908 anticipates the 738 Patent, in case the Court would have concluded that it teaches the modification of an ignition pattern, the ignition pattern being understood to be one relationship between ignition timing and engine speed which, in the case of claims 11 and 16, would be modified based on the sensed exhaust gas temperature.

[265] In my view, the demonstration made by BRP was not convincing enough to conclude on anticipation. There is a difference between the two that is such that I am not persuaded that there is anticipation. Claims 11 and 16 require “a sensor for sensing a temperature of exhaust gas” as the modification of the ignition pattern is “based on sensed exhaust gas temperature”. On the other hand, the 908 Patent speaks of the difference of temperature between the desired temperature of the wall of the exhaust pipe and the actual temperature of the wall. I prefer to consider the matter more fully under the framework for obviousness.

[266] I should note that in an attempt to defend against the BRP argument that the U.S. Patent 908 anticipates the modification claims of the 738 Patent, AC argued that “Dr. Bower opined

that he does not believe the 908 Patent discloses modifying an ignition pattern" (para 150, memorandum of facts and law). This is not accurate. In the passage referred to by AC, Dr. Bower says clearly that he "does not believe the 908 and BRP products modify an ignition pattern. But, if I apply the interpretation that AC must use, then I find that because they're using this corrective value, that then they are modifying this base ignition point in the process of determining the final ignition value". The witness is steadfast that BRP does not modify an ignition pattern. Therefore, in his view, there is no infringement. However, assuming that there would be infringement, it would have to be that "ignition pattern" is given a different meaning: that meaning would have to be that the basic ignition pattern, to be modified on the basis of the exhaust gas temperature, would have to be a single ignition point. That would have taken claims 11 and 16 into the realm of U.S. Patent 908 and the engines used by BRP that practice the 908 Patent. Dr. Bower may well be right. That is the basis on which the invalidity argument must be considered.

B. *Obviousness*

[267] In my estimation, the analysis using the obviousness framework is probably more appropriate in a case where we must assume that the claims should be considered using an alternate construction from the one already retained by the Court in its infringement analysis. In other words, what happens when we assume a construction that would avoid a finding of non-infringement? That construction must assume that the "ignition pattern" can be a single ignition point. It is section 28.3 of the *Patent Act* that requires that the subject-matter not be obvious:

| | |
|---|---|
| 28.3 The subject-matter defined by a claim in an | 28.3 L'objet que définit la revendication d'une demande |

| | |
|---|---|
| application for a patent in Canada must be subject-matter that would not have been obvious on the claim date to a person skilled in the art or science to which it pertains, having regard to | de brevet ne doit pas, à la date de la revendication, être évident pour une personne versée dans l'art ou la science dont relève l'objet, eu égard à toute communication : |
| (a) information disclosed more than one year before the filing date by the applicant, or by a person who obtained knowledge, directly or indirectly, from the applicant in such a manner that the information became available to the public in Canada or elsewhere; and | a) qui a été faite, plus d'un an avant la date de dépôt de la demande, par le demandeur ou un tiers ayant obtenu de lui l'information à cet égard de façon directe ou autrement, de manière telle qu'elle est devenue accessible au public au Canada ou ailleurs; |
| (b) information disclosed before the claim date by a person not mentioned in paragraph (a) in such a manner that the information became available to the public in Canada or elsewhere. | b) qui a été faite par toute autre personne avant la date de la revendication de manière telle qu'elle est devenue accessible au public au Canada ou ailleurs. |

[268] Anticipation and obviousness are not one and the same. In *Beloit Canada Ltd v Valmet Oy*, (1986) 7 CIPR 205 (CA), the Federal Court of Appeal explained the difference thus at page 210:

> … obviousness is an attack on a patent based on its lack of inventiveness. The attacker, says, in effect, "Any fool could have done that." Anticipation, or lack of novelty, on the other hand, in effect assumes that there has been an invention but asserts that it has been disclosed to the public prior to the application for the patent. The charge is: "Your invention, though clever, was already known."

[269] The Court would conclude in this case that the application of the framework for analyzing obviousness leads to the conclusion that the 738 Patent suffers from that ground of invalidity, given the prior art and the common general knowledge. Indeed, the Patent-in-suit is a rudimentary instrument compared to some of the prior art. In *Apotex Inc v Wellcome Foundation Ltd* (2000), [2001] 1 FC 495 (CA) [*Wellcome Foundation*], the Federal Court of Appeal described the concept of obviousness:

> 60 The test for obviousness is whether the notional technician, devoid of inventiveness, but skilled in the art would, in light of the state of the art and of common general knowledge at the date of the invention, have come directly and without difficulty to the solution taught by the patent. This is a difficult onus to discharge.
>
> 61 Obviousness is a question of fact and this Court cannot interfere with the Trial Judge on this issue unless he committed a manifest error in weighing the evidence or committed an error of law. Care must be taken to guard against the danger inherent in hindsight analysis that an invention may appear obvious after the fact which was not obvious at the time of the invention.

Recently, the English and Wales Court of Appeal insisted once more on how much fact-driven is the consideration of obviousness. Clearly the Court of Appeal avoids putting a straitjacket on the law of obviousness. (*Hospira UK Ltd and Genentech, Inc*, [2016] EWCA Civ 780, at paras 9 to 17)

[270] *Sanofi-Synthelabo* captures crisply the state of the law when examining an allegation of obviousness by adopting the approach followed in Great-Britain:

> 67 It will be useful in an obviousness inquiry to follow the four-step approach first outlined by Oliver L.J. in *Windsurfing International Inc. v. Tabur Marine (Great Britain) Ltd*., [1985] R.P.C. 59 (C.A.). This approach should bring better structure to the obviousness inquiry and more objectivity and clarity to the analysis. The Windsurfing approach was recently updated by Jacob

> L.J. in *Pozzoli SPA v. BDMO SA*, [2007] F.S.R. 37, [2007] EWCA Civ 588, at para. 23:
>
> In the result I would restate the Windsurfing questions thus:
>
> > (1) (a) Identify the notional "person skilled in the art";
> >
> > (b) Identify the relevant common general knowledge of that person;
> >
> > (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;
> >
> > (3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;
> >
> > (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention? [Emphasis added.]
>
> It will be at the fourth step of the *Windsurfing/Pozzoli* approach to obviousness that the issue of "obvious to try" will arise.

[271] The rigidity that was assumed by the trial judge in *Sanofi-Synthelabo* has now been somewhat reduced. As already found, the person of skill in the art will have a mechanical engineering degree with a few years of experience. It is possible that calibrators with significant experience would be part of the team constituting the Posita. The 738 Patent is concerned with the two-stroke engine that uses exhaust gas temperature to control the ignition timing. There is agreement on most of the essential elements of the claims which are, in effect, part of the knowledge of a mechanical engineer (a two-stroke engine has a cylinder, a piston, an ignition source, etc.).

[272] AC took issue with some of the prior art, in the form of patents or applications for patents, located by the person skilled in the art. Part of the problem would of course come from the fact that AC would have defined the person of skill as someone who has experience rather than a degreed mechanical engineer. Furthermore, it is argued that the search conducted went beyond the diligent search. I disagree.

[273] The domain in which the search was conducted is circumscribed and perfectly reasonable. The 738 Patent is about two-stroke engines where the exhaust gas temperature is used for a particular purpose. It is not limited to snowmobiles and the 738 Patent is specific that it is about engines used "to drive various vehicles such as snowmobiles, motorcycles, personal watercraft and others" (Patent p 1). Surely a person of skill, like a mechanical engineer, who is diligent would locate prior art dealing with ignition timing and exhaust gas temperature, even if it refers to motorcycles.

[274] Similarly, the mere fact that some prior art was concerned with catalytic converters would not disqualify a research that otherwise deals with the use of exhaust gas temperature. I accept the evidence to the effect that it was understood that, sooner or later, and probably sooner rather than later, emission regulations would apply to snowmobiles as they already were in existence for other recreation vehicles, as motorcycles and watercrafts were already covered in the United States. Thus, looking into the art that is concerned with emission reductions does not strike me as being far afield. Quite the opposite when the Posita is taken to have a mechanical engineering degree.

[275] I am less than convinced, however, that prior art concerned with 4-stroke engines, because it operated differently, would be covered by a diligent search. At any rate, that prior art is less than essential and would carry little weight. It follows that the prior art identified by BRP is not only relevant to the alleged invention, but it would have been located by a diligent search focusing on what is the alleged invention. It is worth recalling that the effort centered on the invention and the location of where the competition for snowmobile, and recreational vehicles generally, would be the United States and Japan. Indeed, Application 959 has as the patent applicant the Suzuki Motor Corporation, AC's motorist at the time the alleged invention was developed. It is difficult to fathom a reason why an application for a patent by AC's motorist that is concerned with the ignition curves being selected from a plurality of ignition curves on the basis of the exhaust gas temperature can be said to be not relevant or, for that matter, requiring more than a diligent search when it is so directly on point. The U.S. Patent 908, similarly, emerged very rapidly as AC was looking for a logic that would avoid the 738 Patent logic. The person of skill in the art would not have had to look very far to locate a patent filed in January 1997 and published a few months (September 7, 1999) before the priority date invoked by AC (December 1, 1999). The testimony offered by Mr. Strickland is in my view a complete answer to accusations of over-zealousness. A serious company wishing to launch a new product would operate as BRP did in identifying the relevant intellectual property and seeking to avoid violating it. So would a Posita.

[276] The inventive concept in this case is, at the end of the day, quite simple, if one excludes from consideration the requirement that there is an ignition pattern composed of more than one ignition point, which would be a distinguishing feature of the 738 Patent. Thus, the invention is

limited to, with respect to the two-stroke engine, the exhaust gas temperature being used to select the ignition timing for the purpose of providing optimum operation of the engine. Although AC suggested that the optimization is limited to performance in the sense of power and acceleration, it is obviously not the case since the disclosure also speaks in terms of avoiding damages to the engine and selecting the right ignition pattern shortly after start-up. It should also be recalled that the disclosure states that "(i)n addition, the present invention could be applied to two cycle engines used on a stationary setting if desired."

[277] This view taken of the inventive concept is consistent with the testimony of the inventor, Mr. Greg Spaulding, and the expert retained by AC, Dr. Checkel, who wrote at paragraph 101 of P-2:

> Overall, the 738 Patent describes the use of sensing or measuring exhaust gas temperature to detect the engine operating condition specification and using that temperature as an input for determining the ignition pattern to be used. The ignition pattern used as a result may be to obtain optimum engine operating conditions or may for example, be used to alleviate an undesirable engine operating condition.

[278] Mr. Spaulding was in fact testifying in chief about the inventive concept without even referring to ignition patterns. Early on in his testimony, here is how he explained his invention:

> BY MR. EVANS:
>
> Q. Mr. Spaulding, could you just, generally speaking, explain what it is that you invented?
>
> A. My invention is using exhaust gas temperature to optimize settings, ignition timings on a two-stroke engine.
>
> Q. And what do you mean by optimize?

> To select the – using exhaust gas temperature to select the optimum ignition timing based on that internal temperature. The best calibration of timing for a given internal temperature of the exhaust.
>
> (Transcript, p 2616)

Later on in his testimony, Mr. Spaulding referred to ignition patterns (pp 2671 and 2707-2708).

[279] On cross-examination, it became clearer why the existence of ignition patterns is not prevalent in the view taken of this invention by its inventor:

> Q. But still you consider that these two engines fall within the scope of your invention?
>
> A. Yes.
>
> Q. Because your invention if I understand correctly, is the broad concept of modifying or correcting or selecting or any other way to affect ignition timing using exhaust gas temperature sensor as an input. Right?
>
> A. Yes.
>
> Q. So as long as you can have an exhaust gas temperature sensor, an ECU, and an ignition timing value or pattern or other parameters relating to ignition timing that will account for this exhaust gas temperature, this is your invention?
>
> A. I believe I'm understanding what you're saying.
>
> Q. What do you understand?
>
> A. I'm understanding that regardless of the logic used to achieve the exhaust gas temperature, the technology selects – measures exhaust gas temperature, uses that information to select patterns or ignition timing to optimize the engine in the various conditions, among other things. As far as ignition timing, I'm saying that. There are other areas of control.
>
> Q. And based on that understanding, you say, yes, this is my invention?

A. Yes.

Q. Correction of ignition point versus correction of ignition timing?

A. Yes.

Q. Selection of ignition timing patterns versus selection of ignition timing point, they both fall within the scope of your invention, as you see it?

A. As I see it, yes.

(Transcript, pp 2781-2782)

As far as the witness is concerned, what counts in the end is that the ignition timing, the selection of the ignition point, be made based on exhaust gas temperature. As already noted, although this is not the correct construction of the claims, this is assumed to be a possible reading of the Patent for the purpose of the obviousness analysis.

[280] The exchange during the cross-examination continued and it confirmed that the witness was not only concerned by the end product, but also that there may not have been much new in the invention:

Q. Yes. And what you want to accomplish is a final result, a final ignition timing point. Right?

A. Yes.

Q. And am I correct to say that, when you submitted your idea back in 1999 or October 1998 to Suzuki, this is what you requested, the broad concept of modifying, calculating, selecting, or other way to do it, but to account for exhaust gas temperature and modify somehow the ignition timing?

A. That was my request to Suzuki, yes.

Q. And you left to Suzuki the way to see what approach would be taken to achieve this result. Correct?

A. "Approach" meaning software logic?

Q. Software logic. Selecting an ignition pattern would be left to Suzuki to determine?

A. Yes. The logic of the software, yes.

Q. Modifying an ignition pattern, this would be – this would come from Suzuki. Correct?

A. I've got to make sure I understand you. The method of modifying an ignition pattern?

Q. Well, either the selecting an ignition pattern, modifying an ignition pattern, or modifying an ignition point, you left that to Suzuki, right, the logic of how to do it?

A. I – those things were known. I mean, you already had patterns, so it wasn't that you didn't know that you would modify a pattern or a point in the pattern. You know, I guess I'm not sure when you're saying I left that up to Suzuki to decide on what a pattern is or what a point is.

Q. No, not what a pattern means. So you said that patterns were known before. Right?

A. Timing patterns

Q. Timing patterns were known?

A. Yes.

Q. So what you wanted to accomplish with your system was to be able to modify the ignition timing of the snowmobile based on exhaust gas temperature. Correct?

A. Yes.

Q. Whether it would be accomplished by selecting patterns, which you just said were known. Correct?

A. Whether it be by selecting?

Q. Yes. Or whether it would be by calculation?

A. Oh, yes. That's right. Whatever the method.

Q. Whatever the method to do it was provided to you by Suzuki. Right?

A. Yes.

Q. Because, what you were interested in at the end of the day, was the end result?

A. Yes.

(Transcript, pp 2783 to 2785)

[My emphasis]

[281] I have little difficulty in finding that the prior art made the 738 Patent, as understood by AC, obvious to the Posita. As indicated on numerous occasions during the trial, what was truly invented in this case remains somewhat nebulous. But it is assumed for the purpose of the obviousness analysis in this case that the Court ignores the prevalence, indeed the centrality, of the ignition point being ignited according to the ignition pattern (with its numerous ignition points) that is either selected (the pattern) based on the exhaust gas temperature, or the final ignition pattern according to which the ignition point will be found and ignited is modified based on exhaust gas temperature. In effect, by dumbing down its Patent, AC makes it open to the obviousness attack.

[282] The 959 Application, the Suzuki Motor application of ten years prior to the 738 Patent, deals specifically with ignition patterns being selected on the basis of the exhaust gas temperature. The selection is done in order to optimally control the ignition timing. There is not much daylight between the 959 Application and the inventive concept of the 738 Patent. The fact that the 738 Patent is silent as to the purpose to which the sensed exhaust gas temperature is to be used to optimize the operation of the engine, and to what effect, makes it impossible to see a significant difference between the two. In other words, the very general inventive concept,

without any precision about the use that can be made of it, makes it easy to link Application 959 with the Patent-in-suit. The inventive concept in Application 959 is the use of exhaust gas temperature to optimally control the ignition timing. So is the inventive concept of the 738 Patent.

[283] Actually, the fact that there is no indication whatsoever as to how the invention is to be used in a snowmobile engine makes that feature of the three selection claims (40, 33 and 47) remarkably weak. If one knows how to use the invention for a motorcycle, what would not be obvious for the person skilled in the art? The 738 Patent is silent about the features that should be considered in using exhaust gas temperature for setting the ignition timing at different engine speeds in the case of a snowmobile. That simply does not differentiate between the prior art and the Patent-in-suit.

[284] AC argued that Application 959 is not concerned with two-stroke engines. I disagree. The Application brings by reference another Application, the unexamined Japanese patent application 562-70660 (Application 660); the Application 660 speaks of a two-stroke engine and I accept Dr. Bower's evidence that, as Application 959 seeks to assert improvements to the 660 Application, it follows that Application 959 is also concerned with the two-stroke engine. Application 660 is not something found elsewhere in the prior art but rather it is referenced directly in the 959 Application. Indeed, Applications 959 and 660 must be read together. These applications have a common theme: the ignition timing is calibrated based on the temperature of exhaust gas.

[285] Similarly, U.S. Patent 908 is a direct response to AC's attempt to portray its Patent as allowing for equations that would account for many variables, with the exhaust gas temperature being used to adjust the ignition point. The evidence in this trial is to the effect that it is one of two things. Either, the ignition point is adjusted to account for exhaust gas temperature or it is the ignition pattern, consisting of more than one ignition point, that is changed based on the exhaust gas temperature and the ignition point will be found by the controller.

[286] The U.S. patent 908 is in my view a very difficult hurdle for AC to jump in order to argue against obviousness. The two experts agreed that it teaches adjusting ignition timing based on the sensed exhaust gas temperature: it is evident on the face of the 908 Patent. The controller uses a three-dimensional map from which a basic ignition timing is determined as a function of engine speed and throttle position. If the sensed gas temperature is not that which corresponds with optimal performance, a correction value based on the exhaust gas temperature (the difference between the sensed temperature and the desired temperature) is applied.

[287] It is true that U.S. Patent 908 uses the difference of temperature between the desired exhaust gas temperature and that measured in order to make the adjustment. The 738 Patent's disclosure is rather flexible, expressing preference for direct contact with the exhaust gas temperature for accuracy and reduction in reaction time. But, it is also possible to sense the temperature outside of the exhaust system: the disclosure even allows to sense the temperature of water on a water jacket surrounding an exhaust pipe. In my view, U.S. Patent 908 addresses squarely the use of exhaust gas temperature in order to arrive at an ignition point. If the difference between measuring the gas outside of part of the exhaust system and establishing the

temperature used by subtracting the temperature measured and that desired is material to the inventive concept, which is very doubtful, I have no doubt that going from something more complex (i.e. comparing desired and actual temperature of the gas) to something simple (measure the exhaust gas directly) would be obvious to the person skilled in the art. This is a step obvious to the Posita and that simply does not require a degree of invention. There is no requirement for an inventive step: it is obvious. In fact, the inventive concept of the 738 Patent would appear to have been well known if one is to exclude the particular use of ignition patterns.

[288] Dr. Checkel, at paragraphs 81to 86 of his report on invalidity (P-60) repeats, for all intents and purposes, what is found in the 738 Patent. Under the title "The Invention Disclosed in the Patent", the Court could not find anything illuminating as we are informed that the "patent relates to controlling ignition timing" and "specifically to a particular manner of using sensed gas temperature for setting ignition timing". The expert then continues with generalities in stating that the strategy disclosed in the 738 Patent is the selection of an ignition pattern out of a plurality of ignition patterns based on gas temperature. He does not go beyond repeating what can be read in the Patent. It is anything but clear what he makes of those words. He even makes a virtue out of the fact that the Patent does not say a word about the operating conditions and the circumstances in which an ignition pattern could be selected.

[289] I have been convinced by the evidence led by BRP that its engines practice the 908 Patent in that they extract from a base map selected on a basis other than the sensed exhaust gas temperature a value. At any rate, that has not been challenged by AC. That value is then adjusted, among other factors, by a value based on sensed exhaust gas temperature. Once the 738

Patent is stripped of the particular meaning of "ignition pattern" to be understood that it can also relate to an ignition point, it becomes clear that the inventive concept is the same as that of the 908 Patent: an ignition point is adjusted, including with using the sensing of the exhaust gas temperature.

[290] When the specification of 738 is considered as a whole, one is faced with a patent which lacks inventiveness. The exhaust gas temperature can be used to affect the ignition timing. The 738 Patent does not offer anything that would differentiate it from other patents. That same idea, general inventive concept, is found in the prior art. There is no distinguishing attribute, feature or characteristic found in the 738 Patent that would set it apart from the prior art. To say that the invention will assist in optimizing the operation and performance of a two-stroke engine, without any indication as to how, is not addressing the requirement that there must be a differentiating feature such that there is inventiveness. Similarly, claiming that we are dealing with a snowmobile engine is of no assistance if it is not disclosed how that would make a difference.

[291] In *Teva Canada Ltd v Pfizer Canada Inc*, 2012 SCC 60, [2012] 3 SCR 625, the Supreme Court found the disclosure to be deficient in a case where the specification did not allow to identify the particular compound active in treating erectile dysfunction (EJ):

> 66 In this case, if we consider the specification as a whole, there is nothing to support the view that the use of sildenafil for the treatment of ED is a separate invention from the use of any of the other claimed compounds for that same purpose. No specific attributes or characteristics are ascribed to sildenafil that would set it apart from the other compounds. Even if we take into consideration the fact that sildenafil is an "especially preferred compound", there is still nothing that distinguishes it from the other eight "especially preferred compounds". The use of sildenafil

> and the other compounds for the treatment of ED comprises one inventive concept.

By analogy, in this case there is no suggestion in the Patent concerning the difference for a snowmobile. The disclosure does not state any particular feature of the snowmobile engine. One suspects that the calibration of a snowmobile engine, because of the conditions in which it operates, must take into account differently the exhaust gas temperature in finding the optimal ignition point (or ignition pattern). But the Patent does not take the matter any further. It simply says that the invention is directed at two-stroke combustion engine that is "used, for example, to drive various vehicles such as snowmobiles, motorcycles, personal watercraft and others" (738 Patent, p 1, lines 6 and 7; see also p 3, lines 2 to 4).

[292] If the Patent-in-suit is not providing any information about the special requirements of a snowmobile engine, it would be left to the person of skill to make appropriate adjustments which is, by definition, short of inventiveness. The 738 Patent does not solve the problem, if any, that is posed by a snowmobile engine. It simply states that three independent claims are applied to an engine of a snowmobile, without more.

[293] AC advanced, quite meekly, in my view, that its invention is different because it is more general than the more precise purpose found in the prior art. The argument would have had more strength had the Patent brought any kind of specificity as to how the general notion of gas temperature to adjust ignition timing can be used in different circumstances. Such is not the case. Nothing of the sort is even alluded to in the 738 Patent. Furthermore, the prior art was already

concerned with the exhaust gas temperature being used to operate the engine at its optimum. For instance, the abstract of the 908 Patent seeks to illustrate what is found in the Patent:

> A number of embodiments of exhaust gas temperature sensors that cooperate with an exhaust control for maintaining optimum engine performance by controlling the exhaust gas temperature to maintain the desired pulse back effect on the exhaust gas system.

In describing the control system, more precision is available, we read:

> As previously noted, the ECU 75 controls the timing of firing of the spark plugs 73. This timing is selected in a manner to provide optimum engine performance and this includes timing of the firing of the spark plugs 73 so as to maintain the optimum exhaust back pressure pulse transmission signals.
>
> In addition to controlling the timing of firing of the spark plugs 73 by their ignition system 74, the ECU also controls the fuel supply amount transmitted from the carburetor 65 by a fuel supply control system, indicated schematically at 85 in FIG. 1.
>
> Certain engine running signals are also transmitted to the ECU 75 as well as other conditions such as ambient air pressure and temperature. The depicted controls include a throttle position detector 86 that cooperates with the throttle valve 66 to provide a signal indicative of operator demand. There is also a sensor 87 associated with the crankshaft 57 so as to provide a pulse signal that it is indicative of not only crank angle but, by measuring crank angle with respect to time, engine speed. The ECU 75 has a memory section 88 that contains certain map information, as shown in FIG. 7, so as to provide the necessary information to lo [*sic*] the ECU 75 to obtain optimum engine control.
>
> (Column 6, lines 60 to 67 and column 7, lines 1 to 15)

[294] It would seem rather obvious, even trite, that the purpose of the invention was to improve. When was the last time an invention professed to make things worse? At any rate, that would likely not meet the definition of "invention" in the *Patent Act* that specifies that it means "any new and useful art, process, …, or any new and useful improvement in any art, process,

…". AC relied on the testimony of the inventor to argue that the invention is for the purpose of optimizing performance at that particular gas temperature (memorandum of facts and law, para 167). Not only is the Court invited to read more in the passage of the testimony used to make the argument (Transcript, p 2616, lines 5 to 14) than can be, since the witness was not offering what the optimization was about, but just a few minutes later the same witness explained further what his invention was achieving:

> A. If you measure the exhaust gas temperature with my invention, yes, it selects temperatures with settings that are optimized for these two patterns.
>
> Q. Okay. And at the time of your invention, to your knowledge, what were other people trying to do to compensate for this phenomenon?
>
> A. People would wrap pipes or insulate them.
>
> Q. Okay.
>
> A. Try to get the system up to some higher temperature and then maybe cover the pipes to keep them warm before an event or something.
>
> Q. What was the purpose of that?
>
> A. To try to retain heat inside the pipe in hopes that certain performance characteristics would be better for them at whatever event they were at or use they were doing with it.
>
> Q. How is your idea different?
>
> A. Well, my pipe sensor technology will measure that exhaust gas. It will select values that are optimum for a temperature. When that temperature rises in normal operation, say when the snowmobile is going from a partial throttle load to a wide open load, the temperature is rising in there, the sensor senses that, it continually makes timing settings for the various temperatures. When the temperature rises, it moves those values up into the optimum settings automatically.
>
> (Transcript, p 2625, lines 16 to 28, and p 2626, lines 1 to 14)

Actually, the description given corresponds to the inventive concept of the 908 Patent. Given the silence of the Patent on the use that can be made of the exhaust gas temperature for various possible purposes, I fail to see how this can be of assistance to AC. This purpose cannot be a distinguishing feature or characteristic without a modicum of precision. Without it, there is no air of reality to the argument.

[295] AC did not argue that there was a significant difference between selection claims and modification claims on this Patent-in-suit. It was mainly a matter of claims drafting, intending to draft a narrower claim than the selection claims (Transcript, February 1, 2016, pp 100-101).

[296] Application 959 would also be part of the prior art showing that ignition timing being adjusted by using exhaust gas temperature was in existence ten years before 1999. There was not much new in the 738 Patent if the notion of ignition pattern, as it is to be understood, is excluded from real consideration. The novelty of the 738 Patent is advanced by AC as being the use of ignition patterns (memorandum of facts and law, para 165), yet it must take its distance from it in order to argue that BRP infringes where BRP does not activate the ignition source according to an ignition pattern, that ignition pattern being composed of numerous ignition points. Once that distinguishing feature of the 738 Patent is excluded, we are left with an inventive concept, and an invention, that is not different from the prior art, and in particular Application 959 and U.S. Patent 908. There is little that differentiates the Patent-in-suit.

[297] Other prior art was also brought in by BRP. They tend to show that ignition timing as a function of exhaust gas temperature was already well known.

[298] In U.S. Patent 5,050,551 (the 551 Patent), the exhaust gas temperature is used to select a particular ignition pattern in relation to the activation of catalytic converters. Depending on the temperature sensed, the ignition timing on the engine would be adjusted. The 551 Patent is dated September 24, 1991, many years before the 738 Patent, yet the relationship between temperature and ignition timing was well known. The same can be said of U.S. Patent 5,642,705 of July 1, 1997. Published in 1997, it seeks to maintain the exhaust gas temperature in order to activate a catalytic converter. The controller applies a correction to adjust the fuel injection quantity and an ignition timing adjustment (an advance) when the temperature activated is below the target exhaust gas temperature to activate the catalyst.

[299] I would conclude that the subject-matter described by the claims was obvious to the person skilled in the art. An inventive concept, defined only by the use of sensed gas temperature for setting ignition timing, in order to optimize the engine operation, was known to the skilled person defined as including a mechanical engineer with three years of experience, for many years. Furthermore, the goal for a particular set of settings, even if relevant, is of no assistance to AC because it is never explained how the invention relates to different goals, whether they be to improve acceleration or avoid damage to the engine. In other words, the invention does not disclose how the temperature can be used for different goals. Different purposes for using exhaust gas temperature for setting ignition timing are referred to in a general way: acceleration, engine is cold or hot, the effects of combustion achieved by varying the ignition timings, operating conditions may require different timings, the type of fuel or the temperature indicating problems that can be avoided through appropriate ignition timings. The issues are stated, not explained and certainly not resolved. In the end, they bring nothing to the inventive concept

because there is no way of ascertaining how the invention, i.e. using gas temperature for setting ignition timing, can have an effect.

[300] BRP cannot practice the 908 Patent and be in violation of the 738 Patent without the 738 Patent having the same elements as the 908 Patent. AC was not convincing in its attempt to argue around the 908 Patent. Application 959, the Japanese application of Suzuki, AC's motorist, was also a significant difficulty for AC that was never overtaken.

[301] Nevertheless, the Court examined carefully the argument put forth by AC on invalidity. It has to find, on balance, in favour of BRP as the evidence of its expert was more convincing, as it accounts for the text of patents and applications considered.

[302] In his report (P-60), Dr. Checkel, identified these features of the 738 Patent as not covered by the common general knowledge: "(a) selecting an ignition pattern from a plurality of such maps based on using the sensed exhaust gas temperature; (b) modifying an ignition pattern by using the sensed exhaust gas; (c) using these things and methods with a snowmobile". It remains very much unclear if these features identified by the expert for AC can relate to an ignition point being the ignition pattern, especially "(a) selecting an ignition pattern for a plurality of such maps". AC never resolved the conflict between the language in the claims around "ignition pattern" and the ignition point. It ignores for all intents and purposes the notion of pattern when arguing infringement, but it brings it back to defend against invalidity. That is an awkward position to be in. That plays into the hands of BRP's "*Gillette* defense". In order to defend against invalidity AC is forced to argue that its Patent is different from the prior art: that

difference is the use made of the ignition pattern. However, in so doing it opens the door for BRP to escape being captured by its Patent. That may well explain the reluctance of Dr. Checkel to discuss at any length ignition patterns. Moreover, I note that the witness introduces flexibility in subparagraph (a) and (b) of his paragraph 136 that is not to be found in the language of the claims. There is no "using of the sensed gas temperature", and that makes a difference. The claims speak in terms of the ignition pattern used by the controller being selected [or modified] based upon the sensed exhaust gas temperature, not merely being used in the selection or modification of a pattern.

[303] The ignition pattern is not selected based on using the temperature in some fashion: it is selected based on the temperature. The claims are clear: the exhaust gas temperature once sensed takes the controller to one ignition pattern. The controller activates the ignition source at a particular point according to the ignition pattern that must have at least two ignition points. That is evidently consistent with the specification that states that "[t]he selected ignition pattern then is used to control the ignition advance based on the engine operating speed." (p 4, lines 24-25). [My emphasis]

[304] Dr. Checkel concluded that these elements did not form part of the common general knowledge. However, I have been persuaded that Application 959 by Suzuki discloses the selection of an ignition pattern being selected from a plurality of ignition patterns: the selection does not only use the exhaust gas temperature, but the selection is based on the sensed exhaust gas temperature. Mr. Spaulding confirmed in his testimony that timing patterns were known at the time and that he was interested in selecting and modifying patterns based on exhaust gas

temperature (Transcript, pp 2783-2784, lines 9 to 28 and lines 1 to 28). It had already been disclosed ten years before that an ignition pattern may be selected based on exhaust gas temperature.

[305] I accept Dr. Bower's evidence that the 908 Patent is relevant if AC is to argue that its claims 11 and 16, the modification claims, are not invalid by reason of obviousness. Dr. Checkel reckoned that the 908 Patent teaches adjusting the ignition timing based on exhaust gas temperature (Transcript, pp 3077-3078, lines 26 to 28 and 1 and 2). A broad interpretation of the claims by AC needed to argue infringement on the part of BRP brings into play the 908 Patent. The uncontroverted evidence in the face of an absence of evidence presented by AC leads to a conclusion that the 908 Patent disclosed modification based on exhaust gas temperature. There was nothing new in adjusting timing based on gas temperature.

[306] By asserting its claims so broadly, AC was leaving itself open to invalidity arguments. The narrowness of claims is known to afford protection against invalidity. There is of course a need to protect the invention as "[e]verybody will be free to use the invention in the unfenced area." (*Burton Parsons*, at para 134 of these reasons for judgment).

[307] Given the logic used by the BRP engines, AC had in order to argue infringement to abandon the central feature of its claims, the existence of ignition patterns from which ignition points would be extracted. However, by abandoning that feature, AC was also abandoning what distinguished its 738 Patent from the prior art. Optimizing the operation of a two-stroke engine through the use of sensed exhaust gas to adjust ignition timing was not new.

[308] As already discussed, the lack of precision around what difference applying the inventive concept would make in the case of a snowmobile engine makes this distinguishing feature irrelevant when discussing obviousness. Even if the application of the invention were to be part of the inventive concept, there was no convincing evidence to suggest that applying the inventive concept to snowmobiles would require an inventive step by the person skilled in the art. There is no evidence, let alone convincing evidence, that the adaptation of the invention to a snowmobile engine would require steps that would require any degree of invention.

[309] It follows that whatever reading one gives to the claims, the subject-matter defined by those claims would have been obvious. This invention lacks inventiveness and it would therefore constitute a complete defense to the allegation of infringement.

## XI. *Overbreadth*

[310] BRP made an argument *in extremis* according to which the claims in suit are all overbroad. In other words, the five claims, together of course with the independent claims 34, 41 and 28, are broader than the invention disclosed in the specification.

[311] As stated by the Federal Court of Appeal in *Pfizer Canada Inc v Canada (Minister of Health*, 2007 FCA 209 at para 115, 158 ACWS (3d) 987, "[i]t is now settled law that a patent which claims more than what was invented or disclosed can be found invalid for being overly broad." In order to prevail, it must be shown that the claims in the 738 Patent are broader than the invention as disclosed.

[312] As I understand it, the argument made is somewhat technical. It is based on what counsel has referred to as "claim differentiation". There are in this Patent a number of independent claims that are further refined and limited with dependent claims; the dependent claims convey specifically the notion that the engine considered by those independent claims "comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe". These kinds of refinements are found with respect to independent claims 1, 6, 21, 28, 34, and 41, and in dependant claims 4, 9, 24, 31, 37 and 44. The selection claims 33, 40 and 47 asserted in this case are associated with independent claims 28, 34 and 41 which have as other dependent claims those that refer specifically to exhaust pipes. Thus, independent claims 28, 34 and 41 are all followed by dependent claims that speak specifically of an exhaust pipe in which is disposed a sensor. These dependent claims to independent claims 28, 34 and 41 are different from the dependent claims asserted in this case where all that is left are the independent claims where the engine is a snowmobile engine without direct reference to exhaust pipes. Other claims do not have these refinements in dependent claims, including the modification claims 11 and 16.

[313] The claim differentiation argument goes like this. The invention, in order to be operational, requires that there be an engine with an exhaust pipe. A claim that would not include exhaust pipes would cover more than the disclosed invention by not requiring specifically the presence of exhaust pipes. BRP argues that some dependent claims include exhaust pipes, which proves that the other claims are overbroad because they do not refer to the pipes. BRP relies on *Whirlpool Corp v Camco Inc*, 2000 SCC 67 at para 79, [2000] 2 SCR 1067 [*Whirlpool*].

[314] In *Whirlpool*, the Court found that if two claims are identical but for one feature, it must be that the feature is an essential element of the claim. The difference between two claims was that, in one, the word "intermittently" was used and, in another, it was the word "continuously" that was used. That made a big difference because in one case, the auger was continuously rotated and in the other claim it was intermittently rotated. As the Court put it, "[t]he claims clearly differentiate between two modes of operation."

[315] The flaw in the BRP argument, respectfully stated, is that it fails to give the asserted claims a purposive construction taking fully into account the specification. It fails to reckon that the specification speaks of the use of an exhaust pipe to have the sensor disposed in it as possible embodiments, not essential elements and that, at any rate, Figure 1 includes an exhaust pipe.

[316] The invention requires that the gas produced by the combustion of the mixture of air and fuel be expelled from the cylinder. The temperature of that exhaust gas must be measured. Hence, the summary of the invention provides that, "[i]n another aspect of the present invention the exhaust gas temperature is determined by use of a sensor that is in contact with the exhaust gas, for example in an exhaust pipe." The same formulation is used at p 3, line 7, of the Patent. Evidently, what is essential to the invention is that gas temperature be measured once expelled from the cylinder; the exhaust gas temperature may be measured elsewhere than in the exhaust pipe. The same point is made at page 3 of the 738 Patent, the inventor adding at lines 7 to 10 that "[t]he present invention is not limited to any particular exhaust system, and various combinations of exhaust pipes and manifolds can be used with engines that have more than one cylinder." Furthermore, BRP compares the asserted claims to what it considers to be required to benefit

from only one particular use that can be made of the invention, not a comparison between the invention and the claims. To put it another way, the invention is broader than what BRP asserts to make its overbreadth argument.

[317] The Court finds guidance on the method of interpretation, as it should, from the passage often quoted from *Consolboard Inc v MacMillan Bloedel (Saskatchewan) Ltd*, at pp 520-521[*Consolboard*]:

> We must look to the whole of the disclosure and the claims to ascertain the nature of the invention and methods of its performance, (*Noranda Mines Limited v. Minerals Separation North American Corporation* [[1950] S.C.R. 36]), being neither benevolent nor harsh, but rather seeking a construction which is reasonable and fair to both patentee and public. There is no occasion for being too astute or technical in the matter of objections to either title or specification for, as Duff C.J.C. said, giving the judgment of the Court in *Western Electric Company, Incorporated, and Northern Electric Company v. Baldwin International Radio of Canada* [[1934] S.C.R. 570], at p. 574, "where the language of the specification, upon a reasonable view of it, can be so read as to afford the inventor protection for that which he has actually in good faith invented, the court, as a rule, will endeavour to give effect to that construction".
>
> [Emphasis in the original]

I have concluded that the kind of overly technical construction, comparing words found in some claims and not others is not appropriate, especially given that BRP's construction is based in fact on only one possible benefit derived from the invention. It should not be endorsed as it departs from the purposive construction expected in matters of this nature and the proper construction to be given to those claims.

[318] The following passage taken from *Burton Parsons*, above, at page 563, would seem to me to apply to the case:

> In my view, the rights of patentees should not be defeated by such technicalities. While the construction of a patent is for the Court, like that of any other legal document, it is however to be done on the basis that the addressee is a man skilled in the art and the knowledge such a man is expected to possess is to be taken into consideration.

In fact, the differentiation of claims, in *Whirlpool*, does not exclude the purposive construction of claims. Rather, the differentiation is one way of inferring the true meaning of the claims. In my view, the proper construction of the claims of the 738 Patent cannot be mechanistic, as is proposed by BRP. The purposive construction leads to a different conclusion.

[319] Strictly speaking, the disclosure does not require the presence of exhaust pipes in order to measure the gas temperature. How the temperature is sensed, that is whether the sensor contacts directly the exhaust gas or not, is only an aspect of the invention as the following references will attest:

> In another aspect of the present invention the exhaust gas temperature is determined by use of a sensor that is in contact with the exhaust gas, for example in an exhaust pipe.
>
> (p 2, lines 7 to 9)

> Exhaust gas resulting from the combustion of the fuel air mixture is expelled from the cylinder, for example through an exhaust pipe. The present invention is not limited to any exhaust system, and various combinations of exhaust pipes and manifolds can be used with engines that have more than one cylinder.
>
> (p 3, lines 6 to 9)

> It is preferred that the sensor 24 be in direct contact with the exhaust with the exhaust gas for the purpose of accuracy and

> reduction in reaction time, for example by being positioned in the exhaust pipe 26. However, it is possible to sense the temperature on the outside part if the exhaust system or to sense the temperature of water in a water jacket surrounding an exhaust pipe.
>
> (p 4, lines 4 to 8)

It is the ability to measure the temperature of the exhaust gas that is essential. Where that measurement is to occur is a matter of preference. It could be in the exhaust pipe, but it could also be elsewhere. As the disclosure states:

> In the case of a sensor directly contacting exhaust gas in the exhaust pipe or other part of the exhaust system, the sensor should be able to withstand that environment, and suitable measures should be taken to seal the exhaust system at the point where the sensor extends into the exhaust system. An example of a suitable sensor for use in directly contacting the exhaust gas is a thermistor. It is desirable that the sensor be positioned in the exhaust system at a position sufficiently far from the engine to avoid sharp rises and falls (spikes) in temperature of short duration. However, if the sensor is too far from the engine the responsiveness of the system is adversely affected, i.e. there will be too much delay in sensing increases and decreases in temperature. The exact position is determined based on the specific characteristics of the exhaust system involved. (p 4, lines 7 to 19)

[320] The existence of an exhaust system is referred to in the specification and it must be implied. Not only does the disclosure refer to an exhaust system, but the person of skill would have recognized that much. Furthermore, Figure 1 of the 738 Patent presents a rough drawing of a two-stroke engine. That same drawing is found on the first page of the patent under the title “Two-cycle engine with exhaust temperature-controlled ignition timing”. In each of these two figures is prominently displayed an exhaust pipe 26.

[321] The purpose of method claims 31, 37 and 44 as well as engine claims 4, 9 and 24 is not so much to introduce the existence of exhaust pipes as it is to be specific that the sensors must be disposed, in those claims, in the exhaust pipe as opposed to somewhere else. Contrary to BRP's assertion, the claims do not broaden the invention as disclosed in the specifications: they limit it. The asserted claims simply do not indicate a preference for where the gas temperature is to be measured. Other claims do. As the Supreme Court put it in *Whirlpool* after having approved the passage from *Consolboard*, above, "[n]ot only is "purposive construction" consistent with these well-established principles, it advances Dickson J.'s objective of an interpretation of the patent claims that "is reasonable and fair to both patentee and public" (para 49). The construction offered by BRP would not appear to be reasonable and fair to the patentee by seeing a differentiation between claims where none exists once a purposive construction is put on the claims.

[322] This interpretation commends itself even more so where claims 4, 9, 24, 31, 37 and 44 are read, as they should, together with the claim preceding them. The six claims are built on the same format: the engine (or the method) is the engine (or the method), of the claim preceding. I use independent claim 28 as an illustration:

- Claim 28 posits simply "sensing a temperature of the exhaust gas expelled from the cylinder".
- Claim 30 adds precision by requiring that "the exhaust gas temperature [be] sensed with a sensor that contacts the exhaust gas".
- Claim 31 starts from method 30 that senses the gas temperature by contact with the exhaust gas to add merely that "wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe".

Claim 30 provides that "[t]he exhaust gas temperature is sensed with a sensor that contacts the exhaust gas". Read together, independent claim 28 is the method of operating a two-cycle engine which calls for the gas expelled from the cylinder to be sensed for its temperature. Dependent claims 30 and 31 establish that in method claim 28, the sensor contacts the exhaust gas and where there is an exhaust pipe for carrying the exhaust gas, the sensor is disposed in that exhaust pipe. As already noted, the specification does not require that the sensor be in the exhaust pipe; it indicates that it is preferred that there be direct contact with the exhaust gas for better accuracy and reaction time, "for example by being positioned in the exhaust pipe". These claims give effect to that preference.

[323] Actually, the dependent claims where reference is made to exhaust pipes cascade from the independent claims 28, 34 and 41, the same independent claims from which asserted claims 33, 40 and 47 cascade. A purposive construction of the claims leads to only one conclusion. The logic is the following:

(a) The independent claim establishes the essential parameters, one of which being that the exhaust gas expelled from the cylinder will be sensed;

(b) One dependent claim establishes one of the preferences stemming from the disclosure to have the sensor contact the exhaust gas;

(c) Another dependent claim states that the sensor contacts the exhaust gas such that the sensor would be disposed in the exhaust pipe.

In the case at bar, the only asserted claim is, in effect, the independent claim where the engine is limited to a snowmobile engine rather than other two-stroke engines used in motorcycles,

personal watercrafts or even “two cycle engines used in a stationary setting” (p 3, line 5). That dependent claim, coupled with the independent claim, does not express a preference for where the exhaust gas temperature is measured.

[324] As already pointed out, this invention is not limited to optimizing power and acceleration, but it can address a number of other issues that could damage a two-stroke engine. The invention claimed in independent claims 28, 34 and 41 do not claim for more than what is disclosed. They claimed what is disclosed. By having dependent claims where the preferred method of sensing the exhaust gas temperature is claimed, AC is limiting itself not broadening the scope of the invention. As Hughes & Woodly on Patents put it at §29:

> The claim must disclose the invention but it is not required to disclose the advantages. However, the claim must not be broader than the invention disclosed. If the claims include the essence of the invention, they cannot be broader than the invention. Overclaiming must be in relation to an essential element of the invention. If the claim fails to include an element essential to the invention disclosed, it is invalid. If the claim omits a non-essential element, it will not be rendered invalid.

[325] The asserted claims do not exceed the invention described in the specification. They all claim that there will be sensing of the temperature of the exhaust gas which is expelled from the cylinder. That sensed temperature is used to select an ignition pattern from which an ignition point will be extracted or the sensed temperature will be used to modify one of a plurality of basic ignition patterns. The claims with respect to how the temperature will be measured, that is, with the sensor being in contact with the gas, in the exhaust pipe, do not introduce an element that was essential to the invention as described in the disclosure. The analogy with *Whirlpool*, above, is not apposite.

[326] The purposive construction of the claims must include a fair appreciation of what the invention is and how it is described in the specification (see *Burton Parsons,* above, pp 565-566). BRP has failed to do so. Its overbreadth argument based on its "principle of claim differentiation" fails.

XII. *Inventor*

[327] The problem with determining who the inventor is would be in this case the paucity, and perhaps the lack, of evidence of the contribution to the invention claimed by the inventor. It is not disputed that a minor contribution will suffice, but that contribution would have to show ingenuity, and not merely be verification (*Drexan Energy Systems Inc v Canada (Commissioner of Patents),* 2014 FC 887 at para 26 [*Drexan Energy*]). The issue is more to find evidence to convince the Court that Mr. Spaulding made a contribution such that he is the inventor or one inventor.

[328] Since inventorship is not defined in the *Patent Act*, the requirements to qualify as the inventor will be derived from sections of the Act (*Apotex Inc v Wellcome Foundation Ltd*, 2002 SCC 77, [2002] 4 SCR 153 [*Wellcome SCC*]). Considering together the definition of "invention" and ss. 34(1) (which is now ss. 27(3)) the Court stated again that having a good idea does not make one an inventor:

> 97 Section 34(1) requires that at least at the time the patent application is filed, the specification "correctly and fully describe the invention ... to enable any person skilled in the art or science to which it pertains ... to ... use it". It is therefore not enough to have a good idea (or, as was said in *Christiani*, *supra*, at p. 454, "for a man to say that an idea floated through his brain"); the ingenious

> idea must be "reduced to a definite and practical shape" (ibid.). Of course, in the steps leading from conception to patentability, the inventor(s) may utilize the services of others, who may be highly skilled, but those others will not be co-inventors unless they participated in the conception as opposed to its verification. As Jenkins J. notes in *May & Baker Ltd. & Ciba Ltd.'s Letters Patent, Re* (1948), 65 R.P.C. 255, at p. 281, the requisite "useful qualities" of an invention, "must be the inventor's own discovery as opposed to mere verification by him of previous predictions".
>
> [My emphasis]

As the Supreme Court had already stated in *Shell Oil Co v Canada (Commissioner of Patents)*, [1982] 2 SCR 536, "a disembodied idea is not per se patentable. But it will be patentable if it has a method of practical application. The appellant had shown a method of practical application in this case" (p 554).

[329] The issue for the Court is therefore to examine the evidence to assess what contribution was made by Mr. Spaulding such that he qualified as an inventor. Simply postulating a problem will not contribute enough to be considered an inventor. In the Federal Court of Appeal's *Apotex v Wellcome Foundation* (2000), 10 CPR (4th) 65, Sexton J.A. sought to clarify who an inventor is in Canadian law:

> [30] An invention is defined in section 2 of the *Patent Act* as:
>
> > "invention" means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter;
>
> An inventor of an invention must be two things: (i) the person who first conceives of a new idea or discovers a new thing that is the invention; *and* (ii) the person that sets the conception or discovery into a practical shape.

…

> 32 It is clear from all of this that, for a person to be considered an inventor, the invention for which patent protection is sought must have originated in the inventor's own mind. As Mr. Robert B. Frost's textbook *Letters Patent for Inventions* explains, "a person will not be considered the true and first inventor if he himself did not make the invention, or if the idea of it did not originate in his own mind...". Likewise, as Maclean P. stated in *Gerrard Wire Tying Machines Co. v. Cary Manufacturing Co.*, a true inventor "must not have borrowed [the idea] from anyone else." Similarly, Dr. Fox notes that,
>
> > [i]n order to be the inventor, the applicant for a patent must have invented the thing himself, *and not as a result of suggestion by another* or as a result of reading. If it had been in previous use or available to the public, or if the applicant himself did not make the invention, or if it did not originate in his own mind, the applicant cannot be considered to be in law the inventor.
>
> Finally, in *Hughes and Woodley on Patents*, the authors explain that "presenting a problem to another for solution is not an act of invention." In law, then, an inventor is that person (or those persons) whose conception or discovery gives rise to the invention for which a patent is sought. It should thus be equally clear that a person who does not conceive the idea or discover the thing is not an inventor.
>
> [Emphasis in original, footnotes omitted]

[330] Given the conclusion reached about infringement and validity, there is no need to reach a firm conclusion on inventorship. However, having reviewed the evidence of the stated inventor, Mr. Spaulding, the Court would have been inclined to find on a balance of probabilities that Mr. Spaulding is not the inventor on the record presented to the Court. Had there been a contribution, he would have been expected to have clear and cogent evidence to that effect. What was it, specifically, and when did that occur? Such was not the case. A concise statement would have

been enough. A document from AC would bring corroboration. That evidence, or something approaching evidence of the specific contribution of Mr. Spaulding, would have been enough.

[331] Mr. Spaulding said repeatedly during his testimony what he claimed was his invention. Right at the beginning of his testimony he stated:

> Q. Mr. Spaulding, could you just, generally speaking, explain what it is that you invented?
>
> A. My invention is using exhaust gas temperature to optimize settings, ignition timing on a two-stroke engine.
>
> Q. And what do you mean by optimize?
>
> A. To select the – using exhaust gas temperature to select the optimum ignition timing based on that internal temperature. The best calibration of timing for a given internal temperature of the exhaust.
>
> (Transcript, p 2616)

[332] Next, the inventor testified about how the development of the invention took place. In essence, Mr. Spaulding was asking questions of the AC motorist, the Suzuki Motor Corporation, and the evidence is that he was receiving suggestions for how to solve problems. The solution offered did not satisfy Mr. Spaulding. And there is what I have called a "pivot" during his testimony, when the invention appears to emerge:

> Q. So, you said you weren't happy with the stage of development you were at when this was put in the – into the ECU. So what was the next stage of development?
>
> A. The next stage was having myself, anyway, kind of started to move away from a rev limiter type idea towards a two map system selected by a switch or a button, but whereas the, we'll call it a hot/cold switch, whereas the cold setting would select a timing pattern that did not limit rev, but the timing pattern could be tailored as far as ignition timing values and such, could be tailored

> towards a power curve like this, similar to a 400 degree power curve when the pipe is cold.
>
> Then when the – as the temperature rises in the system, and the operator then would switch the – make the switch to the normal pattern, which would select a timing pattern that was optimized for the higher internal temperature setting, pipe. So it kind of evolved into that strategy rather than limiting rev.
>
> (Transcript, p 2653)

Having evolved in his thinking without seemingly telling anyone or constituting a document that would be made available, the witness testified that he did not advise Suzuki to whom questions were addressed for fear of confusing his interlocutors:

> A. That is the hot pipe pattern. Then under heading 7, "Rev Limit Ignition Timing," that is the cold pipe pattern. So if you flip the switch on cold, you would have selected that what they continue to call rev limit ignition timing.
>
> Q. So why is that being called rev limit timing?
>
> A. Well, you know, as we kind of had talked about the progression, it started with the rev limiter and ended up a rev limiter data installed in the '98 model. I had kind of evolved into a different – more a two map system like the '99 has here that did not limit rev. But sometimes with Suzuki – I didn't want it to become confusing to them that we change the title of this. For their benefit I just left it – continued to let them call it a rev limiter system, yet my path has kind of changed. But it was just easier communication-wise if I didn't request that to be changed. I was afraid of –
>
> Q. So you left the title and the specification the same, by you're saying that it had a different function?
>
> A. Yes, I left the title. You know, it was easier for them to call it that, I felt, so I just left it alone I guess.
>
> Q. So looking at this rev limit ignition timing map, can you just – if you can explain how this is different than the rev limit ignition timing map we saw in the '98 model year specification, which is P-55?

> A. Well, whereas the ’98 model, if you depress the button, if it had a button, if you depress it and selected the rev limit ignition timing pattern, that’s what it would do, it would limit rev. When you let go of the button, then you would accelerate, begin the race, whatever the case may be.
>
> This differs in the sense that the entire pattern is different, and it’s operating on this cold – if the switch is in cold and the race starts, it’s operating on this cold pipe pattern until it attains a temperature, in which case it’s switched to the hot pattern. So it’s different in the sense that the previous idea, the rev limit idea, simply limited rev. It did have some value in heating up the pipe, but this ’99 version cold and hot switch could tailor an ignition timing pattern more towards the power characteristics of a pipe that was colder.
>
> (Transcript, pp 2656-2657)

[333] The document being reviewed by the witness (exhibit P-56) is the Finalized Engine Specification for engines delivered by Suzuki, not AC or Mr. Spaulding himself. The witness then explains that under heading 6 (ignition timing) and 7 (rev limit ignition timing) in the Engine Specification, these are in fact, patterns.

[334] That leaves something to be desired in terms of evidence of the contribution. The witness has an idea, but he does not tell his motorist for fear that they will be confused. We now know that Japanese Application 959 was presented by the Suzuki Motor Corporation, the motorist used by AC and with whom Mr. Spaulding insisted he was developing engines ten years after the Application. The 959 Application selects ignition curves on the basis of the sensed exhaust gas temperature. It is the motorist that developed and made public Japanese Application 959. That is the same motorist that answered questions about how to resolve issues presented by AC. It would seem, according to the inventor, that the motorist would not have realized the Finalized Engine Specification, which it produced, included ignition curves. Mr. Spaulding confirmed that he does

not have corroborating evidence, in the nature of documentation or witnesses, that he contributed to the invention (Transcript, pp 2704-2705). Even the notes he took during the development of the invention are mostly related to field tests. Mr. Spaulding was in fact adjusting the calibration (Transcript, pp 2790-2791) for which he is eminently qualified. When "his" system, his "technology", emerges in the form of ignition curves in P-56, it is through the Finalized Engine Specification delivered by Suzuki. This exchange on cross-examination is telling:

> Q. Is it fair to say that these notes contain nothing as to you submitting your idea to Suzuki Motor Corporation for an exhaust gas temperature sensor?
>
> A. These notes contain nothing pertaining to submitting to Suzuki?
>
> Q. To requesting your idea to Suzuki?
>
> A. That's correct. They don't indicate that
>
> Q. And is it fair to say that this notebook includes nothing relating to the logic of the control of the ECU that you used on the ZR 440?
>
> A. Yes, that's correct. The logic you're saying?
>
> Q. The logic of control. Nothing about the computer program. Correct?
>
> A. Correct.
>
> (Transcript, pp 2191-2792)

P-56, the Finalized Engine Specification, discloses two ignition patterns presented as "6. Ignition Timing" and "7. Rev Limit Ignition Timing". The inventor now contends that they are in fact ignition patterns to be selected on the basis of the temperature of the exhaust gas. It is far from obvious on the face of the document. It is also far from clear what was Mr. Spaulding's contribution other than asking questions. There is nothing in evidence, other than the witness

saying that one calibration is for a “hot pipe” and the other for a “cold pipe”, to support the contention, including what the inventor would have indicated to Suzuki. How did Suzuki learn of the new system, a new system that has rather similar features to their Application 959, already ten years old? The evidence fails to articulate where the idea was articulated and how the idea became a reality with the contribution of Mr. Spaulding. We seem to be much closer to an idea floating through a brain (*Wellcome SCC*, above, at para 97) than an actual invention.

[335] There is no doubt that Mr. Spaulding is an excellent calibrator and that calibration plays a role in the development of an engine. But it may be that his contribution is calibration and how to maximize the use of tuned pipes. The inventor said this when asked by the Court for a confirmation that it was his idea, not that of Suzuki’s, that is the subject matter of the 738 Patent:

> THE WITNESS: Our relationship with Suzuki from the very start, when I was there, was as I explained, to work with the – first the design of an engine, which they would then produce for us. Then Arctic Cat would be responsible for the development of that engine. One part of development is developing the exhaust system. That was something that Suzuki did not do. They did not develop pipes, tuned pipes. They didn’t have experience in doing that. That group had not done that, the snowmobile group that we worked with for many years.
>
> Absolutely, they were very intelligent people and good providers of engines, but without having done the development and testing, and work like that on a two-stroke tuned pipe, you couldn’t – a person could not understand and get a grasp on what happens inside a pipe and how it reacts to a two-stroke motor, and they did just not have that experience.
>
> (Transcript, p 2705)

As explained by the witness himself, the invention is not calibration:

> THE WITNESS: Yes, by “my system” I meant the exhaust gas temperature measurement by sensor to select ignition timing

> patterns that are optimum for engine operation at those internal pipe temperatures.
>
> (Transcript, p 2671)

We are far from providing any explicit contribution to the claimed invention.

[336] For the invention to work, calibration will be needed, but the calibration is not the invention, in the very words of the inventor. But, where is the evidence of something other than calibration, finding the right ignition timings for hot and cold pipes? As Justice O'Keefe said in *Drexan Energy*, above, verification is not enough.

[337] The cross-examination of Mr. Spaulding showed that he was not concerned with how results would be attained as long as his general idea, broad concept of using gas temperature to control ignition timing, was attained.

> Q. But still you consider that these two engines fall within the scope of your invention?
>
> A. Yes.
>
> Q. Because your invention if I understand correctly, is the broad concept of modifying or correcting or selecting or any other way to affect ignition timing using exhaust gas temperature sensor as an input. Right?
>
> A. Yes.
>
> Q. So as long as you can have an exhaust gas temperature sensor, an ECU, and an ignition timing value or pattern or other parameters relating to ignition timing that will account for this exhaust gas temperature, this is your invention?
>
> A. I believe I'm understanding what you're saying.
>
> Q. What do you understand?

> A. I'm understanding that regardless of the logic used to achieve the exhaust gas temperature, the technology selects – measures exhaust gas temperature, uses that information to select patterns or ignition timing to optimize the engine in the various conditions, among other things. As far as ignition timing, I'm saying that. There are other areas of control.
>
> Q. And based on that understanding, you say, yes, this is my invention?
>
> A. Yes.
>
> Q. Correction of ignition point versus correction of ignition timing?
>
> A. Yes.
>
> Q. Selection of ignition timing patterns versus selection of ignition timing point, they both fall within the scope of your invention, as you see it?
>
> A. As I see it, yes.
>
> Q. Calculation of final ignition timing point would still fall within the scope of your invention?
>
> A. Yes.
>
> (Transcript, pp 2481-2782)

This passage, already referred to in the "Invalidity" section of these reasons, illustrates that not only is the witness excluding the requirement of an ignition pattern as the notion is defined in the 738 Patent, but he is limiting his invention to the temperature determining the ignition timing. This idea, which may not be new at any rate, is not made practical by the inventor.

[338] Mr. Spaulding insisted that Figures 4 to 8 in the 738 Patent represent his "pipe sensor technology", yet they are merely rough graphical representations of ignition maps for different temperature ranges of exhaust gas temperature. There was never an explanation for what that

technology might be. When asked what he means by " my technology", Mr. Spaulding answered:

> THE WITNESS: What I mean is using the exhaust gas temperature to select patterns for improvement in performance of a two-stroke by selecting multiple timing patterns not by – my technology is not designing a sensor or writing the software required. I guess I look at those as tools to accomplish measuring temperature and having it select timing patterns for performance changes on a two-stroke engine. I don't know if that –
>
> (Transcript, pp 2706-2707)

[339] The weight of the evidence is to the effect that the ability to select the patterns did not come from Mr. Spaulding. He claims that his idea was using exhaust gas temperature to select between the different ignition timing patterns, but he never said how that was to be accomplished. Actually, figures 2 and 3 of the 738 Patent, two flow chart illustrations, were not even produced by AC, but came from Suzuki. The flow charts provide examples of how different patterns (hold, information and normal patterns) can be invoked. The point of the matter is not so much to discuss figures 2 and 3, but rather to note that the only reference to flow charts and control logic came from Suzuki. The two flow charts were sent by Suzuki to Mr. Spaulding by fax on August 31, 1999, barely a few months before the priority date of December 1, 1999 for U.S. Patent 09/452, 657 and May 10, 2000 for U.S. Patent 09/568,449, the two AC patents.

[340] The description given of his invention, system or technology by the inventor always boils down to the same thing. It is remarkably similar to what is disclosed in the Application 959. The Suzuki Application states twice that "[a]dditionally, when the engine speed meets or exceeds a prescribed speed the engine ignition timing control device controls the ignition timing more on the lag side than the aforementioned given ignition timing, in response to the engine exhaust

system temperature state detected by the aforementioned exhaust system temperature state sensor". The ignition timing operates in response to the sensed exhaust gas temperature. Had the Court reached the stage that a decision was required on whether he is the inventor, it would have been difficult to conclude, given the evidence adduced and on a balance of probabilities, that Mr. Spaulding had more than an idea (*Wellcome*, above). In fact, the evidence is not at all convincing that the idea actually came from the stated inventor. The Court can only operate on the basis of the evidence put forth by the parties and, then, weigh it. On this record, it would seem that the contribution was more in the nature of asking questions for Suzuki to come up with solutions. But, even if it is assumed that the idea of having ignition timings correspond to ranges of exhaust gas temperature, the evidence would fall short of the mark to show that Mr. Spaulding put it in practical shape.

[341] The testimony of Mr. Spaulding was vague as to what his contribution was other than the idea having evolved into ignition timings being based on exhaust gas temperature. He seems to have asked questions and postulated problems for others to solve. If he did provide solutions, he did not say what they were. We do not have the evidence needed to conclude that he contributed to the invention beyond the general idea, a general idea that was put in the public domain by Suzuki.

[342] Hughes and Woodley on Patents put it succinctly at p 130:

> The question as to who is an "inventor" has been the subject of less debate than whether there is an invention; it is the person from whose mind the invention originated; it is the person whose conception gives rise to the invention. It is not the person who postulates the problem, nor the person who carries out the mechanical acts or testing as to whether the invention will work.

> An inventor is not the person who publicizes the work of the real person who devised the subject matter. An inventor is the person who conceives the new and useful art, process, machine, manufacture or composition of matter or any new and useful improvement thereto, and includes a person who contributes to the inventive concept; it does not include those whose activity is directed to verification rather than the original inventive concept.

[343] In this case, the evidence points in the direction of an absence of contribution given the lack of evidence of what that contribution would have been. At its most basic, the inventor should have been able to express clearly what his contribution was. Instead, we have P-56, a document emanating from the motorist, which is not presented as the invention but is the invention according to the witness. And the testimony never reveals what it is that would have been conveyed to Suzuki, without creating confusion, that could constitute the invention. Indeed, no one from Suzuki testified in this case. As pointed out, Suzuki had already considered moving ignition patterns in reaction to changes in the temperature of exhaust gas some ten years earlier in search of the optimal ignition timing. There is no convincing evidence of what the contribution of the "inventor" was on this record, in this case.

[344] AC's position on inventorship is to claim that the inventor worked with suppliers (Suzuki for the engine and Kokusan for the controller) to put into practice the invention. However, AC did not point to what the required contribution might be other than stating there was one. As with many features of this case, precision has been lacking. The absence of evidence of contribution from the person who claims to be the inventor is very problematic. Not only there is no documentary evidence to support a contribution other than a general idea, but the inventor himself limits his own contribution to having had the idea of using exhaust gas temperature to

select between ignition patterns, an idea that could hardly have startled the motorist Suzuki that had made public its own Application 959 ten years earlier.

## XIII. *Conclusion*

[345] The difficulty faced by the Plaintiffs in this case was from the very beginning how to define the purported invention. Indeed, they avoided doing it in a clear and precise fashion in spite of carrying the burden of proof. If, as the Court has found, the construction of the five asserted claims leads to the conclusion that the notion of "ignition patterns" is central to the invention and claims, it is not possible to conclude that the BRP engines violate any of the claims. BRP is simply practicing a control logic that does require that a plurality of ignition patterns, each composed of more than one ignition point, will be selected on the basis of the exhaust gas temperature (claims 40(34), 33(28) and 47(41), the so-called selection claims. The Plaintiffs encounter the same difficulty in asserting the "modification claims" (claims 11 and 16). In that case, a plurality of basic ignition patterns are posited. It will be the selected basic pattern that will be modified based on exhaust gas temperature. Again, the ignition pattern is composed of more than one ignition point and it will be from the ignition pattern that the ignition point corresponding to a particular engine speed will be ignited. That is not how the BRP engine is operating. There is no infringement.

[346] If, on the other hand, one attempts to consider the invention more broadly, as being merely the use of exhaust gas temperature to optimize ignition timing in a two-stroke engine, the Plaintiffs are confronted with Application 959 and U.S. Patent 958. One is hard pressed to find

what is new with the 738 Patent. It suffers from obviousness. There is no evidence of inventiveness in adapting for snowmobile use.

[347] As asked repeatedly by the Court, throughout the trial of this case, what is the invention? The testimony of the purported inventor did not elucidate the matter. It would have remained unproven on a balance of probabilities in this case that if there was an invention, the "inventor" contributed to the invention other than by asking questions the motorist sought to respond to. However, I have not had to conclude in a formal fashion.

[348] As a result, the action by Arctic Cat must be dismissed. To the extent there is a need to decide on the counterclaim concerning the validity of the asserted claims in case the Court's conclusion on infringement is wrong, the Court finds that the asserted claims are invalid. As a result, BRP is entitled to the relief sought.

## XIV. *Damages*

[349] In view of the conclusion reached with respect to the issues of infringement and invalidity of the 738 Patent, it is not, strictly speaking, necessary to address the issue of damages, had the Patent been ruled to be infringed and valid. This is a case where bifurcation should have been more carefully assessed. However, I feel that it is useful to offer some observations given the evidence that was presented to the Court.

[350] The burden is evidently on the shoulders of the Plaintiffs to persuade the Court as to the amount of damages that have been sustained by the patentee. It is subsections 55(1) and 55(2) of the *Patent Act* that govern. They read:

| | |
|---|---|
| 55 (1) A person who infringes a patent is liable to the patentee and to all persons claiming under the patentee for all damage sustained by the patentee or by any such person, after the grant of the patent, by reason of the infringement. | 55 (1) Quiconque contrefait un brevet est responsable envers le breveté et toute personne se réclamant de celui-ci du dommage que cette contrefaçon leur a fait subir après l'octroi du brevet. |
| (2) A person is liable to pay reasonable compensation to a patentee and to all persons claiming under the patentee for any damage sustained by the patentee or by any of those persons by reason of any act on the part of that person, after the application for the patent became open to public inspection under section 10 and before the grant of the patent, that would have constituted an infringement of the patent if the patent had been granted on the day the application became open to public inspection under that section. | (2) Est responsable envers le breveté et toute personne se réclamant de celui-ci, à concurrence d'une indemnité raisonnable, quiconque accomplit un acte leur faisant subir un dommage entre la date à laquelle la demande de brevet est devenue accessible au public sous le régime de l'article 10 et l'octroi du brevet, dans le cas où cet acte aurait constitué une contrefaçon si le brevet avait été octroyé à la date où cette demande est ainsi devenue accessible. |

[351] In the case at bar, subsection 55(2) does not apply. The only task was to assess the damages sustained by the patentee. In spite of what may appear to be suggested by subsection 55(1), it is impossible in most cases to arrive to some amount with any kind of mathematical accuracy. This is true in most cases and it is certainly true in this case. The often quoted paragraph taken from *J.R. Short Milling Co. (Canada) Ltd. v Continental Soya Co. and George*

*Weston Bread and Cakes, Ltd.* (1943-44) , 3 Fox's Patent Cases 18, at p 29, summarizes the situation faced by trial judges:

> In practically all reported cases the judges refer to the difficulty facing them in such maters [*sic*] and the impossibility of arriving at an amount with any kind of mathematical accuracy. Lord Shaw says that this is accomplished "to a large extent by the exercise of a sound imagination and the practice of the broad axe". The words of Lord Shaw are merely another way of saying that accuracy was impossible and that imagination must be exercised for or against the plaintiff. It does not mean that one can be generous, for damages are by way of compensating the plaintiff and not as a penalty or punishment of defendant.

Accordingly, a court seeks to order payment of damages that will be considered fair given the circumstances of a particular case. That is achieved as best as possible on a case by case basis.

[352] The Plaintiffs have chosen to seek damages by way of the establishment of a reasonable royalty for the use of the invention. As is often the case when the plaintiff is unable to prove lost sales sustained by the plaintiff because of the infringement, royalties will be used to help compensate the loss that would have been suffered (*Jay-Lor International Inc c Penta Farm Systems Ltd*, 2007 FC 358, 59 CPR (4th) 228) [*Jay-Lor International*].

[353] The burden of proof resides on the shoulders of the Plaintiff for the patentee must show by conclusive evidence what the royalty rate should be. The difficulty in a case like this is of course that the commercial value of the invention is difficult to assess. Moreover, the Court must strive to compensate the claimed invention solely with respect to damages that can be attributed to the invention. It is therefore the burden of the Plaintiffs to give evidence that will separate from the profits realized by the infringer the damages that are as a result of the infringed

invention. Where the invention is but one individual component of a multi-component product, the damages in the form of royalties must be in order to compensate the infringement of that individual component of the multi-component product that is captured by the invention. In effect, the royalty recognizes that the sales by the infringer are an illegal transaction which requires to be compensated. However, it is only the infringement that requires compensation.

[354] This is not an easy endeavour in a case where the invention is simply and only that the temperature of the exhaust gas of an engine can be used, through the device of an ignition pattern, in order to set the ignition timing of an engine. The 738 Patent speaks in terms of optimizing the performance of the engine, but it does not tell the world how that can be done, what constitutes optimization or what technology is required to use the "invention". The inventor of 738, Mr. Greg Spaulding, spoke in terms of his technology. As I have already indicated, with all due respect, technology is not what the 738 Patent is all about. As found in the Oxford Canadian Dictionary, technology means "the study or use of the mechanical arts and applied sciences." It is only the application of this to practical tasks in industry. The 738 Patent is not a technology. It is based on the idea that the exhaust gas temperature would tell someone knowledgeable things about the engine which could then be improved or deficiencies cured. At the end of the day, what needs to be done on the damages' front is to assess how much that would be worth in a hypothetical negotiation that would lead to an agreement on an appropriate royalty. What is the value to be derived from such invention?

[355] The Court heard from two expert witnesses who came to significantly different results. There is no doubt that both experts, Mr. Andrew Carter and Dr. Keith Ugone, are experts in the field of damage assessment and their expertise was not challenged.

[356] Their task was made remarkably difficult, perhaps impossible, because the invention is not tangible and the evidence available did not produce a measure of precision. It is the application of the general idea that there may be correlation between exhaust gas temperature and ignition timing that is useful. However, that correlation can be useful if it solves problems, and the Patent is silent as to how the correlation can be used. As the Supreme Court put it in *Free World Trust*, above, "the ingenuity of the patent lies not in the identification of a desirable result but in teaching one particular means to achieve it." How to assess the value of the general idea where the true benefit will come from understanding what the exhaust gas temperature tells and how that information can be used through adjustments to the ignition timing is a different endeavour, given in particular the many uses that can be made of the exhaust gas temperature according to the Patent. It may be said that the invention is necessary but it is certainly not sufficient to have the means to use it. The inventor, Mr. Spaulding, confirmed during the trial that his invention is practiced by AC. However, he never indicated to the Court to what effect the invention was used.

A. *Mr. A. Carter for the Plaintiffs*

[357] Mr. Carter approached the issue of assessing damages through four methods that could be used to reach an appropriate royalty. For a reason that remains unclear, Mr. Carter repeated in his

expert report on a few occasions that he believed that AC had lost sales, together with convoyed sales, because of the alleged infringement of BRP. It is unclear how that can be relevant to the exercise undertaken. It is equally unclear what the evidence could be to support such contention given the fact that the invention appears to have remained largely unknown in the market place. There does not seem to have been much effort on the part of AC, and BRP, to market the advantage conferred by the invention. Similarly, he spoke of conveyed sales (pages 89, 32 and 33 of his report, P-61) yet this is only relevant if sales had been lost due to the infringement which he acknowledged he was not asserting because these cannot be assessed. As a result, these comments must be discounted and they carry no weight.

[358] Similarly, has been cruelly deficient in this case how the Patent was practiced and thus what value is to be attributed to invention either by AC or BRP. The Court has not had the benefit of the value associated not only with the invention, but with the use that may have been made of the invention in view of the numerous possible applications, as disclosed in the specification.

[359] I readily accept the characterization of the royalty as being the product of seeking to attempt to reach an agreement between willing participants, as described in *Jay-Lor* International, above. We read:

> **125** A reasonable royalty rate has been described as "that which the infringer would have had to pay if, instead of infringing the Patent, [the infringer] had come to be licensed under the Patent The test is what rate would result from negotiations between a willing licensor and a willing licensee" (*AlliedSignal*, above at 176).
>
> **126** This notion is premised on the assumption that someone who wishes to use patented technology would normally have

> sought permission and been willing to pay a royalty for its use. The patentee, if prepared to license its invention, would then negotiate the terms of the licence, including the amount of royalty, with the intended licensee. The construct is obviously artificial in the sense that the infringer, in this case, did not make the choice to seek permission from the patentee when it began to use the patented technology in its own device. Assumptions on how parties might have negotiated must be made. However, licensing is a very common practice in the intellectual property field and has developed into an area of academic study. […]

[360] Here, Mr. Carter proposes four different methods for reaching an appropriate royalty rate. Without the assistance of the expert at trial, it would have been difficult to understand how he reached his conclusions on the sole basis of his report. It could be said that the report was somewhat deficient in the requirement, in accordance with the Code of Conduct for Expert Witnesses adopted pursuant to Rule 52.2 of the *Federal Courts Rules*, that "the reasons for each opinion expressed be included". The way the report was framed certainly did not make an understanding of the report any easier.

[361] Be that as it may, here is a summary of the four methods.

> (1) The expert compared two engines produced by BRP. One engine, the 800 P-TEC does not practice the invention. That engine was compared to the 800 E-TEC which practices the invention. That engine is a direct injection engine which does not use a carburetor.

[362] The expert sought to derive the profit premium between the two snowmobiles. The method does not seek to compare purely on the basis of the practiced invention, but rather compares the two snowmobiles as opposed to, for instance, comparing the two ECUs in which resides the functionality that is protected by the Patent, or the two engines. In effect, the expert is

comparing the contribution margins derived by BRP for a P-TEC snowmobile and for an E-TEC snowmobile, the difference between the two including, presumably, a percentage of the contribution to account for the new engine featuring the invention. It is not disputed that BRP's E-TEC engines practice the use of the exhaust gas temperature to adjust ignition timing.

[363] The expert then goes on to review a number of so called "snowmobile bench marks studies" conducted by BRP during years 2007 to 2013. The expert chose factors identified by the respondents as having some importance in choosing a particular model. Three of an often long list of factors were retained by the expert: engine power, reliability and acceleration. It appears that the expert considered that these three factors are proxies for the attributes related to the invention in issue in this case. The expert then proceeds to add the percentage of respondents who have identified these factors, that summation being then divided by the addition of all the percentages associated with the totality of the factors received (which is significantly higher than 100%). In the view of the expert, this yields a relative importance of the factors; the percentage thus obtained is described as being the ratio of reliability, engine power and acceleration to all factors. These ratios per year are the following: [REDACTED].

[364] The expert then goes on to multiply the two percentages at both ends of the range ([REDACTED] and [REDACTED]) with the so called "profit premium range" of whole snowmobiles between the 800 P-TEK model and the 800 E-TEC model for model-years 2012, 2013 and 2014, to reach a so-called "royalty indicator" derived from the increase in the BRP's profitability of $[REDACTED] to $[REDACTED] [[REDACTED]% (being the ratio of the relative importance of factors in 2013) x $[REDACTED] (being the profit premium for the 800

E-TEC snowmobile over the 800 P-TEK for 2012) and [REDACTED]% (being the ratio of the relative importance of factors in 2012) x $[REDACTED] (being the profit premium for 2014)].

[365] There are evidently numerous issues with such an approach. For starters, the Patent is concerned with a functionality in an engine control unit and the expert is comparing the profitability of whole snowmobiles. Furthermore, other than lacking a conceptual underpinning, which is a considerable flaw in and of itself, this approach assumed that reliability, engine power and acceleration account for the invention when, in fact, it is more than likely that factors such as reliability and engine power are affected by much more than the invention. To put it another way, this approach overvalues, on its face, the invention in the assessment of royalties.

[366] Actually, the invention itself does not give any indication as to how to use it to enhance reliability or improve the performance of the engine: it merely indicates that exhaust gas temperature can be used to adjust the ignition timing with a view to optimizing performance and avoiding engine problems. The percentages themselves are subject to significant criticism in that the [REDACTED]% is derived from a survey that is very different from the other surveys. The factors that were listed are much more limited and, on its face, the percentage for each is significantly higher than anything else that was being considered elsewhere. The survey chosen to derive a [REDACTED]% is evidently significantly a-typical.

[367] It is also possible to consider an element of double counting in these surveys where what is being added is percentages of purchasers who would consider acceleration and engine power as being relevant. These are close cousins and using these figures without more may have the

effect of over valuing the factors that the expert deems relevant to the invention under consideration. The profit premium is of course very sensitive to percentages in this model. Double counting affects significantly the profit premium and the methodology chosen does not attempt to address the issue.

[368] Understandably, the expert did not seek to defend this approach. He acknowledged readily that there may be "other non-patented or non-accused elements of a snowmobile that contribute to these categories in the BRP studied as well". We do not even know why it was offered in the first place. In other words, many pages were spent constructing the equivalent of a straw man.

> (2) The second method put forth by Mr. Carter was, in fact, a variation on the theme summarized under (1). This time, instead of multiplying the contribution margins derived from the difference from the contribution margin for the E-TEC snowmobile and for the P-TEC snowmobile, amounts that reach $[REDACTED] in 2012 and $[REDACTED] in 2014, the expert multiplied these figures by a market share of 20%, which would represent the patent holders' market share. He arrives at figures of $[REDACTED] (20% of $[REDACTED]) and $[REDACTED] (20% of $[REDACTED]).

[369] Obviously, this method suffers from the same infirmity suffered by the method presented in (1) because it assumes that the profitability difference between the E-TEC and the P-TEC snowmobile is a function of the invention. It takes the difference between the contribution margins and seems to posit that they represent the difference between the two that is coming from the invention. Obviously, such cannot be the case, or at least, there is nothing in the evidence, or shown by the expert, to support that hypothesis. Indeed, if the difference came only from the accused invention, one would be hard-pressed to explain how the difference can grow

from $[REDACTED] to $[REDACTED] over a period of three years (a growth of [REDACTED]% over three years). The contribution to the profitability associated with the invention should be relatively stable according to the model offered by the expert. Clearly, the contribution margins are constituted of elements other than the accused invention.

[370] Once again, the expert did not defend strenuously, or otherwise, this method, thus creating another straw man. Far from defending, he made, appropriately in my view, the same concession as was made with the first method.

> (3) Mr. Carter compared the additional profit that BRP was expecting for its new 600 E-TEC engine as it was comparing it to its "600" semi-direct injection engine. The expert indicates that BRP was projecting an increased retail price attributable to the direct-injection engine of $[REDACTED]/unit. Given that BRP in 2002 expected that some additional costs for the production for the E-TEC engine would be $[REDACTED], Mr. Carter projected an incremental profit of between $[REDACTED] and $[REDACTED] that would be associated with moving to the E-TEC technology, which included the invention.

[371] This method has the advantage of seeking to bring the analysis down to the functionality by moving away from contributions between whole snowmobiles to bring the focus on the engine. For a reason that remains obscure, the expert would then split the profits equally between AC and BRP, simply indicating that it would be in an effort to be conservative. At trial, Mr. Carter contended that he was of the view that the percentage should be higher than 50% but would recommend that 50% be used. There was no rhyme or reason that I could decipher for why a royalty of 50% of the profit derived from the new engine would be appropriate for a functionality located in the ECM and would be acceptable to BRP. At any rate, the royalty that

would need to be paid by BRP according to this method would be situated between $[REDACTED] and $[REDACTED] CAD per unit sold by BRP.

[372] There is a complete lack of information and analysis as to what would be included in the profitability of a direct injection engine proposed by BRP. This method suffers from some of the same general infirmities as the other two. It is probably an improvement that this method considers the added profitability of the engine as opposed to the whole snowmobile. Accepting that the profit of $[REDACTED] to be made would come from the new direct injection engine, it is far from clear that the invention can be seen as explaining alone the profit. What is sold is a new direct injection engine. The invention would be merely an appendage. Although it is undoubtedly true that the invention had value for BRP as it identified early that it could be of interest for its new direct injection engines, it is clear that much work would have been required to turn the idea that exhaust gas temperature could be used to adjust timing ignition for a useful purpose, in view of a complete lack of information in the Patent, into the product that would address performance and reliability issues. The question that is left without answer is to what effect the invention was used and what value can therefore be ascribed to it. To his credit, the expert was simply using the figures that are available on this record and that come from BRP. On the other hand, no effort was made to be more circumspect or to provide some analysis, even in rough form, of the relative contribution of the invention to the profit compared to the profit generated by the E-TEC engine. At any rate, clearly the expert did not believe in his own method in view of the lack of analysis. He certainly did not dwell on the methodology: half a page of a 89-page report was dedicated to that option. I would have thought that the methodology deserved

better as it may have proven to be a sound basis for some assessment of damages using a royalty arrived at through negotiations.

> (4) The preferred method offered by the expert is his comparison of AC snowmobiles using model year 2005, where the engine does not include the invention, and model year 2006, where the said invention is included.

[373] It was the expert's claim that the AC models considered (the F6 Firecat EFI and EFI X in 2005 and the F6 Firecat EFI and EFI R in 2006) generated contribution margins that would have to come from the invention. In his report, the expert writes that "thus, the vast majority of the difference in incremental profitability between these two years can be attributed to the patented technology" (p 39 of Mr. Carter's report). Unfortunately, this conclusion is based on a rather crude comparison of the models, without even trying to assess the use the invention was put to and the value generated by the invention itself.

[374] This methodology is based on very little. There is no indication as to how the invention was used by AC in its 2006 model, only that it was. This contention is derived from the presence of an exhaust gas temperature sensor on the 2006 model. It must be stressed that this methodology used the snowmobile manufactured by AC. There is no reason in my view why a more sophisticated analysis of the use made of the invention and its relative value was not offered. The expert was using the Plaintiffs' snowmobiles after all. No evidence was led by the Plaintiffs about the actual use of their invention which would have assisted their own expert if he was to rely on the profitability of AC's snowmobiles to establish an appropriate royalty. It was disappointing that the promise made at the beginning of the report's chapter discussing the

comparison of the AC F series snowmobiles did not bear fruits. The report claims that "[t]he determination of a reasonable royalty, in simple economic terms, involves valuing intangible asset(s) and determining what a user would pay for the use of the asset(s)" (p 30). It is a view shared by the Court. But that was not done. It is the value of the intangible asset that must be assessed, and that was not performed. It is only the value of the asset that can be the subject of a royalty. Without some understanding of the use made of the invention, the assessment of the value of the invention can only be lacking and produce crude results. Given that AC is using its own snowmobiles in this method, I can see no reason why the use made of the invention was not part of the evidence.

[375] Instead of a nuanced analysis supported by evidence about the use made of the intangible asset in reality and the efforts made to promote its use such that the consumer could ascribe a value on what is new and useful, the best that was offered is a comparison of contribution margins of the snowmobiles as a whole. If contribution margins of snowmobiles are to be the sole basis for establishing a royalty base, a careful analysis would have been expected and contribution margins better be robust in order to be solid indicators of the value that can be attributed to the invention. After all, the expert accepted in his method (3) that the BRP engine generated a contribution of $[REDACTED].

[376] In this case, it would appear to me that this approach has some of the same deficiencies as identified with other methods. When considering carefully figure 16 of the expert's report, which compares contribution margins between snowmobiles, and keeping in mind that what needs to be compensated is only the infringement of the Patent and not factors that contribute to profitability

other than those coming from the invention, one is hard pressed to understand how those contribution margins are arrived at. For instance, when comparing the 2005 F6-EFI R to the F6 EFI of the same year, one sees that there is a difference of $[REDACTED] in the contribution margin per unit in favor of the “R” (R would indicate a reverse function on the snowmobile). Accordingly, one would expect that when considering the same comparison between the F6-EFI R and the F6-EFI for year 2006, where the invention is somehow practiced we are told, the EFI R should bring a contribution margin higher by $[REDACTED] than that of the EFI. That is not what the evidence would reveal. The difference between the two contribution margins shrinks by 56%, to $[REDACTED]. While the difference between the contribution margins for the F6 EFI for years 2005 and 2006 is indicated to be $[REDACTED], the difference between the F6 EFI R is less, at only $[REDACTED]. Why is there such a difference between contribution margins for what is supposedly the same feature?

[377] Furthermore, we know from figure 15 that the suggested retail price of the EFI in 2005 and the EFI in 2006 have increased by a mere $250. The same is true with respect to the other snowmobile that is compared between the years 2005 and 2006, the F6 Fire Cat EFI Snow Pro. In spite of that slight increase of $250, the average sales prices per unit for the three models under consideration grew by an average of $[REDACTED], while the sales of units of the three models having decreased by some 16% year over year. Furthermore, the average sales price is itself considerably higher than the suggested retail price. Hence the suggested retail price for the 2006 EFI model is indicated to be $[REDACTED], after an increase of $250 from the 2005 model, while the average sales price is $[REDACTED]. One possible explanation is that the sales price includes other features such as improvements (e.g. electric start, high windshield) in

the nature of optional equipment, and garments and accessories. These increase the contribution margins possibly by hundreds of dollars, yet they should not be considered in order to calculate the contribution margins attributable to the invention. At any rate, there was no explanation provided for those differences. Indeed, the invention was not even marketed.

[378] It is clear that the contribution margins cannot be a reliable indicator. This is made even more so where the significant variability of the margins is observed between different colours of the same snowmobile. According to Exhibits 7.3 and 7.4 of Mr. Carter's report, two F6 EFI snowmobiles in 2005 have a difference of $[REDACTED] in their contribution margins where the only difference was the colour of the snowmobile (black at $[REDACTED] and green at $[REDACTED]). What is even more surprising than the difference based on colour is the fact that the same F6 EFI snowmobiles, but for year 2006, have contribution margins where the black snowmobile's contribution of $[REDACTED], from $[REDACTED], an increase of 26%, while the green snowmobile has a contribution margin of $[REDACTED] in 2006, an increase of barely 4%. As a result, the profitability of the black snowmobile becomes better, compared to that of the green snowmobile, in 2006. No explanation was offered for why contribution margins would be different between colours during the same year, and would vary wildly between years. The point of the matter is that the measure of the contribution margins is simply unreliable. Without any analysis explaining the rather wild variation, the contribution margins can only be of little assistance, if any, in deriving indicators of the value of the invention. There is also the fact other features of a snowmobile such as the shocks, which are said to be an important feature (testimony of Mr. Guy), used on the 2006 model of the EFI and EFI R are branded as opposed to the shocks on the 2005 EFI model which are without a brand (Arctic Cat gas (IFP) shocks).

[379] There is no evidence on this record of any consideration being given to changes in consumer demand, the marketing efforts or discounts offered. The record does not even show how the invention was used and to what effect.

[380] In the end, the Court is left with an expert's opinion which relies exclusively on some contribution margins for its own snowmobiles to be used to assess the royalty that a competitor would be willing to pay for the use of an intangible product. In order to be of assistance, the contribution margins used must themselves be unassailable if nothing more precise is offered. In the instant case, the expert chose the contribution difference between the F6 EFI R of 2005 and that of 2006 ($[REDACTED]), divided it by two (in order to be conservative he says) and came up with a royalty figure of $[REDACTED]/unit. He could have gone for the contribution difference between the 2005 and 2006 models of the F6 EFI ($[REDACTED]) or the difference between the EFI Sno Pro ($[REDACTED]). A weighted average of the considered F6 models would have generated a difference of $[REDACTED]. However, these contributions by model only show that the contributions are sensitive to a variety of factors. What remained unknown is what are the elements of the chosen contribution margin. How much of the $[REDACTED]/unit can be reasonably attributed to the invention?

[381] The theoretical underpinnings of this approach are unknown and the choice made of a number over another is not supported by any explanation, let alone evidence. With 125 000 accused snowmobiles, that constitutes a significant difference: at $[REDACTED]/unit, the damages reach $[REDACTED]; if is used the weighted average of $[REDACTED], the damages reach $[REDACTED]; using the difference in contribution margins for the most expensive

model ($[REDACTED]/unit) the damages are upwards of $[REDACTED]. There was never any effort made to evaluate the contribution of the intangible asset to the new engine, and what was the contribution of the new engine to the increased profitability of the new snowmobiles. One would have thought that possible when the Plaintiffs are using their own snowmobiles.

[382] The purpose in listing those difficulties is not so much to conduct some nit picking operation, but rather to show that the approach favored by the expert has its own warts as do the other methods, presented by the expert but not defended. It is very much unclear what those contribution margins per unit include, other than the invention. As already pointed out, that invention is itself very significantly limited and, in my view, it requires a significant leap of faith to accept any of the methodologies that are offered by the expert. As already pointed out, the burden is on AC to show in a persuasive manner that the proposed royalties will compensate only the infringement of the Patent and it would be inappropriate to seek to compensate other elements that are part of the profitability of the snowmobile.

[383] In *Monsanto Canada Inc v Schmeiser*, 2004 SCC 34, [2004] 1 SCR 902, the Supreme Court stated:

> 101. It is settled law that the inventor is only entitled to that portion of the infringer's profit which is causally attributable to the invention: *Lubrizol Corp. v. Imperial Oil Ltd*., [1997] 2 F.C. 3 (C.A.); *Celanese International Corp. v. BP Chemicals Ltd*., [1999] R.P.C. 203 (Pat. Ct.), at para. 37. This is consistent with the general law on awarding non-punitive remedies: "[I]t is essential that the losses made good are only those which, on a common sense view of causation, were caused by the breach" (*Canson Enterprises Ltd. v. Boughton & Co*., [1991] 3 S.C.R. 534, at p. 556, per McLachlin J. (as she then was), quoted with approval by Binnie J. for the Court in *Cadbury Schweppes Inc. v. FBI Foods Ltd*., [1999] 1 S.C.R. 142, at para. 93).

Although stated in the context of an accounting of profits, the principle remains the same for other methods to assess the damages suffered. Surely, the awarding of damages must avoid unjust enrichment.

[384] It follows that the royalty figures offered by AC were to be subject to very serious caution. In my view, they are all derived from methodologies that are so crude and deficient as to being of little assistance to the Court. Mr. Carter's favoured method is, for all intents and purposes, comparing flawed contribution margins of two snowmobiles manufactured by AC in 2005 and 2006. The expert has not satisfied his burden of showing that the royalty is limited to a compensation of the invention. Indeed, we do not know how the invention is used. That information ought to have been available given that he was comparing engines manufactured by AC. He assumes that comparing snowmobiles, and the snowmobiles of his clients at that, as opposed, for instance, to a smaller, or the smallest saleable unit that is part of the snowmobile, can produce reliable results. In order to alleviate the concern that comparing the snowmobile's profitability may generate overvaluation, the expert tried to compare within the AC family of snowmobiles two snowmobiles that are in his view similar. For the reasons already given, I have come to the conclusion that he has not been successful in convincing the Court of any of the methodologies in so doing.

[385] Instead, we have an expert who concluded that "using these quantitative royalty indicators (that includes the four methods already described), and mindful of the qualitative factors in AlliedSignal Inc v Du Pont Canada Inc (1998), 78 CPR (3d) 129 and (1999), 86 CPR (3d) 324 [AlliedSignal], it is my opinion that the parties would have agreed on a royalty of

$[REDACTED] CAD per infringing BRP snowmobile. Such a royalty would be consistent with the lower end of the majority of quantitative indicators noted above". With the greatest of respect, the Court is expecting more and better. Producing four methods, three of which are rejected out of hand by the expert, in order to favour a comparison between snowmobiles produced by AC falls short of making a demonstration that the invention is worth the kind of royalty that is derived from very limited evidence, which, itself, has its own flaws and deficiencies. That was the Plaintiff's burden and the Plaintiff has not discharged that burden.

[386] However, I would not mean to suggest that no royalty would be payable. Rather, the Court was looking for a methodology that would produce a royalty commensurate with the invention.

B. *Dr. Ugone for the Defendant*

[387] Unfortunately, the evidence offered by the expert retained by BRP is also flawed and would have been of limited assistance. The evidence of both experts suffers from artificiality. While Mr. Carter , for AC, derived a royalty of $[REDACTED]/unit, Dr. Ugone, for BRP, came up with a range between $4.60 and $7.50 per unit using three methods:

- Incremental cost-based apportionment
- Relative cost and inputs-based apportionment
- Accused functionality usage-based apportionment

[388] Dr. Ugone asserts that the infringer's anticipated profits must be the starting point. His evidence is that BRP was anticipating a profit of $[REDACTED]/unit on account of a new engine in November 2004 for the 600 E-TEC engine. Given that the invention is not the engine, there is a need to apportion the profit associated with the invention in the new direct injection engine, such that only that which is derived from the invention could be made the subject of a royalty. I agree. He referred to the three methods to which he gave catchy names as accomplishing the apportionment.

(1) Incremental cost-based apportionment

[389] Dr. Ugone is here using the cost associated with two BRP engines: the 600 HO SDI and the 600 HO E-TEC, one being a semi-direct injection engine and the other practicing the invention being a direct injection engine (the E-TEC). The total cost of each engine being known ($[REDACTED] for the SDI and $[REDACTED] for the E-TEC), together with the engine control module (ECM) and sensors for ignition timing ($[REDACTED] for the SDI and $[REDACTED] for the E-TEC), the expert simply produced the ratio of the cost of the ECM to the total cost of the engine for the two snowmobiles. The percentage thus obtained for the SDI, [REDACTED]% ([REDACTED]), is then subtracted from the percentage for the E-TEC, [REDACTED]% ([REDACTED]). The expert merely declares that the incremental cost percentage can be used to apportion the increased profit associated with the invention. He does not say how.

[390] The relative cost of the ECM is higher for the direct injection engine than for the semi-direct injection engine. But there is no explanation given and it is unknown how the "model" could operate under different circumstances. Without the theoretical underpinnings for the model, they appear to be convenient numbers for the purpose of this case, no more. It is not known either on this record what portion of the extra costs within the ECM can be attributed to the invention or what other savings were realized on the cost of the engine such that the increase in the cost of the ECM is $[REDACTED]/unit, but the cost of the whole engine increases by a mere $[REDACTED]/unit.

[391] The [REDACTED]% ([REDACTED]%- [REDACTED]%) was called by the expert "incremental" cost percentage of the accused ECM: Dr. Ugone would then simply multiply [REDACTED]% by the anticipated profit to arrive at a profit said to be associated with the ECM of $5.47/unit ([REDACTED]% of $[REDACTED]) which becomes an increase in direct profit associated with the ECM. How the percentage of "y" can be subtracted from the percentage of "x" to obtain something useful remains a mystery in spite of the questions from the Court. The model seems to be saying this. Once you establish the relative cost of the ECM (which contains the invention) to the accused engine cost ([REDACTED]%) and you compare it to the relative cost of an ECM (without the invention) to the cost of that old engine ([REDACTED]%), that comparison tells you something about the cost of the invention. How does such a comparison reach that result is unknown.

[392] The expert was never able to explain the concept behind the model. It is attractive by its simplicity. But is it simplistic? The equation simply posits:

| | |
|---|---|
| | Cost of accused ECM relative to cost of engine |
| - | Cost of ECM of SDI relative to cost of engine |
| | Incremental cost percentage |

The equation begs the question: the incremental cost percentage of what? And what does a subtraction of relative costs of ECM tell anything about the cost of the functionality within the ECM? Clearly $^{\text{cost of ECM}}/_{\text{cost of engine}}$ tells the relative cost of the ECM. But what about the accused functionality? If there is an apportionment based on incremental costs, it should be the incremental cost of the accused functionality, which helps generate a profit, that should be considered.

[393] If incremental costs are driving the analysis, why not evaluate directly the percentage of increase between the cost of the ECM for the SDI engine ($[REDACTED]) and that of the ECM for the E-TEC engine ($[REDACTED]), which is [REDACTED]%, generating a profit margin of $[REDACTED]/unit. An increase in the cost of the ECM of [REDACTED]% helps to generate a profit of $[REDACTED] for a whole engine, the cost of that whole engine being relatively stable ($[REDACTED] vs $[REDACTED], an increase of [REDACTED]%). That takes the direct profit to $[REDACTED]/unit, not $5.47/unit. That approach is likely no more principled than that offered by the expert, yet both approaches could probably qualify as being based on an incremental cost-based apportionment, but with results dramatically different. This method assumes that the increase in the ECM cost is due solely to the new functionality. Had it been established that the [REDACTED]% increase, or a smaller percentage in view of the fact that the ECM includes features relevant to a direct injection engine but not related to the functionality that constitutes the invention, it may have provided some basis. I would have

concluded that the method presented by the expert cannot offer an acceptable basis for assessing a royalty and being the basis of some virtual negotiation.

(2) Relative cost and inputs-based apportionment

[394] The second method offered by Dr. Ugone is also to estimate a direct profit as a function of the cost associated with the new ECM for the E-TEC engine that is practicing the invention. Having established that the ECM and sensors cost $[REDACTED] (compared to $[REDACTED] for the SDI engine), which represents [REDACTED]% of the total cost of the engine ($[REDACTED]), the expert apportions [REDACTED]% of the anticipated profit on the E-TEC engine to the ECM. Because the ECM represents [REDACTED]% of the cost of the engine, [REDACTED]% of the profits associated with the new engine are apportioned to the ECM. Accordingly, the profit allocated to the ECM is $[REDACTED]/unit ([REDACTED]% of $[REDACTED]).

[395] However, the model does not end here. The expert goes on to identify 14 inputs that are managed by the ECM, only three of which would be used in dealing with the engine management system of the new accused engine. He then multiplies the profit allocated to the ECM ($[REDACTED]) by [REDACTED] ([REDACTED]%) to arrive at an increase of direct profit attributable to the invention of $6.77/unit.

[396] There are issues with this method as applied by the expert. There is no indication of why the cost of the ECM would produce a profit directly proportional to the profitability of the whole

engine. There is no effort made either to understand the importance that the ECM truly has on the profitability of the new direct injection engine.

[397] Moreover, while this analysis is meant to identify the marginal profit that would be coming from the ECM's inputs relevant to the invention, the expert chooses to recognize three of 14 inputs as being useful in the use of the invention. However, it was conceded on cross-examination by Dr. Ugone that many of the 14 inputs were also part of the ECM of the 600 HO SDI. That suggests that the cost of those inputs is already accounted for in the ECM of the semi-direct injection engine (cost of the ECM being $[REDACTED]). If the additional profit anticipated from the E-TEC engine ($[REDACTED]) has to come from the ECM which represents [REDACTED]% of the total cost of the engine, it is not clear, and the expert does not explain, why 14 inputs are considered if the same inputs are found on the old ECM. In other words, if $[REDACTED] is the incremental profit derived from the new direct injection engine and if it is fair to consider that only [REDACTED]% of the total profit from the engine comes from the ECM, then only those inputs that will contribute to that incremental profitability of the direct injection engine should be counted.

[398] As the expert readily acknowledges himself in his report, $[REDACTED]/unit represents, assuming direct proportionality between increased cost and increased profitability, the increased profit from the introduction of the new ECM of the direct injection engine in the E-TEC model which is expected to generate a profit of $[REDACTED]. That kind of marginal analysis, in order to be consistent, would have to continue throughout. However, the methodology appears to be deficient on that front.

[399] By choosing 3/14 of all the inputs, Dr. Ugone does not differentiate between inputs already accounted for in the SDI engine, which presumably account for the profitability of that old ECM, and new inputs needed for the new direct injection. From those inputs needed for the new engine would be extracted those that are specific to the invention. If, for instance, only seven new inputs are needed for the direct injection engine, it would not be 3/14 of all inputs that would be relevant to the relative cost and inputs-based apportionment but, instead, 3/7.

[400] To put it another way, what needs to be apportioned at this stage are the inputs in the ECM that relate to the invention, not those inputs already accounted for in the SDI engine. Mathematically, that suggests that, while the numerator would remain at 3 (since these are the inputs related to the invention), the denominator would be less than 14 as many of those same inputs are already accounted for in the profitability of the SDI engine. I repeat, $[REDACTED]/unit is the marginal, or additional profit, anticipated by BRP for its new engine. Only that which contributes to this marginal profit should be used; if it is true that the marginal profit of $[REDACTED] is not due entirely to the invention, it would appear reasonable that a marginal analysis should seek to differentiate only the ECM inputs that relate to the invention, but not those inputs that come from the old SDI engine.

[401] In considering the list of 14 inputs, one is struck by many of them as not relating, most probably, to the uniqueness of the direct injection engine: (1) air pressure sensor, (2) air temperature sensor, (3) coolant temperature sensor, (4) battery voltage, (5) the start/RER button, (6) oil level, (7) the digitally encoded security system. There is no evidence on this record of what these inputs control and it would be imprudent to conclude one way or the other. Actually,

other inputs may not have anything to do with the new direct injection engine. Conversely, it may be that some inputs, though already in the ECU of the SDI engines, had to be adjusted or even improved. The record is simply silent. Similarly, the same weight is given to every input in this model, although it is likely that some are more important than others.

[402] The point however is that crude calculations are oftentimes very sensitive to changes. Here, if instead of 14 inputs the number of inputs relevant to the new direct injection engine is rather 7, the increased direct profit attributable to the invention doubles to $13.56/unit. That amount is evidently revised upwards if is taken into account the relative importance the units of the ECM have in achieving the $[REDACTED] profit anticipated by BRP. As per Dr. Ugone's model, the profitability of the ECM is directly proportional to the cost of the ECM, without any indication of the true importance of the ECM in the operation of the engine. Some refinement would have been welcome.

[403] Even without the more refined evidence, Dr. Ugone's second model could probably have been of some assistance in the wielding of the broad axe that is required in the assessment of damages. I note that Mr. Carter's third method uses the same basic rationale, that is that the increased profitability of the new engine would be the basis for a royalty. Mr. Carter would take half of the new profitability of the engine and allocate it to AC. To be of better use, more and better evidence would have been needed to assess the true value of the ECM compared to the profit anticipated from the whole engine, as well as a better understanding of the inputs now found in the ECM which also contribute to the direct injection engine without being related to the practiced engine. Another approach could have been to use the more appropriate number as

the starting point in the virtual negotiation. The number would have been adjusted in further consideration of the 13 factors.

(3) Accused functionality usage-based apportionment

[404] This third methodology would appear to be founded on the notion that the more an invention is used, the more value it carries.

[405] There are many difficulties with the use that is made if this methodology. The calculations that were made, and were never amended, relied on evidence that was ruled inadmissible. BRP tried to introduce into evidence reports that account for testing conducted on the use that is made of the invention. Because there is no admissible evidence regarding the testing conducted, the results carry no weight (ruling of January 22, 2016).

[406] Nevertheless, it is perhaps worth commenting on the concept put forth by the expert. As already indicated, the general idea is simple enough. In order to put it into application, Dr. Ugone received information to the effect that the invention would be in use only for the E-TEC engines where the throttle position is at 70% of its capacity or more. That is a choice that has been made by BRP. That, according to the evidence ruled inadmissible, could happen 2.7% to 4.4% of the time for the E-TEC engines. According to evidence properly before the Court, although of limited weight and probative value, it would generally be between 3% and 5% of the time, with the possibility of rising to 10% for the throttle to be open at 70% capacity. These low percentages are explained by the fact that a 70% throttle position generates very high speeds that

cannot be sustained by most riders. These numbers are subject to significant caution as they come from a BRP engineer's own personal experience (Mr. Schuehmacher). It is a rather tenuous position to take to rely on such thin evidence to establish a royalty base.

[407] From what we can understand, the engine that is operating at 70% of the throttle position could experience engine misses ("hiccups") of short duration, but they would be perceived by the rider. It would have been thought at the time a negotiation would have taken place on a royalty that the invention could alleviate that phenomenon. Nothing is said about the performance enhancements that could result from the practice of the 738 Patent in this part of the expert's evidence. It is as if the only use that can be made of the invention is to remedy engine misses. BRP, in argument, contended that AC's case on damages "hinges on linking its invention to BRP's so called "engine miss problem"" (memorandum of facts and law, para 164). This is surprising because none of the methodologies offered by Mr. Carter hinge only on linking the invention with engine misses. In fact, two of his methodologies refer directly to surveys where the factors considered relevant for the invention are reliability, power and acceleration. Similarly, the first two methods presented by Dr. Ugone are based on costs and cost and inputs-based apportionment, without any suggestion that the only use of the invention made by BRP is limited to the reliability of the engine.

[408] Dr. Ugone applies these percentages directly to the anticipated profit per engine of $[REDACTED], bringing them to a range of $4.62/ unit ([REDACTED]% x $[REDACTED]) to $7.52/unit. If, instead 2.7% - 4.4% are used the percentages of 3% - 5% as advanced by Mr. Schuehmacher, the range goes to $5.13/unit - $8.55/unit.

[409] The main difficulty posed by this crude methodology, other than reliance on numbers that are not produced by appropriate experimentation tested in the context of court proceedings, is that if the functionality was in use 100% of the time, BRP would have to concede that it should pay a royalty of $[REDACTED] for a functionality that is only contributing to the profitability of the new engine. To put it another way, the theoretical underpinnings to establish any kind of relationship between usage and profits are very much unclear. It does not account either for the severity of the problem BRP was attempting to solve or the frequency at which the issue would arise when the throttle is at least at 70% of its capacity. 100% of the time to resolve a small nuisance would result in a royalty of $[REDACTED]? And this limitation seems to apply only to the E-TEC engines, not the other two accused engines (Transcript, p 909). Nevertheless, the expert would apply the methodology to all accused engines.

[410] It is less than clear what this “accused functionality usage-based apportionment” brings. It simply posits that the invention will be used only when the throttle position is at 70% of its capacity; that happens only during a small percentage of the time of utilization of a snowmobile. How is that a proxy for the value associated with the use of the invention? What about if the throttle is open at 70% of its capacity every time the snowmobile is used, if only for a short period? Would that be indicative of something? If so, how does that relate to the profitability of the whole engine? And how about if misses are experienced every time the snowmobile is brought to high speeds by opening up the throttle by more than 70% of its capacity?

[411] What is used in the model is the period of time during which the throttle is left open beyond 70% of its capacity. Nothing else. What that shows is a mystery if one is trying to assess

the profit derived from the invention from which a reasonable royalty is obtained. But the model does not seek to account for the frequency at which problems would occur within the period of time the throttle is open at 70% if it were not for the invention. The frequency of hiccups would be more indicative of the severity of the issue, and therefore the value of the invention, than the percentage of time a throttle would be operating at 70% of its capacity.

[412] The method does not account either for the relative importance the problem encountered may have. “Hiccups” are the manifestation of some issues with the engine. The evidence is that they are perceptible. Is also in evidence that durability, reliability and quality are important factors for customers that impact on sales. Who wants to have a “missing engine” in the middle of the countryside on a cold winter day? What impact would that have on the brand? In my view, this method is so crude and deficient as being of low utility.

[413] Dr. Ugone relied quite heavily on what he called triangulation: his three approaches generate royalties at the low end, but they are consistent in the results attained and that serves as re-enforcement. Mr. Carter did the same thing, to some extent, with his four methods. However, that carries strength only if the three (or four) approaches have themselves a measure of reliability. In my view, two of the approaches as presented are significantly lacking, to the point of providing little assistance to the Court in its evaluation of the damages that would have been suffered by AC. Only one approach, the “relative cost and inputs-based apportionment”, with adjustments, could serve in a virtual negotiation because its starting point is the added profitability on the new engine of the invention. Although the model lacks refinement, it has the advantage of bringing the analysis to the level of the functionality which constitutes the

invention; the difficulty is to figure out how much of the new profitability can be derived from the invention.

[414] In a case decided earlier this year, the Ontario Court of Appeal referred to the trial judge having found that "neither of the experts' approaches was "unassailable" and, accordingly, that their respective numbers "could [not] be accepted without modification": para 303. Acknowledging that "but for choosing a mid-point between the two" (Livent's suggestion), he was "at a loss to settle upon a principled approach for preferring one set of numbers over another", he in effect split the difference: para 303." (*Livent Inc (Special Receiver and Manager of) v Deloitte & Touche*, 2016 ONCA 11 at para 386, 393 DLR (4th) 1 [*Livent Inc*]; leave to appeal to the Supreme Court of Canada granted). That could have been a tempting solution in this case. The Ontario Court of Appeal did not disapprove of that approach as long as there is best effort to consider the evidence. Having concluded the expert's evidence was flawed, the judge did not have to assess the damages at zero. In *Livent Inc*, the Court of Appeal wrote:

> 387 Deloitte argues that it was not open to the trial judge to take an unprincipled approach to fixing the quantum of damages by simply choosing the mid-point between the experts' numbers.
>
> 388 I do not accept this argument. As the trial judge observed, "[t]he assessment of damages is as often as not a mug's game" (para. 274) and trial judges are obliged to do the best they can on the evidence, short of failing to analyze the evidence at all or simply guessing: see e.g. *Murano v. Bank of Montreal* (1995), 20 B.L.R. (2d) 61 (Ont. Gen. Div.), at pp. 120-23, rev'd in part on other grounds (1998), 41 O.R. (3d) 222 (C.A.).

[415] It would appear to me that assessing damages at zero is an option that should be favored only in the extreme cases in view of a violation of a valid patent. François Grenier, in his Monetary Relief – Damages, in Intellectual Property Disputes, edited by Ronald E. Dimock,

Carswell, loose-leaves at p 17-4.1, suggests that the plaintiff who does not show by conclusive evidence on appropriate royalty base might be awarded nominal damages only. This is not a solution that should be reached easily. In this case, I would have concluded that there is not a complete absence of evidence. There was an absence of satisfactory evidence. As in *Livent Inc*, I would have looked for a solution.

[416] One difficulty with choosing a mid-point between experts' numbers is that it does not provide an incentive for experts to assess damages in a reasonable way. The incentive is to push for extremes. The incentive should rather be to offer assistance to the Court. The broad axe referred to by Lord Shaw in *Watson, Laidlaw & Co. Ltd. v Pott, Cassels & Williamson*, [1914] 31 RPC 104, should not in my view be used to over compensate or deprive the patentee. If a broad axe is appropriate, I doubt that it can be so if the broad axe is replaced by a sledge hammer. In the case at hand, for the same invention, one expert arrives at a royalty of $[REDACTED]/unit while the other arrives at a range of direct profits between $4.60 and $8.55 per unit. Splitting the difference is hardly satisfactory.

[417] I have indicated at trial that I did not have doubts about the qualification of the two experts before the Court. In my view, the problem stems from the invention the value of which must be assessed. It is very much intangible; it becomes something tangible once it is determined what the temperature of the exhaust gas is telling and how that information can be used to improve the performance of the engine or alleviate problems incurred during the operation of the engine. This Patent and the claims do not teach a particular means to achieve the desirable result.

It makes the assessment of the value of an invention like that particularly perilous as the evidence in this case showed.

[418] AC did not suggest that BRP present an account of their own profits either. The Plaintiffs have chosen the royalty route because evidently they could not assess their own damages, their lost profits. There is a simple reason for that: it is not possible to assess the lost sales on account of this invention. What demand is driven by such an intangible invention? In its *Annotated Patent* Act, Stratton described how damages are usually assessed: "Damages are typically assessed by considering what sales the patentee would have made but for the infringement, and awarding damages based on the lost profits of such lost sales." (p 1-292) In fact, Mr. Carter seems to favour an approach that ends up being a hybrid. He seeks to calculate the increased profit that AC would be realizing on its own sleds by comparing contribution margins. Mr. Carter then applies that increased profitability of AC snowmobiles ($[REDACTED]/unit) not on its lost sales, but rather on all the sales of accused units realized by BRP. He then reduces the increased profitability of the snowmobiles by 50%, arriving at a royalty of $[REDACTED] for the invention, a mere functionality of the engine. This approach is inherently flawed. The Plaintiffs turn the royalty approach on its head by seeking to recoup their claimed lost profits on their snowmobiles ($[REDACTED]/unit), but applying the lost profits on the sales achieved by BRP (125 000 units). If damages are the lost profits that AC would have made on the lost sales, AC's proposition, in a sense, is to claim that it would have made 62 500 sales for which it would have made a profit of $[REDACTED]/snowmobile. The arithmetics provide a clear picture, worth a thousand words:

([REDACTED] x 125 000 = [REDACTED] x $^{125\,000}/_{2}$)

There is not even a suggestion that AC could have added to its sales 62 500 units on account of a functionality.

[419] BRP claims that its new engine, not the new snowmobile, brings a marginal profit of $[REDACTED]. At $[REDACTED]/unit BRP would be giving away as a royalty for a functionality [REDACTED]% of the profit on its new engine. If a 50/50 split of the profits that AC would have realized on its snowmobiles applied to 125 000 units sold by BRP is to be an appropriate royalty rate, a better justification than this constitutes "an effort to be conservative" is needed, including the percentage of the new profit which comes from the functionality.

[420] The Court was advised by counsel that there is not in this country jurisprudence similar to what has been developing in the United States in the last few years. The issue relates to the apportionment to arrive at a reasonable royalty, where the accused product consists of patented and unpatented elements. Thus, it is difficult to compare whole products where the benefits of the invention apply only to some elements.

[421] Although the notion is not new, it seems that the use of the smallest salable patent-practicing unit is gaining traction in the U.S. Back in 1884, the Supreme Court of the United States in *Garretson v Clark*, 111 U.S. 120 (1884), dealt with the apportionment analysis:

> When a patent is for an improvement, and not for an entirely new machine or contrivance, the patentee must show in what particulars his improvement has added to the usefulness of the machine or contrivance. He must separate its results distinctly from those of the other parts, so that the benefits derived from it may be distinctly seen and appreciated.
>
> …

The patentee…

> must in every case give evidence tending to separate or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features, and such evidence must be reliable and tangible, and not conjectural or speculative, or he must show by equally reliable and satisfactory evidence that the profits and damages are to be calculated on the whole machine, for the reason that the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature.

Recent federal case law in the U.S. is advocating, to some extent, using the smallest salable infringing unit with close relation to the claimed invention. That would certainly have been of assistance in this case, as opposed to considering the contribution margins between snowmobiles (*VirnetX Inc v Cisco Systems, Inc et al*, US Court of Appeals, Federal Circuit,767 F.3d 1308 (2014)).

[422] It is beyond the scope of these reasons to elaborate on the American approach and the recent case law. Suffice it to say that in this case, with respect to the 738 Patent, the comparison of the contribution margins between whole snowmobiles of different years was unreliable. Comparing engines and the added profitability due to the invention was an improvement. It may have provided more enlightenment if the analysis had focused on the ECM (or ECU) where it may have been possible to be more precise as to the actual use. In other words, a better focus on the smallest patent-practicing unit may have brought more adequate clarification on the real damages incurred by AC.

[423] That is why the "relative cost and inputs-based apportionment" of Dr. Ugone has some attractiveness as a basis for negotiation. Once is established the profit per unit of one engine using the invention, it is not unreasonable to apply to it the percentage of the cost of the engine associated with the smaller infringing unit, the ECM. It is then a matter of evaluating the features of the ECM which benefit from the invention. The suggestion of Dr. Ugone that it be limited to 3/14 inputs was not acceptable. But a different ratio, reflecting better the fact that inputs were already in the ECM before it was improved to accommodate new inputs may have provided the broad axe to arrive at an appropriate direct profit leading to a royalty rate. A further improvement could have been to give different weights to the various inputs.

[424] Finally, I wish to add one comment on the *AlliedSignal* 13 factors. The two experts considered in the hypothetical negotiation the 13 factors with varying degrees of rigour. They each go through the list of 13 *AlliedSignal* factors, give an assessment for each factor and then declare victory. (I have appended to these reasons for judgment a chart reporting on the result of the assessment for the 13 factors done by the experts). In each case their victory would not have had an effect on the royalty rate calculated. Some of the factors were more carefully considered while others received little attention.

[425] Dr. Ugone, having established what he considered to be an appropriate range for the royalty using direct profits derived from the invention, went through the 13 factors. I would suggest that the 13 *AlliedSignal* factors are no more a talisman than the *Georgia Pacific* 15 factors (Ericsson Inc. v D-Link Systems, Inc., U.S. Court of Appeals for the Federal Circuit, December 4, 2014). It is not merely a list to go through, but rather the appropriate factors for a

given case that should be used, analysed and applied. Here, Dr. Ugone was initially of the view that the factors should be used to move within the range of royalties already determined by his methodologies. Only when pushed did he agree that the Court may use the factors to actually depart from the range.

[426] Mr. Carter's use of the factors was more convoluted. His four quantitative approaches were not clearly described and some of the information was presented as part of the review of an *AlliedSignal* factor. One of the four approaches was fully presented under the discussion of factor #7, Compensation for Research and Development Costs. An inordinate amount of time was spent discussing approaches the expert did not support. In the end, his favoured approach is presented in a cursory manner (2 pages out of an 89 page-report), a favoured approach which ends up as one royalty of $[REDACTED]/unit. It remains unclear what effect, if any, the *AlliedSignal* factors have had other than seek to confirm the high royalty rate. It would seem that it also served to disqualify the approach presented in five lines under factor #12 (displacement of business), which would have generated a royalty range of $[REDACTED] to $[REDACTED]. There was no explanation why a royalty of $[REDACTED]/unit had to be discarded in favour of $[REDACTED]/unit.

[427] The Court would have had to conclude that the experts were not considering carefully enough the *AlliedSignal* factors and the impact they had on the rate. Merely going through the list of factors, and providing some rating for each, does not assist a court if the conclusion is that the royalty rate remains unchanged. I would have thought that the factors deserve better. If a royalty is to be determined with the assistance of a hypothetical negotiation involving the

appropriate and relevant *AlliedSignal* factors, it would be important that a careful analysis be provided to assist the Court. In this case, neither the so called quantitative method nor the examination of the *AlliedSignal* factors sought to evaluate the value of the invention. We still do not know how it was used, either by AC or BRP, so that it would be possible to assess what benefit might be derived.

[428] In the end, there is no award of damages in view of the conclusion reached on infringement and validity. It is clear, however, that a royalty of $[REDACTED]/unit would have been patently unreasonable on the evidence on this record. Mr. Carter denied at trial that he was relying on the Nash Bargaining Solution. (The Bargaining Problem, by John F. Nash, Econometrica, Vol. 18, issue 2 (April 1950). The 50% was simply unexplained. Splitting the difference between that number and the royalty range arrived at by BRP would have been inequitable without evidence. However, it would also be inequitable to assess the damages at zero. A more appropriate approach could have been the blunt, but practicable, relative cost and inputs base apportionment, with adjustments. A royalty higher than that proposed by BRP would in all likelihood have been appropriate.

## XV. *Objections*

[429] Throughout the trial, the parties have made a number of objections. Most of them have been ruled on and disposed of at the hearing, following arguments. However, the Plaintiffs have made submissions, in writing and supported by a motion record, with regard to four distinct objections. The Defendant had its own motion record in response. The objections were debated

at length and, at the conclusion of the submissions, the Court advised that the matter would be taken under advisement. These are my reasons concerning the objections.

[430] Arctic Cat took issue with some features of the expert report of Dr. Bower, the expert retained by BRP. It is in particular the expert report issued on August 28, 2015 (Dr. Bower's Report) that is in issue.

[431] The four objections can be described thus:

a) opinions that lack a factual basis must be rejected;

b) BRP, through the reports of Dr. Bower, was in fact splitting its case;

c) the *Code of Conduct for Expert Witnesses*, which is a schedule to the Rules adopted in 2010 (SOR/2010-176) to govern the testimony of expert witnesses provides that the expert's report "shall include any literature or other materials specifically relied on in support of the opinions". The Plaintiffs claim that Dr. Bower failed to comply with that provision and that, accordingly, a portion of his report is inadmissible;

d) the expert improperly introduced factual evidence.

The Court will address these objections in turn, together with the two interventions made by counsel for AC that two paragraphs, though not inadmissible, would carry no weight.

A. *Objections to admissibility of evidence*

(1) Lack of factual basis

[432] This objection concerns paragraphs 142 to 146 of the Dr. Bower's Report. That is the report produced by Dr. Bower in response to that of the expert retained by AC, Dr. Checkel, to demonstrate that BRP infringed some of the claims in the 738 Patent. It constitutes Dr. Bower's response to the infringement report. At paragraphs 142 to 146, Dr. Bower sought to quantify the frequency with which the dynamic ignition correction function of the BRP snowmobile is used. In order to obtain data, Dr. Bower asked of BRP the riding history of BRP's E-TEC engines, which are the largest share of the accused engines in this case.

[433] The paragraphs under examination present the analysis of the data which would have been collected following testing conducted by BRP. AC objects to these paragraphs in Dr. Bower's report because the facts that give rise to the analysis by the expert have not been proven: there is no foundation of proven facts for the expert to opine.

[434] BRP argues that the paragraphs are admissible because one of its witnesses, Mr. Schuehmacher, testified concerning the said data which ended up in a report. The witness did not conduct the tests or experimentation and he did not compile the data. He knows about the report and, as such, his evidence constitutes hearsay. Alternatively, BRP claims that the cross-examination conducted by AC of Mr. Schuehmacher constitutes a waiver of BRP's hearsay objection. In the further alternative, BRP would wish for the Court to reconsider its ruling that

the document purported to contain the results of testing conducted by BRP's test pilots are not admissible.

[435] The Court is not minded to revisit its ruling of September 21, 2015 (Transcript pages 1030 and following). BRP, through its witness, Mr. Schuehmacher, was attempting to introduce into evidence the results of testing conducted by someone other than the witness. This constitutes hearsay. We were reminded recently by Justice Stratas, in *Canadian Copyright Licensing Agency (Access Copyright) v Alberta*, 2015 FCA 268 at para 20, of the fundamental general principle that facts must be proven by admissible evidence. If it is undoubtedly true that "documents simply stuffed into an application record are not admissible" (para 20), it is equally true that documents must also be proven if they are to be taken for the truth of their contents. Unless there is some exception, such as judicial notice for instance, or the legislation provides for a particular way of producing evidence, documents need to be proven in the usual way.

[436] BRP tried to rely on the business records exception to the hearsay rule. Since BRP could not satisfy the requirements of the Canada Evidence Act, it would appear that BRP relies on the Common Law. It claims that Mr. Schuehmacher knew about the document, how it was created and that it is "a reliable sample of different snow conditions". With respect, this misses the mark and becomes an effort at bootstrapping. The document is said, without any authority in support, to be reliable because the witness says so. Here, the witness, when asked to do so by Dr. Bower, required that the riding history of the accused E-TEC engine be provided. This is not a record created in the ordinary course of business, but rather a report done for the purpose of litigation as requested by an expert witness. If there are logs that were constituted at the time the testing took

place, they were not produced (Transcript, pp 1155 and 1156). In *The Law of Evidence in Canada* (Sopinka, Lederman & Bryant, LexisNexis, 3rd Ed.), the authors describe the Common Law exception in the following fashion:

> **§6.185** At common law, statements made by a person under a duty to another person to do an act and record it in the ordinary practice of the declarant's business or calling are admissible in evidence, provided they were made contemporaneously with the facts stated and without motive or interest to misrepresent the facts.

I cannot see how the document here considered satisfies these requirements. The rationale for the exception is simply not present: the circumstantial guarantee of truth comes from the constant routine in making entries. An entry in a business record is one thing; it is quite another to create a report, written some time following experimentation asked for in the precise context of litigation, a document that is meant to assist the Defendant. That is not to say that the report was inaccurate: we do not know. It is more that the very nature of a document like this does not have the measure of trustworthiness that comes from records created and kept, for instance, for the systematic and mechanical conduct of business.

[437] Here, the paragraphs in Dr. Bower's report cannot be admissible because there is no evidence to establish the foundation of his opinion. That foundation is absent because the documents purportedly put forth to report on some experimentation constitute inadmissible hearsay. The fact that Mr. Schuehmacher testified that his experience is that snowmobiles are driven 3 to 5% of the time with the throttle opened at 70% of capacity or more does not justify the manipulation of data not found before the Court as presented by Dr. Bower.

[438] BRP also suggests that the cross-examination of Mr. Schuehmacher constituted a waiver. Such was not the case. The Court's ruling allowed the document to be used not for the truth of its content but rather to help assess the credibility of the witness who testified that timing corrections would occur only where the throttle is open at least at 70% of its capacity which, according to the witness, would happen no more than 3 to 5% of the time. The cross-examination was conducted within the limitation set by the Court: to test the credibility of the witness, who is an engineer but is not a test pilot, in relation to his assertions about these figures. There was never any waiver such that it would now be permitted for BRP to rely on the document for the truth of its content.

[439] It follows that Mr. Schuehmacher could not supply a valid basis for the use of the document for the truth of its content. Accordingly, paragraphs 142 to 146 must be excluded as inadmissible. However, the testimony of Mr. Schuehmacher is not challenged on this basis and it is admissible. The weight to be given to it is of course a matter of argument.

B. *Case splitting*

[440] AC also argues that some paragraphs found in the Dr. Bower's infringement report constitute an improper split of BRP's case in chief on validity. This objection relates to paragraphs 10, 93 and 103, together with attachments 2 and 4.

[441] Paragraph 10 is part of the summary offered by Dr. Bower of his opinions. Paragraphs 93 and 103, with the attachments referred therein, deal with the expert's contention that the accused

BRP's engines E-TEC, 440 HO and 600 RS are programmed "in the same manner as the ECUs described in the US 705 Patent and the US 908 Patent". The point being made is the following. If the Court were to find that these accused engines operate on the basis of a modification of an ignition pattern (claims 11 and 16 of the 738 Patent), the Court would have to find, the argument goes, that US Patents 705 and 908 disclosed an ignition pattern selected from a plurality of different ignition patterns, and the basic ignition pattern being modified based on the sensed exhaust gas temperature. To put it another way, since the accused engines practice the US patents, the conclusion that these engines violate the 738 Patent would carry that the 738 Patent practices the prior art of the US patents 705 and 908. As US Patents 705 and 908 are prior art, it would follow that the Patent-in-suit would not be valid.

[442] BRP's prime argument is that it programmed its ECU as described in US Patents 705 and 908, but those patents teach the modifications of an ignition point, rather than having different ignition patterns or for having modifications to the basic ignition pattern. In that sense, this constitutes BRP's defense to the allegation that it is violating the Patent-in-suit since it was using a different logic.

[443] BRP faced with the horns of a dilemma having to decide to argue before the Court invalidity or non-infringement argues, in effect, both. If the two US patents teach a logic that is different than the Patent-in-suit, and if the Court is satisfied that BRP is practicing that teaching, there cannot be infringement. Conversely, if still persuaded that BRP is practicing that teaching, but that which was taught by the two US patents is in effect the logic taught by the Patent-in-suit,

the 738 Patent, the Court is invited to conclude that the Patent-in-suit is not valid. Using the same two US patterns, BRP argues that either it does not infringe or the Patent-in-suit is invalid.

[444] AC argues that BRP had to put forth its expert evidence in its case in chief where it argued that the Patent-in-suit is invalid; it could not wait until its expert offered his evidence in response to the infringement argument which came later, on August 28. According to AC, BRP is splitting its case, contrary to the rule recognized in *R v Krause*, [1986] 2 SCR 466. One can read at p 473:

> [15] At the outset, it may be observed that the law relating to the calling of rebuttal evidence in criminal cases derived originally from, and remains generally consistent with, the rules of law and practice governing the procedures followed in civil and criminal trials. The general rule is that the Crown, or in civil matters the plaintiff, will not be allowed to split its case. The Crown or the plaintiff must produce and enter in its own case all the clearly relevant evidence it has, or that it intends to rely upon, to establish its case with respect to all the issues raised in the pleadings; in a criminal case the indictment and any particulars: see *R. v. Bruno* (1975), 27 C.C.C. (2d) 318 (Ont. C.A.), per Mackinnon J.A., at p. 320, and for a civil case see: *Allcock Laight & Westwood Ltd. v. Patten, Bernard and Dynamic Displays Ltd.*, [1967] 1 O.R. 18 (Ont. C.A.), per Schroeder J.A., at pp. 21-22. This rule prevents unfair surprise, prejudice and confusion which could result if the Crown or the plaintiff were allowed to split its case, that is, to put in part of its evidence -- as much as it deemed necessary at the outset -- then to close the case and after the defence is complete to add further evidence to bolster the position originally advanced. The underlying reason for this rule is that the defendant or the accused is entitled at the close of the Crown's case to have before it [page474] the full case for the Crown so that it is known from the outset what must be met in response.

[445] The difficulty in cases such as this one is that there are different phases to the trial where the burden shifts from one side to the other. That being initially an action for infringement, it is AC that has the initial burden of satisfying the Court that its Patent has been infringed. Evidently,

if no infringement is shown, AC will not be successful and there would be no need to go any further. However, even if the Patent was infringed, the Defendant may still prevail if it satisfies the Court that the Patent, or the claims asserted by the Plaintiffs, are not valid, whatever the reason may be. The burden is then on the shoulders of the Defendant, who becomes the Plaintiff by counterclaim, asserting the invalidity of the Patent.

[446] Here, I fail to see how it can be said that BRP is splitting its case. AC contends that BRP ought to have presented the evidence found in paragraphs 93 and 103 of Dr. Bower's report responding to infringement issues report produced on August 28, 2015, in its case in chief on invalidity, on June 15, 2015.

[447] However, as it has been recognized for more than one hundred years, it is a valid defense to an allegation of infringement that the alleged infringing product is based on the teachings of prior art, such as the two US patents in this case or Application 959. In other words, invalidity is a defense to infringement. The often quoted paragraph of the House of Lords decision in *Gillette Safety Razor Co v Anglo-American Trading Co* (1913), 30 RPC 465 is certainly worth reproducing once again:

> The defence that "the alleged infringement is not novel at the date of the plaintiff's Letters Patent is a good defence in law, and it would sometimes obviate the great length and expense of Patent cases if the defendant could and would put forth his case in this form and thus spare himself the trouble of demonstrating on which horn of the well-known dilemma the plaintiff had impaled himself, invalidity or non-infringement.
>
> (p 488)

[448] In that particular case, the House of Lords described the issue in a way that is quite similar to the circumstances of this case just a few lines before the famous passage:

> If the claims of such a Patent were so wide as to include it, the Patent would be bad, because it would include something which differed by no patentable difference from that which was already in possession of the public. Such a Patent would be bad for want of novelty. If the claims were not sufficiently wide to include the Defendant's razor, the patentee could not complain of the public making it. In other words, the Defendants must succeed either on invalidity or on non-infringement.

[449] If it is a valid defense to an allegation of infringement that the claims asserted are not novel (or have been anticipated), how could it be that offering evidence to that effect in response to the allegation of infringement would be splitting one's case? In my view, BRP's point that its statement of defence pleads invalidity as a ground of non-infringement and that, accordingly, its Expert's report on invalidity fully discusses US patents 705 and 908 is well taken. Not only there is no splitting of the case, but AC cannot realistically suggest that it has been taken by surprise. I have reviewed paragraphs 93 and 103; I am comforted that there is no element of surprise in these two paragraphs.

[450] The point being made in these two paragraphs is simply this. Assuming that it is shown that the four accused engines have an ECU programmed in the same manner as what is taught by U.S. Patents 705 and 908, it would have to be, the syllogism goes, that a finding of infringement against the accused engines would have to carry the same finding concerning 705 and 908. If the four engines infringe the Patent-in-suit, they are being programmed according to U.S. Patents 705 and 908; it would necessarily mean that 705 and 908 would themselves run afoul of the 738

Patent as teaching the same thing. However, 705 and 908 precede the 738 Patent, In that scenario, U.S. Patents 705 and 908 must be prior art, these serving to invalidate the 738 Patent.

[451] BRP is not splitting its case. It is putting forth its case that if the four accused engines infringe, then there is a full defense in showing that it practices the teachings of U.S. Patents 705 and 908.

[452] I note that U.S. Patents 705 and 908 are not sprung on AC at the stage of the response to the allegations of infringement, rather they are discussed also in the BRP validity report of June15, 2015.

[453] It is probably equally true that the Gillette defence "supposedly saves costs, but few lawyers are brave enough to run it as their sole defence. One must be very sure of a hole-proof basket before putting all one's eggs in it." (*Intellectual Property Law*, David Vaver, Irwin Law, 2nd ED, p 396).

[454] Fortunately, the Court has to be concerned solely with whether the 738 Patent has been infringed and is valid. By relying on the defence that the alleged infringement is not novel, BRP did not split its case where Dr. Bower made assertions at paragraphs 93 and 103 of his report on the infringement allegation.

C. *Failure to comply with Expert Code of Conduct*

[455] AC takes issue with paragraphs 175 and 176 of Dr. Bower's Infringement Report. These relate to the technological comparability in two license agreements, the Clean Futures LLC – Controlled Carson LLC Agreement and the Hirel Technologies Inc. Agreement. In both cases, Dr. Bower concludes that the technologies, referred to as "electronic engine management" system, are a technology comparable to the technology claimed in the Patent-in-suit.

[456] The argument relies on paragraph 3h) of the *Code of Conduct for Expert Witnesses*, a statutory instrument referred to in Rule 52.2 of the *Federal Courts Rules*. It reads as follows:

| | |
|---|---|
| 3. An expert's report submitted as an affidavit or statement referred to in rule 52.2 of the Federal Courts Rules shall include | 3. Le rapport d'expert, déposé sous forme d'un affidavit ou d'une déclaration visé à la règle 52.2 des Règles des Cours fédérales, comprend : |
| … | … |
| (h) any literature or other materials specifically relied on in support of the opinions; | h) les ouvrages ou les documents expressément invoqués à l'appui des opinions; |

[457] As I understand it, it is alleged that Dr. Bower's Report infringes the rule because he has failed to attach to his report the said license agreements. That would be in spite of the fact that the documents are listed in Attachment 1 of Dr. Bower's Report (items 32 and 33) and they are attached to Dr. Ugone's Report, another expert retained by BRP, who testified on the issue of damages. Both reports were served on the same day.

[458] I am not inclined to grant the objection. There are at least three reasons for that:

1. Under the Federal Courts Rules, the Court has discretion as to the remedy that would be granted for a violation of the Code of Conduct: it may exclude the offending paragraphs (R 52.2 (2)). The Report itself refers to the agreements which are attached to the Report of another expert. The exclusion of paragraphs 175 and 176 would not be proportional to the failure to comply with the Code, if there was such a failure;

2. I have not been persuaded that any prejudice was caused to the Plaintiffs. Contrary to a case like *Stevens v Plachta*, 2006 BCCA 479 (*Stevens*), where an appendix was not available, the agreements in this case were available. Yet, in Stevens, the British Colombia Court of Appeal found that the trial judge could have received the appendix, thus avoiding a lengthy adjournment. In the case at bar, the agreements were known and they were available. There was no need to even consider an adjournment, which would have been a more appropriate remedy had a remedy been needed;

3. I am less than convinced that the Plaintiffs give paragraph 3h) the appropriate reading it deserves. When read in context and together with its French version, which is equally authoritative (see *R v Daoust*, 2004 SCC 6, [2004] 1 SCR 217 and *R v SAC*, 2008 SCC 47, [2008] 2 SCR 675), I would have thought that the words “literature” and “ouvrage” were used for a particular purpose. Oxford

> Canadian Dictionary speaks of "literature" as being "the material in print on a particular subject". One finds a definition conveying the same meaning to the word "ouvrage" in Le Petit Robert de la langue française: "texte scientifique, technique ou littéraire … Consulter tous les ouvrages oubliés sur une question … Ouvrage de référence." As pointed out again recently in *Merck Frosst Canada Ltd v Canada (Health)*, 2012 SCC 3 at para 203, [2012] 1 SCR 23, "[t]he shared meaning rule for the interpretation of bilingual legislation dictates that the common meaning between the English and French legislative texts should be accepted". In the case at hand, the authors of the Code chose very specific words to designate what shall be included. It is not any written material referred to by an expert, but rather the "literature", "les ouvrages", that shall be included. That, to my way of thinking, connotes the types of authorities that help make the point put forward by the expert, what supports his contention.

[459] I am comforted further by the use of the words "specifically relied on in support of the opinion" and "expressément invoquées à l'appui des opinions". The expert is not so much relying on the agreements as he is giving an opinion on these instruments. Similarly, in French "invoquer" carries the meaning "to call for", "to invoke". As can be seen, paragraph 3h) deals with authorities used in support of the opinion, not the very instruments about which an opinion is given. It is the difference between what is the object of the opinion and the material used to support the opinion. That is consistent with the comments found in *The Law of Evidence in Canada* where under the title "Use of Authoritative Literature", one can read:

> §12.200 Peculiar to the examination of experts is the utilization of text books. In support of any theory, an expert is permitted to refer

> to authoritative treatises and the like, and any portion of such texts upon which the witness relies is admissible into evidence.

[460] I am of course cognizant that the paragraph includes more generic words: “or other materials specifically…” and “ou les documents expressément …” In my view, those words must be read taking into account the limited class designated by “literature” and “ouvrages”, but also qualified by the words “specifically relied on in support of the opinions” (“expressément invoquées à l’appui des opinions”). Not only must the words “literature” and “ouvrages” be given meaning, as opposed to being subsumed in “other materials”, as if the word “literature” did not have a particular meaning, but paragraph 3h) is about that which supports the opinion, not that which is the object of the opinion.

[461] As a result, paragraphs 175 and 176 are admissible.

D. *Improper factual evidence*

[462] AC contends that paragraphs 48, 66, 135, 163 and the third and fourth sentences of paragraph 167 of Dr. Bower’s infringement report provide factual evidence.

[463] It is not clear what the basis is for AC to contend that the expert could not provide this factual evidence. No authority was offered in support. Be that as it may, BRP made a convincing argument that the matters addressed in these paragraphs are all supported by evidence, either testimonial or documentary, offered at trial.

[464] If the Plaintiffs claim that the factual basis is thin, they could certainly argue that the opinion of the expert should not carry much weight (*R v Lavallée*, [1990] 1 SCR 852).

E. *Opinion beyond stipulated expertise*

[465] The Plaintiffs argue that Dr. Bower went beyond the expertise that was recognized in the Expert stipulation. The argument is made in relation to paragraph 145 of Dr. Bower's Report on infringement. Without necessarily objecting to the admissibility of paragraph 145 on the basis advanced, AC claimed that little weight should be put on this evidence. Given my conclusion that paragraphs 145 to 146 of Dr. Bower's Report cannot be admissible, it will not be necessary to spend time on this objection.

[466] The same kind of argument is made concerning paragraph 161, about which AC says that the assessment of evidence being the province of the trier of fact, the opinion given by Dr. Bower should be given no weight.

[467] In paragraph 161, Dr. Bower opines that "there is no evidence that the technology of the 738 Patent contributes to improving Quality/Durability/Reliability of the snowmobile or its engine, and I see no basis for how there could be such contribution". As pointed out by counsel for BRP, Dr. Bower was reacting to assertions made by the expert on damages retained by AC in this case. Dr. Bower may have been better advised to refrain from declaring that there is no evidence; comments like this are to be made by counsel.

[468] An expert is expected to testify on the facts and to give his opinion on matters other than the law, for which he does not have a particular expertise. However, I suspect he did not use the word “evidence” in its legalistic connotation; the point can be made validly that there is no basis for claiming a contribution to improving quality, durability and reliability. That is certainly evidence that can be offered by an expert (as opposed to the expert opining on what constitutes evidence as a legal concept) having the qualifications of Dr. Bower. With a Ph.D. in mechanical engineering, together with extensive experience not only in in-cylinder combustion, but also calibration of engines, engine controllers and engine management systems, as stipulated, I fail to see how he could be prevented from expressing such opinion, or that his opinion should carry no weight.

## XVI. *Post scriptum*

[469] Prior to releasing the reasons for judgment, the Court sought the views of counsel on possible redactions by circulating a draft. Both parties made a number of suggestions.

[470] In essence, both parties suggested deletions in Part XIV which deals with damages. I am of the view that a court should seek to minimize deletions where a public trial has taken place.

[471] However, in this case, the part of the judgment addressing the issue of damages is clearly *obiter* in view of the conclusions reached on infringement and validity. As a result, I have concluded, not without hesitation, that most of the proposed redactions should be maintained in

Part XIV. Other redactions elsewhere in the reasons for judgment have not been accepted as the passages were part and parcel of the rationale for the decision reached by the Court.

[472] A confidential set of reasons will accordingly be kept sealed in the Registry of this Court.

## JUDGMENT

**THIS COURT'S JUDGMENT is that**:

1. The action for infringement of Arctic Cat Inc. and Arctic Cat Sales Inc. is dismissed;

2. The Defendant, Bombardier Recreational Products Inc. is entitled to its costs. The parties are invited to make submissions in writing and limited to 5 pages each on the issue of costs, to be filed in this Court's registry no later than twenty (20) days from the issuance of this judgment;

3. Had the Court found that there was a violation of any of the asserted claims (claims 11, 16, 33, 40 and 47 of Canadian Patent No. 2,322,738), the Defendant, Bombardier Recreational Products Inc., would have been entitled to the relief sought by counter claim, that is a declaration that the asserted claims of the 738 Patent are and have always been, invalid and void;

4. The Court declares that Bombardier Recreational Products Inc. does not infringe any valid and asserted claims of the Canadian Patent No. 2,322,738;

5. As for the counterclaim, the parties are invited to make submission in writing and limited to 5 pages each on the issue of costs of this counterclaim, to be filed in this Court's registry no later than twenty (20) days from the issuance of this judgment;

6. Bombardier Recreational Products Inc. sought in its counterclaim "pre-judgment and post-judgment interest". In view of the lack of precision, the parties are

invited to make submissions in writing and limited to two pages each on the issue of pre-judgment and post-judgment interest, to be filed in this Court's registry no later than twenty (20) days from the issuance of this judgment.

"Yvan Roy"

Judge

**ANNEX "A"**

What is claimed is:

1. A two-cycle engine, comprising:

a cylinder;

a throttle;

a piston moveable in the cylinder, for compressing a fuel-air mixture to be ignited in the cylinder, with exhaust gas from combustion of the fuel-air mixture being expelled from the cylinder;

an ignition source in the cylinder;

a controller for activating the ignition source at a particular point during the compressing movement of the piston, the controller activating the ignition source according to an ignition pattern in which the ignition point during the compressing movement varies with at least one of the operation speed of the engine and throttle position, the ignition pattern being selected from a plurality of different ignition patterns; and

a sensor for sensing a temperature of exhaust gas from the cylinder, the particular ignition pattern used by the controller being selected based upon the sensed exhaust gas temperature.

2. The engine of claim 1, wherein the ignition source is a spark plug and the controller is a capacitor discharge ignition system.

3. The engine of claim 1, wherein the sensor contacts the exhaust gas.

4. The engine of claim 3, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

5. The engine of claim 1, wherein individual ignition patterns are provided for exhaust gas temperature ranges that cover about 50C.

6. A method of operating a two-cycle engine, comprising:

moving a piston in a cylinder to compress a fuel-air mixture in the cylinder;

activating an ignition source in the cylinder during the compression movement;

expelling exhaust gas from combustion of the fuel-air mixture from the cylinder;

controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compression movement varies with at least one of the operation speed and throttle position of the engine;

sensing a temperature of the exhaust gas expelled from the cylinder; and

selecting the ignition pattern from a plurality of ignition patterns based on the sensed exhaust gas temperature.

7. The method of claim 6, wherein the ignition source is a spark plug and a capacitor discharge ignition system controls activation of the spark plug.

8. The method of claim 6, wherein the exhaust gas temperature is sensed with a sensor that contacts the exhaust gas.

9. The method of claim 8, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

10. The method of claim 6, wherein individual ignition patterns are provided for exhaust gas temperature ranges that cover about 50C.

11. A two-cycle engine, comprising:

a cylinder;

a piston movable in the cylinder, for compressing a fuel-air mixture to be ignited in the cylinder, with exhaust gas from combustion of the fuel-air mixture being expelled from the cylinder;

an ignition source in the cylinder;

a controller for activating the ignition source at a particular point during the compressing movement of the piston, the controller activating the ignition source according to an ignition pattern in which the an ignition point during the compressing movement varies with operation speed of the engine, the ignition pattern being selected from a plurality of different basis ignition patterns; and

a sensor for sensing a temperature of exhaust gas from the cylinder, the basic ignition pattern used by the controller being modified based upon the sensed exhaust gas temperature.

12. A two-cycle engine, comprising:

a cylinder;

a piston movable in the cylinder, for compressing a fuel-air mixture to be ignited in the cylinder, with exhaust gas from combustion of the fuel-air mixture being expelled from the cylinder;

an ignition source in the cylinder;

a controller for activating the ignition source at a particular point during the compressing movement of the piston, the controller activating the ignition source according to an ignition pattern in which the ignition point during the compressing movement varies with operation speed of the engine, the ignition pattern being selected from a plurality of different ignition patterns; and

a sensor for sensing a temperature of exhaust gas from the cylinder, the plurality of ignition patterns including a first ignition pattern that is selected when the sensed exhaust gas temperature is a temperature correlated with an undesired operation condition.

13. The engine of claim 12, wherein the temperature correlated with an undesired engine operation condition reflects a type of fuel being used to operate the engine.

14. The engine of claim 12, wherein the temperature correlated with an undesired engine operation condition reflects an engine performance problem.

15. The engine of claim 14, wherein the engine performance problem is selected from the group consisting of incorrect carburetion or incorrect fuel delivery.

16. A method of operating two-cycle engine, comprising:

moving a piston in a cylinder to compress a fuel-air mixture in the cylinder;

activating an ignition source in the cylinder during the compression movement;

expelling exhaust gas from combustion of the fuel-air mixture from the cylinder;

controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compression movement varies with operation speed of the engine selected from a plurality of basic ignition patterns;

sensing a temperature of the exhaust gas expelled from the cylinder; and

modifying the ignition pattern selected from a plurality of ignition patterns based on the sensed exhaust gas temperature.

17. A method of operating a two-cycle engine, comprising:

moving a piston in a cylinder to compress a fuel-air mixture in the cylinder;

activating an ignition source in the cylinder during the compression movement;

expelling exhaust gas from combustion of the fuel-air mixture from the cylinder;

controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compression movement varies with operation speed of the engine;

sensing a temperature of the exhaust gas expelled from the cylinder; and

selecting a first ignition pattern from a plurality of ignition patterns when the sensed exhaust gas temperature is a temperature correlated with an undesired engine operation.

18. The method of claim 17, wherein the temperature correlated with an undesired engine operation condition reflects a type of fuel being used to operate the engine.

19. The method of claim 17, wherein the temperature correlated with an undesired engine operation condition reflects an engine performance problem.

20. The method of claim 19, wherein the engine performance problem is selected from the group consisting of incorrect carburetion or incorrect fuel delivery.

21. A two-cycle engine, comprising:

a cylinder;

a piston movable in the cylinder, for compressing a fuel-air mixture to be ignited in the cylinder, with exhaust gas from combustion of the fuel-air mixture being expelled from the cylinder;

an ignition source in the cylinder;

a controller for activating the ignition source at a particular point during the compressing movement of the piston, the controller activating the ignition source according to an ignition pattern in which an ignition point during the compressing movement varies with operation speed of the engine, the ignition pattern being selected from a plurality of different ignition patterns, the different ignition patterns having different relationships between ignition point and engine speed; and

a sensor for sensing a temperature of exhaust gas from the cylinder, the particular ignition pattern used by the controller being selected based upon the sensed exhaust gas temperature.

22. The engine of claim 21, wherein the ignition source is a spark plug and the controller is a capacitor discharge ignition system.

23. The engine of claim 21, wherein the sensor contacts the exhaust gas.

24. The engine of claim 23, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

25. The engine of claim 21, wherein individual ignition patterns are provided for exhaust gas temperature ranges that cover about 50C.

26. The engine of claim 25, wherein the plurality of different ignition patterns includes a default pattern that is used if a failure of the sensor is determined.

27. The engine of claim 26, wherein the engine is a snowmobile engine.

28. A method of operating a two-cycle engine, comprising:

moving a piston in a cylinder to compress a fuel-air mixture in the cylinder;

activating an ignition source in the cylinder during the compression movement;

expelling exhaust gas from combustion of the fuel-air mixture from the cylinder;

controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compression movement varies with operation speed of the engine;

sensing a temperature of the exhaust gas expelled from the cylinder; and

selecting the ignition pattern from a plurality of different ignition patterns based on the sensed exhaust gas temperature, the different ignition patterns having different relationships between ignition point and engine speed.

29. The method of claim 28, wherein the ignition source is a spark plug and a capacitor discharge ignition system controls activation of the spark plug.

30. The method of claim 28, wherein the exhaust gas temperature is sensed with a sensor that contacts the exhaust gas.

31. The method of claim 30, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

32. The method of claim 28, wherein the temperature of the exhaust gas is sensed with a temperature sensor and the plurality of different ignition patterns includes a default pattern that is selected when a failure of the temperature sensor is determined.

33. The method of claim 28, where the engine is a snowmobile engine.

34. A two-cycle engine, comprising:

a cylinder;

a throttle;

a piston movable in the cylinder, for compressing a fuel-air mixture to be ignited in the cylinder, with exhaust gas from combustion of the fuel-air mixture being expelled from the cylinder;

an ignition source in the cylinder;

a controller for activating the ignition source at a particular point during the compressing movement of the piston, the controller activating the ignition source according to an ignition pattern in which an ignition point during the compressing movement varies with operation speed of the engine and throttle position, the ignition pattern being selected from a plurality of different relationships between ignition point and engine speed; and

a sensor for sensing a temperature of exhaust gas from the cylinder, the particular ignition pattern used by the controller being selected based upon the sensed exhaust gas temperature.

35. The engine of claim 34, wherein the ignition source is a spark plug and the controller is a capacitor discharge ignition system.

36. The engine of claim 34, wherein the sensor contacts the exhaust gas.

37. The engine of claim 36, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

38. The engine of claim 34, wherein individual ignition patterns are provided for exhaust gas temperature ranges that cover about 50C.

39. The engine of claim 34, wherein the plurality of different ignition patterns includes a default pattern that is used if a failure of the sensor is determined.

40. The engine of claim 34, wherein the engine is a snowmobile engine.

41. A method of operating a two-cycle engine, comprising the steps of:

moving a piston in a cylinder to compress a fuel-air mixture in the cylinder;

activating an ignition source in the cylinder during the compression movement;

expelling exhaust gas from combustion of the fuel-air mixture from the cylinder;

controlling the activation of the ignition source according to an ignition pattern in which an ignition point during the compression movement varies with operation speed of the engine and throttle position of the engine;

sensing a temperature of the exhaust gas expelled from the cylinder; and

selecting the ignition pattern from a plurality of different ignition patter is based on the sensed exhaust gas temperature, the different ignition patterns having different relationships between ignition point and engine speed.

42. The method of claim 41, wherein the ignition source is a spark plug and a capacitor discharge ignition system controls activation of the spark plug.

43. The method of claim 41, wherein the exhaust gas temperature is sensed with a sensor that contacts the exhaust gas.

44. The method of claim 43, wherein the engine further comprises an exhaust pipe for carrying the exhaust gas and the sensor is disposed in the exhaust pipe.

45. The method of claim 41, wherein individual ignition patterns are provided for exhaust gas temperature ranges that cover about 50C.

46. The method of claim 41, wherein the temperature of the exhaust gas is sensed with a temperature sensor and the plurality of different ignition patterns includes a default pattern that is selected when a failure of the temperature sensor is determined.

47. The method of claim 41, wherein the engine is a snowmobile engine.

***Fig. 1***

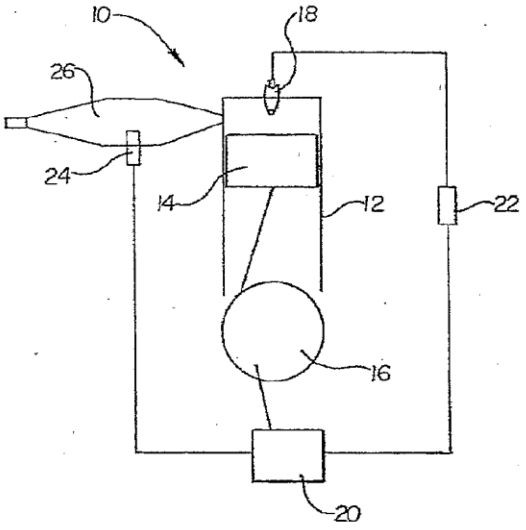


*Fig. 2*

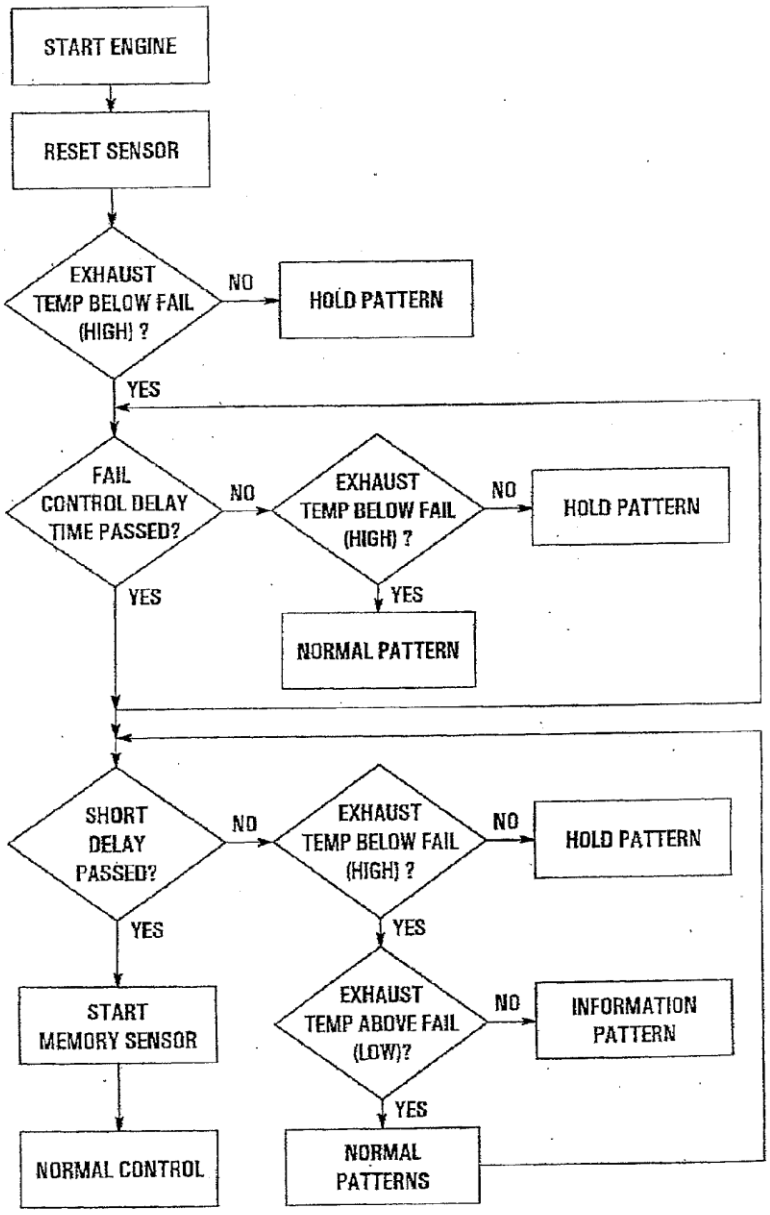

START ENGINE
RESET SENSOR
EXHAUST TEMP BELOW FAIL (HIGH) ?
NO
HOLD PATTERN
YES
FAIL CONTROL DELAY TIME PASSED?
NO
EXHAUST TEMP BELOW FAIL (HIGH) ?
NO
HOLD PATTERN
YES
YES
NORMAL PATTERN
SHORT DELAY PASSED?
NO
EXHAUST TEMP BELOW FAIL (HIGH) ?
NO
HOLD PATTERN
YES
YES
START MEMORY SENSOR
EXHAUST TEMP ABOVE FAIL (LOW)?
NO
INFORMATION PATTERN
YES
NORMAL CONTROL
NORMAL PATTERNS

*Fig. 3*

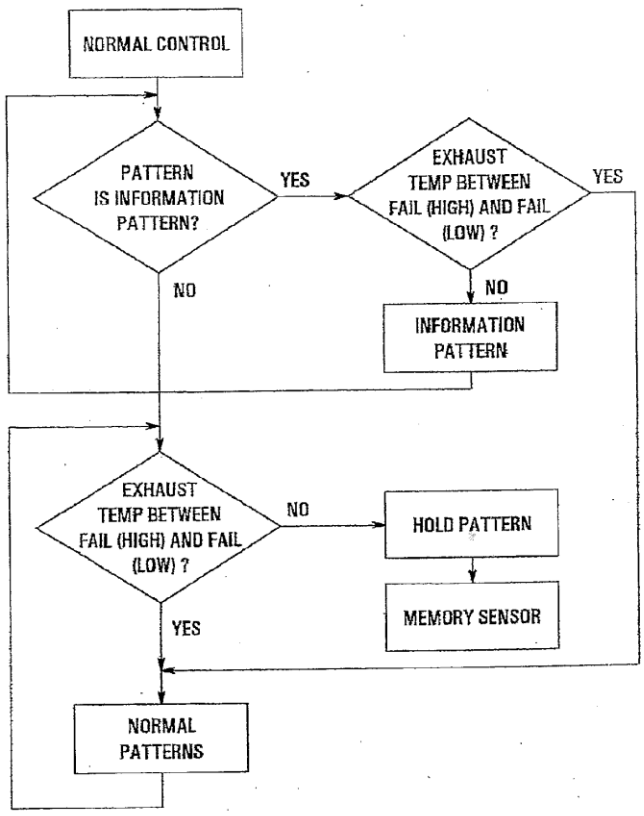

NORMAL CONTROL
PATTERN IS INFORMATION PATTERN?
YES
EXHAUST TEMP BETWEEN FAIL (HIGH) AND FAIL (LOW) ?
YES
NO
NO
INFORMATION PATTERN
EXHAUST TEMP BETWEEN FAIL (HIGH) AND FAIL (LOW) ?
NO
HOLD PATTERN
MEMORY SENSOR
YES
NORMAL PATTERNS

*Fig. 4*

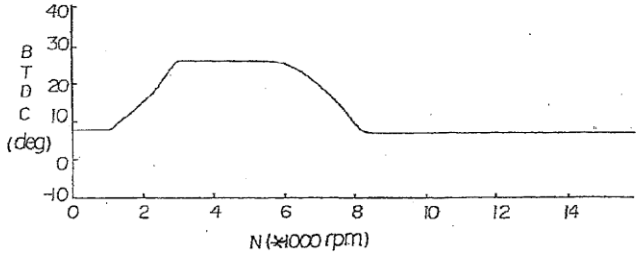



*Fig. 5*

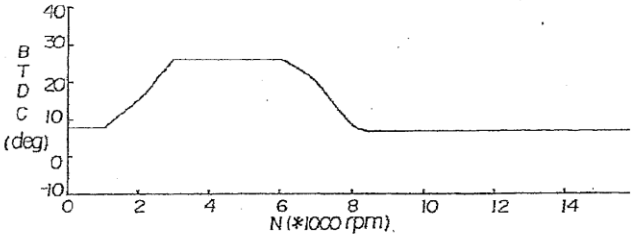



*Fig. 6*

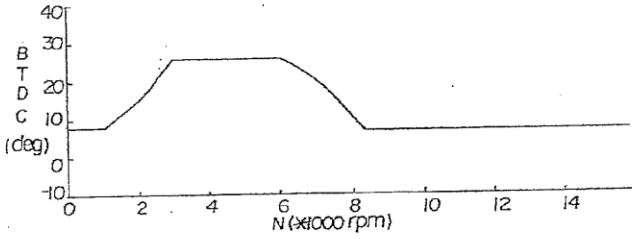


***Fig. 7***

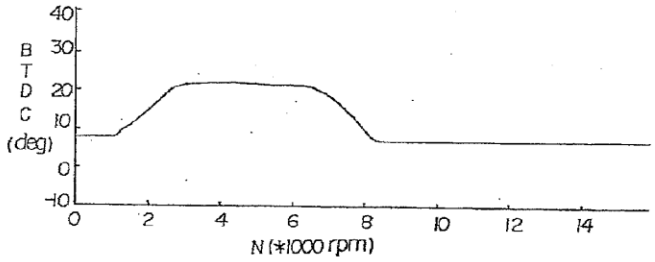
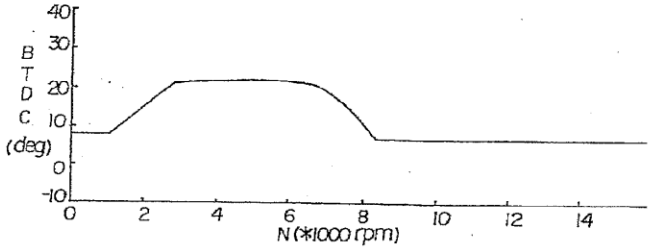

40
30
20
10
0
-10
BTDC (deg)
0
2
4
6
8
10
12
14
N (*1000 rpm)

***Fig. 8***


40
30
20
10
0
-10
BTDC (deg)
0
2
4
6
8
10
12
14
N (*1000 rpm)

**ANNEX "B"**

| | **AC**<br><br>**Mr. Carter** | | **BRP**<br><br>**Mr. Ugone** |
|---|---|---|---|
| 1. | Neutral | Transfer of technology | Neutral |
| 2. | Neutral | Practice of patent | Neutral |
| 3. | Neutral | Non-exclusive license | Neutral |
| 4. | Neutral | Territorial limitations | Neutral |
| 5. | BRP | Term of license | Neutral |
| 6. | AC | Competitive technology | AC |
| 7. | AC | Competition licensor-licensee | AC |
| 8. | BRP | Demand for the product | BRP |
| 9. | AC | Risk | Neutral |
| 10. | AC | Novelty of invention | BRP |
| 11. | AC | Compensation for R&D | BRP |
| 12. | AC | Displacement of business | Neutral |
| 13. | AC | Capacity to meet demand | Neutral |

*For each factor, the expert indicated which party would be favoured in a virtual negotiation. BRP spoke in terms of upward or downward pressure on the royalty rate while AC gave the nod directly to one or the other of the parties.

**FEDERAL COURT**

**SOLICITORS OF RECORD**

| | |
|---|---|
| **DOCKET:** | T-1353-13 |
| **STYLE OF CAUSE:** | ARCTIC CAT INC. v BOMBARDIER RECREATIONAL PRODUCTS INC. |
| **PLACE OF HEARING:** | TORONTO, ONTARIO |
| **DATE OF HEARING:** | SEPTEMBER 14, 15, 16, 17, 18, 21, 22, 23, 24, 25, 28, 29, AND 30, 2015; OCTOBER 1, 2, 5, 6, 7 AND 8, 2015; JANUARY 25, 26, 27 AND 28, 2016; FEBRUARY 1 AND 2, 2016 |
| **CONFIDENTIAL JUDGMENT AND REASONS AND PUBLIC JUDGMENT AND REASONS:** | ROY J. |
| **DATED:** | SEPTEMBER 16, 2016 |

**APPEARANCES:**

| | |
|---|---|
| Ronald Dimock<br>Michael Crinson<br>Ryan Evans<br>Bentley Gaikis<br>Naomi Metcalfe | FOR THE PLAINTIFF |
| Marek Nitoslawski<br>David Turgeon<br>Joanie Lapalme<br>Michael Shortt | FOR THE DEFENDANT |

**SOLICITORS OF RECORD:**

| | |
|---|---|
| Dimock Stratton LLP<br>Toronto, Ontario | FOR THE PLAINTIFF |
| Fasken Martineau DuMoulin, LLP<br>Montreal, Quebec | FOR THE DEFENDANT |