Federal Court  Cour fédérale

Date: 20170126

Dockets: T-2149-14

Citation: 2017 FC 104

Ottawa, Ontario, January 26, 2017

PRESENT: The Honourable Mr. Justice Manson

BETWEEN:

FRAC SHACK INC. AND FRAC SHACK INTERNATIONAL INC.

Plaintiffs/
Defendants by Counterclaim

and

AFD PETROLEUM LTD.

Defendant/
Plaintiff by Counterclaim

JUDGMENT AND REASONS

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I. The Pleadings

[1] This action concerns the validity and infringement of Canadian Patent 2,693,567, entitled "Fuel Delivery System and Method" (the "'567 Patent"). The '567 Patent was filed on February 16, 2010; published on October 21, 2010; and issued on September 23, 2014. The owner of the '567 Patent is Frac Shack Inc. ("FSH").

[2] The Plaintiffs in this action are FSH and Frac Shack International Inc. ("FSI") (collectively, "Frac Shack" or the "Plaintiffs"). The Defendant is AFD Petroleum Ltd. ("AFD" or the "Defendant").

[3] The Plaintiffs assert that the Defendant has infringed claims 1 to 4, 7 to 13, 15 to 23, and 26 to 38 of the '567 Patent, through the design and operation of a fuel delivery system known as the AFD Onsite Refuelling System (the "AFD Frac Trailer").

[4] The Defendant asserts that the AFD Frac Trailer does not infringe the '567 Patent, and counterclaims that the '567 Patent is invalid because: (i) it is obvious; (ii) there is insufficient disclosure in the patent; and/or (iii) the claims are broader than the invention made or disclosed. At trial the defence of invalidity based on ambiguity was abandoned.

[5] The following issues are raised:

1) Preliminary issues:
    a. Should portions of the expert reports prepared by Douglas Smith and Kevin Matiasz be struck?
    b. Should portions or the entirety of the expert report prepared by Richard Berry be struck?
2) Patent infringement and validity:
    c. Validity:
        i. Are claims 1 to 38 of the ‘567 Patent invalid because the disclosure fails to provide sufficient information for the person of ordinary skill in the design of fuel storage and delivery systems to successfully carry out the purported invention?
        ii. Are any of claims 1 to 38 of the ‘567 Patent invalid because the claims are broader than any invention made or disclosed in the specification?
        iii. Are claims 1 to 38 of the ‘567 Patent invalid because of obviousness?
    d. Infringement:
        i. Are any of claims 1 to 4, 7 to 13, 15 to 23, and 26 to 38 of the ‘567 Patent infringed by the AFD Frac Trailer:
            1. before September 23, 2014;
            2. between September 23, 2014 and October 18, 2014, or
            3. after October 18, 2014?
3) Remedies:
    e. Are the Plaintiffs entitled to injunctive relief, damages, and/or accounting for profits from the Defendant?

II. Summary of the Results in this Action

[6] The results in this action are:

1) Preliminary issues:
    a. The expert reports prepared by Douglas Smith and Kevin Matiasz are admitted in their entirety.
    b. The expert report prepared by Richard Berry is admitted in its entirety.
2) Patent infringement and validity:
    c. Validity:
        i. Claims 1 to 38 of the ‘567 Patent are sufficient.
        ii. The following claims are broader than any invention made or disclosed:
            1. claims 1 to 6, which fail to disclose a fuel level sensor;
            2. claims 16 to 18 and 32 to 37, which disclose use at a work site, not use during fracturing operations at a well site; and
            3. claims 20 to 26, which disclose a fuel delivery system, the use of which is not limited to any specific location.
        iii. Claims 1 to 15, 19, 27 to 31, and 38 of the ‘567 Patent are not obvious.

iv. Claims 7 to 15, 19, 27 to 31, and 38 are valid.

d. Infringement:

i. Claims 10, 27, 29, and 30 are valid, but not infringed by the AFD Frac Trailer.

1. The '567 Patent was issued on September 23, 2014. Before this date there was no infringement.
2. It is admitted by the Defendant that AFD infringed claims 11 and 12 between September 23, 2014 and October 18, 2014, and further the following claims were also infringed:
    a. claim 7;
    b. claim 8;
    c. claim 9;
    d. claim 13;
    e. claim 15, as it depends on claim 13;
    f. claim 19, as it depends on either claim 16 or 17;
    g. claim 28, as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17);
    h. claim 31, as it depends on any of claims 7, 8, 9, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17)); and
    i. claim 38, as it depends on claim 32.
3. The following claims were infringed by AFD after October 18, 2014:
    a. claim 7;
    b. claim 8;
    c. claim 11;
    d. claim 13, as it depends on claim 11;
    e. claim 15, as it depends on claim 13 (as it depends on claim 11);
    f. claim 19, as it depends on either claim 16 or 17;
    g. claim 28, as it depends on any of claims 7, 8, or 19 (as it depends on either claim 16 or 17);
    h. claim 31, as it depends on any of claims 7, 8, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on any of claims 7, 8, or 19 (as it depends on either claim 16 or 17)); and
    i. claim 38, as it depends on claim 32.

3) Remedies:

e. The Plaintiffs are entitled to injunctive relief, an accounting of profits for infringement, and reasonable compensation for use prior to September 23, 2014 from the Defendant, as specified below.

III. Background

A. *The Parties*

[7] FSH is an Alberta-incorporated company, which carries on business as a manufacturer and operator of oilfield equipment, including fuel delivery systems for the oil and gas industry. Its products include the Frac Shack™ fuel delivery system (the "Frac Shack System"), which is an embodiment of the '567 Patent. FSH is the owner of the '567 Patent.

[8] FSI is a corporation incorporated pursuant to the laws of Canada, which carries on business as an operator of oilfield equipment, including fuel delivery systems for the oil and gas industry. FSI is a wholly owned subsidiary of FSH and at all material times has been a licensee of FSH, in respect of the '567 Patent and the Frac Shack System technology. The Plaintiffs market and operate the Frac Shack System in Canada.

[9] AFD is an Alberta-incorporated company, which carries on business as a designer, manufacturer, operator, distributor, and seller of fuel delivery systems for the oil and gas industry. Its products include the AFD Frac Trailer.

B. *Technology Background*

(1) Hydraulic Fracturing

[10] Hydraulic fracturing is the process of pumping fluids down into a subterranean wellbore to create pathways which enable the oil or natural gas to flow to the surface, so as to maximize the extraction of oil or natural gas. Hydraulic fracturing is typically used on "unconventional

formations", in which horizontal drilling is used to extract oil and natural gas that is unable to flow naturally to the surface.

[11] Creating these horizontal wellbores requires a high volume of hydraulic fracturing. Current unconventional formations require many stages of hydraulic fracturing for the wells to become economically viable. This is generally done through the use of multi-stage, high rate and high volume hydraulic fracturing treatments.

[12] A hydraulic fracturing operation at an unconventional formations requires large quantities of supplies—fuel, fracturing fluids, chemicals, and proppants (solid materials designed to keep an induced fracture open)—and many large portable pieces of equipment. The portable equipment, which generally includes at least one diesel engine and at least one diesel fuel storage tank, is transported on trailer units to the location by diesel tractors. The typical unconventional gas hydraulic fracturing operation would have between 24 to 30 tractor-trailers on location.

[13] Fracturing operations at unconventional wells sites usually involve multiwall pads, which can contain 2 to 24 or more wells, to increase their economic viability. Ideally, these fracturing operations would operate 24 hours-a-day. However, a logistical constraint on the operation requires the delivery of fuel to each piece of equipment used at the location. While a fuel shortage may merely result in down time while the equipment is refueled; it may also result in significant wellbore problems—such as, damage to the formation resulting in an inability to complete the fracture treatment—if the shortage occurred during one of the fracturing treatments.

[14] In order to minimize the risk of fuel shortages, fuel levels are continuously monitored and fuel tanks are refueled as needed. The fuel tank used on most fracturing equipment allows the unit to operate three to four hours under normal operating conditions. Refueling is ideally done between fracture treatments. However, in some operations the fuel tanks have to be refilled while the equipment is operating due to the length of time needed to complete the fracture treatment. Refueling while the fracturing equipment is operational is known as “hot refueling”.

(2) Hot refueling

[15] Prior to 2010, refueling of fracturing equipment was done by a worker pulling fuel-laden hoses to each piece of equipment’s fuel tank and manually discharging diesel fuel into the tank (“manual hot fueling”). Manual hot fueling was and is a dangerous and difficult task as it typically requires workers to refuel as the equipment is operating, working between equipment that is spaced about a meter apart, with pumping equipment that is operating at high pressures.

[16] Due to the difficulties created by the fracturing environment and the equipment layout, manual hot fueling often requires a three-person crew: (1) a hose operator, who discharges the fuel into the tank; (2) a hose carrier, who helps drag the hose between the equipment; and (3) a fire watcher, who is equipped with firefighting equipment in case of an accident. Occasionally, there is a fourth worker, who is operating the fuel pumping equipment, and can shut down the fuel pump if necessary.

[17] The risk of fire using manual hot refueling may, on some fracturing sites, be quite high. Diesel vapours can be released into the atmosphere when the fuel tank caps are removed. These

fuel vapours are heavier than air and can travel a considerable distance to sources of ignition and flashback, increasing the risk of a fire hazard. Spilled or aerosolized diesel can also ignite, particularly if in close proximity to the diesel engine, the temperature of which can exceed 400 °C when operating under heavy load.

[18] In addition to the fire risk, there are numerous other potential health and safety hazards associated with manual hot refueling:

a. Lifting hazards:
    - It is estimated that 100 ft. of hose can weigh over 100 pounds. The weight of the hose, plus the friction of dragging the hose may lead to operators incurring repetitive stress injuries from moving the heavy hoses between equipment.
b. Noise hazards:
    - Workers may be exposed to very high noise levels, and are required to wear multiple layers of hearing protection.
c. Confined space hazards:
    - The space between pieces of high pressure equipment is very narrow, and there may be tripping hazards depending on the weather, terrain, and layout of the site. There is commonly only a single point of safe entry and egress for the operators. Visibility and communication may also be an issue.
d. Air quality hazards:
    - Removing the caps of the fuel tanks releases diesel vapour into the air. Operators are also exposed to engine exhaust, and the air can be potentially oxygen deficient or enriched.
e. High temperature hazards:
    - The diesel engines operate at very high temperatures. During the summer, operators can be exposed to significant heat stress.
f. Spill hazards:
    - Spills may cause both a health and environmental hazard, and are a significant concern to oil and gas companies, and fracturing service providers.

C. *The ‘567 Patent*

[19] The ‘567 Patent discloses an apparatus and method for delivery of fuel to equipment or fuel tanks at well sites. The summary of the invention at pages 1 to 2 of the ‘567 Patent provides:

> A fuel delivery system and method is presented for reducing the likelihood that a fuel tank of equipment at a well site during fracturing of a well will run out of fuel. There is therefore provided a fuel delivery system for delivery of fuel to fuel tanks of equipment at a well site during fracturing of a well …
>
> A method is also provided for fuel delivery to fuel tanks of equipment at a well site by pumping fuel from a fuel source through hoses in parallel to each of the fuel tanks; and controlling fluid flow through each hose independently of flow to other hoses.

[20] The ‘567 invention is designed to replace the standard method of refueling equipment at a well site during hydraulic fracturing of a well, which is manual hot refueling. At a basic level, the technology is a system and method for delivery of fuel to fuel tanks comprising a fuel source, having plural fuel outlets attached to hoses which deliver fuel to individual equipment fuel tanks around the site independently of each other.

[21] The ‘567 Patent has five independent claims.

[22] Claim 1:

> A fuel delivery system for delivery of fuel to fuel tanks of equipment at a well site during fracturing of a well, the fuel delivery system comprising:
>
> > a fuel source having plural fuel outlets;
> >
> > a hose on each fuel outlet of the plural fuel outlets, each hose being connected to a fuel cap on a respective one of the fuel tanks for delivery of fuel to the respective one of the fuel tanks; and
> >
> > a valve arrangement at each fuel outlet controlling fluid flow through the hose at the respective fuel outlet.

[23] Claim 11:

> A method of fuel delivery of fuel to selected fuel tanks of equipment at a well site during fracturing of a well, the method comprising:
>
> > pumping fuel from a fuel source through hoses in parallel to each of the fuel tanks;
> >
> > controlling fluid flow through each hose independently of flow in other hoses; and
> >
> > automatically controlling fluid flow in each hose in response to receiving signals representative of fuel levels in the fuel tanks.

[24] Claim 16:

> A fuel delivery system for automatic fuel delivery to multiple fuel tanks at a work site, comprising:
>
> > a fuel source comprising one or more manifolds connectable to one or more fuel source tanks by at least a respective one of one or more fuel lines, and a pump on each fuel line for pumping fuel from the one or more fuel source tanks to the one or more manifolds;
> >
> > each manifold of the one or more manifolds having multiple fuel outlets, each fuel outlet of the multiple fuel outlets having a connection for a hose;
> >
> > each hose having a first end and second end and being connected at the first end of the hose to a corresponding one of the multiple fuel outlets and having fuel delivery connection at the second end of the hose for securing the second end of the hose to a fuel tank to which fuel is to be delivered;
> >
> > an automatic valve responsive to electronic control signals on each fuel outlet;
> >
> > a fuel level sensor associated with each fuel delivery connection; and

> a controller responsive to signals supplied from each fuel level sensor through respective communication channels to provide control signals to the respective automatic valves.

[25] Claim 20:

> A fuel delivery system for delivery of fuel to a fuel tank, the fuel delivery system comprising a controller and a fuel source, the fuel source having one or more fuel outlets and for each fuel outlet:
>
> > a hose on the fuel outlet, the hose being connected to a fuel cap on a fuel tank for delivery of fuel to a fuel tank, a valve arrangement at the fuel outlet for controlling fluid flow through the hose at the fuel outlet, the valve arrangement comprising an automatically operable valve on the fuel outlet;
> >
> > the cap including a fuel level sensor; and
> >
> > the controller being responsive to signals supplied from the fuel level sensor through a communication channel to provide control signals to the automatically operable valve.

[26] Claim 32:

> A fuel delivery system for automatic fuel delivery to multiple pieces of equipment at a work site, comprising:
>
> > a fuel source comprising one or more manifolds connectable to a fuel supply;
> >
> > each manifold of the one or more manifolds having multiple fuel outlets, each fuel outlet of the multiple fuel outlets having a connection for a hose;
> >
> > each hose having a first end and a second end and being connected at the first end of the hose to a corresponding one of the multiple fuel outlets and having a fuel delivery connection at the second end of the hose for securing the second end of the hose to a corresponding one of the multiple pieces of equipment to which fuel is to be delivered;

> an automatic valve responsive to electronic control signals on each fuel outlet;
>
> a sensor associated with each combination of fuel outlet, hose and fuel delivery connection; and
>
> a controller responsive to signals supplied from each sensor through respective communication channels to provide control signals to the respective automatic valves.

IV. Frac Shack Fact Witnesses

A. *Jeffery Todd Van Vliet*

[27] Mr. Van Vliet is the President and a director of both FSH and FSI, and one of the inventors of the '567 Patent. He was a former owner and director of Environmental Refueling Systems ("ERS"), the company from which FSH was created. Currently, ERS is a fuel buying, selling, transporting, storage, dispensing and delivery company. One of ERS's focuses is site fuel delivery for drilling programs, large construction projects, and large truck fleets.

[28] Mr. Van Vliet testified about the history of FSH, and the relationships between ERS, FSH, and FSI. He stated that ERS became involved in fueling at fracturing sites in 2009, when they got a call from a customer who requested that they do manual hot refueling at a site north of Fort Nelson. He described his experience and exposure to manual hot refueling at that site, and recounted that what he saw did not make any safety sense to him, because the approach to safety for manual hot refueling was simply to ensure that the worker doing the manual hot refueling was equipped with sufficient personal protective equipment to attempt to mitigate the hazards associated with the job.

[29] After witnessing the safety protocols at that first site, Mr. Van Vliet and his brother decided that they had to fix the problem of manual hot refueling. There were three goals: (1) get workers out of the dangerous hot zone; (2) reduce the amount of fuel spilled on the ground, which can cause both fire and environmental hazards; and (3) build redundancy into the system, such that each automatic system had a parallel manual system in the event of mechanical failure. He admitted that he personally felt that it was essential for the practical operation of the Frac Shack System for there to be a manual way to control the system, such that an operator could have oversight and control of the automated system if necessary.

[30] Mr. Van Vliet explained numerous design choices made regarding the Frac Shack System, particularly with respect to valve placement, line pressure, and fuel level sensors. Mr. Van Vliet stated that creating the Frac Shack System had been a highly iterative design process, and that they had a few early design failures. However, by January 2010, ERS had created a first prototype, and by the summer of 2010, they had an operational unit. He testified that, in 2010, Frac Shack System units were being displayed at the Global Petroleum Show, and by Halliburton Energy Services ("Halliburton") in Calgary. He also revealed that the Frac Shack System had been at the 2012 Global Petroleum Show, where it was seen by people from AFD. He recalled that, at the 2012 Global Petroleum Show, he was introduced to "one of the Reimer brothers", Mark Bader, and Mike Power.

[31] Mr. Van Vliet also recounted a job done as an efficiency comparison case study between manual hot refueling and the Frac Shack System, for Talisman Energy Inc., in Texas. He stated that the fracturing method being used was a method that could be run continuously, called "ball

and sleeve". He explained that the advantage of "ball and sleeve"—compared to an older method, called "plug and perf"—is that the fracturing equipment does not have to be pressured down between stages, because there is gap between stages and all refueling is done while there is pressure in the pumping equipment. He testified that Frac Shack was able to reduce the time gap between stages to four minutes, from one hour, and that this allowed the company to complete twice as many stages per day, reducing the length of the project by two full weeks. This resulted in cost savings for the producer.

[32] He explained that a knowledgeable person would be able to assemble the Frac Shack System with off-the-shelf parts, with the exception of two components which Frac Shack manufactures: the fuel cap, and the fuel manifold. Additionally, he testified that the early Frac Shack System units, which were completed in 2010, were still operational and being used in the field, in 2016.

[33] On cross-examination, he admitted that Frac Shack (then ERS) was working on finding an appropriate sensor during the 2009-2010 fiscal year, before they eventually settled on combining two off-the-shelf technologies to achieve a solution. Additionally, he conceded that they had to do some testing on three different pumps to determine which would give them the appropriate balance between delivery and not overpowering the system.

[34] He explained that the operation of the Frac Shack System was the sole business focus of Frac Shack and Frac Shack America Inc. ("FSA", not a party to this action) and that FSI currently owns 46 Frac Shack System units. He stated that, in 2014, Frac Shack and FSA did not

receive any requests to use one of the Frac Shack System units that the companies were unable to fulfill and that they had rented out the Frac Shack System units over 3,600 times, since 2010.

[35] The last job that Frac Shack did for Trican Well Service Ltd. ("Trican") was in February 2014, and Trican had only been a Frac Shack customer since 2012. Further, Frac Shack's relationship with Calfrac Well Services Corp. ("Calfrac") was on and off, depending for which oil producer Calfrac was working. The last job Frac Shack did for Calfrac was in August 2015.

[36] He admitted that he did not know which method of refueling Calfrac was currently employing. Additionally, he admitted that some fracturing companies still find manual hot refueling to be an acceptable method of refueling, regardless of whether the equipment in the hot zone is depressurized. He stated that there was no one correct way for fracturing companies to perform a risk matrix and that companies may assess risks differently.

[37] Mr. Van Vliet also admitted that Frac Shack had been trying to get work from Trican and Calfrac, unsuccessfully, since 2014 and 2015 respectively. Additionally, he explained that it had been a business decision for Frac Shack to rent the Frac Shack System units independently of fuel sales. Based upon their pricing of the unit, plus the additional fuel costs, Frac Shack estimated to Encana Corp. ("Encana") that use of the Frac Shack System—two units for the job—would be a savings of $20 per day over manual hot fueling.

[38] Mr. Van Vliet was a straightforward and credible witness.

B. *Peter Chernik*

[39] Mr. Chernik is a Professional Engineer and a member of the Society for Petroleum Engineers. Before retiring, he was the General Manager of Liquid Natural Gas Delivery for Nexen/CNOOC Limited ("Nexen"), a position he held for seven years. He has 39 years of experience in the oil and gas industry, and 20 to 25 years of fracturing experience.

[40] Mr. Chernik explained that, in the old days of fracturing, companies did fracs on vertical wells but, in 2006-2007, the industry changed, such that gas wells are now primarily horizontal wells with "many, many fracs at each of the horizontals". He stated that, prior to 2010, when the jobs were small; there was enough fuel in the pumpers to finish a job before depressuring and refueling. However, once the jobs grew to need 20 to 25 pumpers running simultaneously, people were forced to do manual hot refueling because the pumpers would be running continuously day and night, with only approximately 20 minutes between fracs, which was not enough time to refuel all of the pumpers, without specifically stopping the operation to refuel.

[41] Mr. Chernik stated that he was familiar with the Frac Shack System, and that Nexen had used it for thousands of jobs since around 2011. He described the Frac Shack System as a "technology that was perfect for what [Nexen] needed", since it was much safer, more efficient, and allowed for equipment to be placed closer together to reduce the pad's footprint. He testified that, as soon as management at Nexen was aware of the Frac Shack technology, they wanted to use it at their job sites and, for Nexen, the Frac Shack System worked flawlessly. In his opinion, the key variable to choosing the Frac Shack System was the safety aspect, and the second variable was the ability to work more efficiently.

[42] On cross-examination, Mr. Chernik explained how and why companies performed multiple fracs at a well site, and admitted that there had been no real need at Nexen for Frac Shack's technology prior to 2009.

[43] Mr. Chernik was a straightforward and credible witness.

C. *Scott Van Vliet*

[44] Mr. Scott Van Vliet is the CEO of ERS and one of the inventors of the '567 Patent. He recounted his first trip up to a Schlumberger fracturing site, in 2009, north of Fort Nelson in the Horn River Basin. He stated that ERS was delivering fuel from the fuel depot to the completions pad, and that their workers were doing the manual hot refueling for the operations.

[45] He testified that after he saw the manual hot refueling procedure he discussed the potential safety hazards with his brother (Mr. Todd Van Vliet). He stated that after running the first test with the prototype design, it was recognized that they needed to take the development of the Frac Shack System to a higher level of sophistication. To do this, they decided to spin-off the company FSH from ERS, with Todd Van Vliet at the helm. Mr. Scott Van Vliet elected to remain with ERS to take care of the daily operations.

[46] Mr. Scott Van Vliet stated that the Frac Shack System was a commercially popular product, and an important product from an efficiency and safety standpoint.

[47] There was no cross-examination of Mr. Scott Van Vliet. He was a straightforward and credible witness.

D. *David Lamberton*

[48] Mr. Lamberton has been the customer solutions and marketing manager at FSH since 2014. Previously, from 2013 to early 2014, he worked for Encana. At Encana, Mr. Lamberton was a commodities analyst, who was involved in looking at the direct sourcing of certain commodities for fracturing operations.

[49] Mr. Lamberton testified that he was involved in the decision to use the Frac Shack System at Encana. He stated that the group saw the Frac Shack System as a new, innovative technology that helped make operations safer. He explained that safety was a major factor in Encana's decision to use the Frac Shack System.

[50] He stated that, while he was at Encana, AFD approached his group with their AFD Frac Trailer. He did not remember the specifics of the AFD fueling system, but he remembered the AFD Frac Trailer being similar to the Frac Shack System.

[51] Mr. Lamberton explained that, in his current position at FSH, he primarily promotes the Frac Shack System, finds new business, and manages existing customers. He stated that he highlights the safety and efficiency features of the units, when selling customers on the Frac Shack System, and that the system is marketed as a premium service at premium pricing. He stated that the average number of units rented per job is two on a pad.

[52] On cross-examination he stated that his group at Encana did not find that there were any real advantages in switching to the AFD Frac Trailer from the Frac Shack System. However, he admitted that he did not know whether the Encana engineers had looked at the AFD system to determine whether it met Encana's technical requirements.

[53] Mr. Lamberton was a straightforward and credible witness.

E. *Bruce D. Garland*

[54] Mr. Garland is an engineer and the Managing Director of Drilling and Completions at WesternZagros Resources. Prior to working for WesternZagros, he was employed at Nexen, where, from 2009 to 2014, he was the Drilling and Completions Manager for the Horn River fracturing projects.

[55] He stated that he was familiar with the Frac Shack System, and that he thought that the system was an improvement over manual hot refueling. He testified that Nexen used the Frac Shack System in the summer, from 2009—when Calfrac introduced the technology to the company—at least until 2014. In 2011, Nexen separated refueling from the frac contractors, such that they contracted for each separately, and contracted directly with Frac Shack for use of the Frac Shack System.

[56] Mr. Garland did not recollect any environmental or safety issues occurring with any of the Frac Shack System units, and believed that Nexen had used the units for over one thousand jobs, on four or five different pads, during the time he was with the company. He stated that

given the choice today, he would choose a Frac Shack System type of technology over manual hot refueling because of both the safety and efficiency benefits. He testified that he personally thought that the Frac Shack System was excellent, and that Nexen also realized data benefits that were used as part of their fracturing program optimization.

[57] On cross-examination, Mr. Garland admitted that he had no knowledge of Nexen's operations outside of the Horn River Basin.

[58] Mr. Garland was a straightforward and credible witness.

V. Frac Shack Expert Witnesses

A. *Douglas G. Smith*

[59] Mr. Smith holds a Certificate in Occupational Health and Safety from the University of Alberta, and has been a Health Safety and Environment ("HSE") Professional for 23 years. Mr. Smith is a HSE consultant in the Oil and Gas Industry, and is currently a safety consultant for a new technology LNG application and Co-Chair of Industry Recommended Practice (IRP) 8 Pumping of Flammable Fluids.

[60] Prior to becoming an independent consultant, Mr. Smith worked in house for oil and gas companies including GASFRAC Energy Services, Baker Hughes Canada Inc., and BJ Services Co. (now a subsidiary of Baker Hughes). He has 37 years of experience in the oil and gas industry. He is a Canadian Registered Safety Professional, and a member of the Canadian

Society of Safety Engineering and the Institute of Hazard Prevention, Process Safety Discussion Group.

[61] Mr. Smith was qualified as an expert in health and safety at fracturing sites, including health and safety at well sites. A *Mohan* objection was made regarding the scope of his testimony and the admissibility of paragraphs 8, 30 to 41, and appendices A to C of his Construction and Infringement Report, and the entirely of his Validity Report. There was also a case-splitting objection raised regarding paragraphs 3 to 5, 54 to 91, and 106 to 110 of his Validity Report.

B. *Kevin P. Matiasz*

[62] Mr. Matiasz received a B.Sc. in Geological Engineering from the University of Saskatchewan in 1997. He is a practicing member of the Association of Professional Engineers and Geoscientists of Alberta, a member of the Society of Petroleum Engineers, and Co-Chair for Drilling and Completion Committee Industry Recommended Practice 24 Fracturing Operations.

[63] Mr. Matiasz is a Completions Advisor for Kandor Consulting Inc. Prior to starting Kandor Consulting Inc., he worked at Encana and Halliburton. At Halliburton, Mr. Matiasz worked as a Senior Technical Professional and then as a Senior Account Representative, roles which required him to rig-up and operate fracturing equipment. At Encana, he held multiple positions, including Completions Operations Manager for the Duvernay operating area.

[64] Mr. Matiasz was qualified as an expert in the field of completions engineering in the oil and gas industry including fracture and coil tubing design and fuel delivery to fracturing equipment at a well site. A *Mohan* objection was made regarding the scope of his testimony and the admissibility of paragraphs 10 to 17, 41 to 73, and appendix E of his Construction and Infringement Report, and the entirely of his Validity Report. There was also a case-splitting objection raised regarding paragraphs 6 to 8 and 44 to 45 of his Validity Report.

C. *Colleen Basden*

[65] Ms. Basden received a B.A. in Accounting from the University of Waterloo. She is a Chartered Accountant, and a Chartered Professional Accountant. She has been certified by the Canadian Institute of Chartered Accountants as a Specialist in Investigative and Forensic Accounting, and a Specialist in Business Valuation. She is also certified in Financial Forensics.

[66] Ms. Basden is a Partner of KPMG LLP, and a Senior Vice President in KPMG Forensic Inc. She has worked on a variety of assignments relating to the calculation of economic loss for litigation purposes.

[67] Ms. Basden was qualified as an expert in forensic accounting, including the calculation of damages and accounting of profits with experience in patent infringement actions.

VI. AFD Fact Witnesses

A. *Shane R. Ohman*

[68] Mr. Ohman is a manager at Legacy Petroleum, responsible for the day-to-day operations in Hinton; and the fuel delivery, maintenance and oversight of remote operations in Grande Cache, Alberta. He was previously employed with Trican, from 2009 to spring of 2015, as a field worker and then as a frac coordinator in Hinton.

[69] He testified that 90 to 95 percent of all refueling at the Trican sites, in 2014, was manual hot refueling. He stated that at some point Trican started using the Frac Shack System because Shell Canada Ltd. had contracted with Frac Shack for the project. He could not remember any other Trican customers that used the Frac Shack System.

[70] Mr. Ohman explained that, in order to minimize the safety hazards of manual hot refueling, Trican would connect a larger fuel tank to multiple "T manifolds" into the ground, from which they could run one-and-a-half-inch fuel lines to the pumper fuel tanks. This minimized the need for operators to drag the heavy fuel hose from one piece of equipment to another. He stated that this also minimized the need for workers to stand over the high pressure lines, because they could approach the fuel tanks from the tractor side of the equipment.

[71] He expressed that a drawback of the Frac Shack System was that the units he saw were not very mobile, because they were mounted on skids, and once the units were in place the other equipment had to be crowded around them. He further testified that he experienced billing issues,

where Frac Shack was sending invoices to Trican late, making it difficult for Trican to get their paperwork completed on time.

[72] Mr. Ohman stated that he was involved in a 2014 decision to use the AFD Frac Trailer, and that the reason his team went with the AFD Frac Trailer over the Frac Shack System was that AFD's trailer was more mobile and could be situated after the other fracturing equipment was assembled. Additionally, he thought that the company was easier to deal with regarding business issues. He testified that, in 2014, if the AFD Frac Trailer was not available, Trican would choose to manually hot refuel.

[73] On cross-examination, Mr. Ohman admitted that he was unaware that the Frac Shack had a more mobile trailer-mounted unit. He also admitted that it is not in Trican's interests to get a fracturing job done faster, because their pricing depends on the length of time spent at the frac site. When asked to identify an email chain, to which he was copied, where Trican was asking Frac Shack for reduced pricing, he could not remember whether he had read the email.

[74] Mr. Ohman testified in a straightforward and matter of fact manner. However, he admitted that he could not remember, or did not know, many of the details of Trican's operations during 2014.

B. *Dennis Brodersen*

[75] Mr. Brodersen is the owner of Legacy Petroleum. He explained that the current business of Legacy Petroleum is to look after and refuel fuel stations in Wildwood, Edson, Hinton,

Grande Cache, and a remote fuel site. He stated that the fueling station at Grande Cache is a "card lock", which is a fueling station that comprises remote tanks with sensors that record fuel levels and payments. He testified that the Legacy Petroleum services any industry that burns diesel fuel or gas (e.g., farmers, rigs, road construction, frac sites, and others).

[76] Mr. Brodersen stated Legacy Petroleum has been involved in manual hot refueling at frac sites, since 2006, and is currently a contractor for Trican. He explained that, today, fracturing equipment runs 24 hours-a-day and to help mitigate safety hazards at the site, his company sets up "T manifolds" that split the large refueling hose into smaller lines, which allows the operators to minimize their time in the hot zone. He related that the "T manifolds" would be hooked up to have up to ten lines, and that various lines could be isolated if they were unnecessary for a particular fueling job.

[77] He testified that, although Legacy Petroleum would be responsible for bringing in the fuel and setting up the "T manifolds", most fracturing companies, such as Trican, would have workers on site to perform the actual manual hot refueling. He estimated that he has been involved in thousands of manual hot refueling operations, since 2006, including over 500 jobs for Trican, in 2014. He stated that he had never been shut down because of a safety incident.

[78] On cross-examination, Mr. Brodersen admitted that Legacy Petroleum is only in the business of selling fuel, and that their workers are not the ones taking safety risks during manual hot refueling. He also expressed that minor diesel spills or sprays are not, in his opinion, a significant safety issue.

[79] Other than his opinion on this last safety issue, involving diesel spills or sprays, I found the witness to be credible.

C. *Michael Power*

[80] Mr. Power is the Vice-President, Pacific Region of AFD, having started with AFD in 2005 as an Operations Supervisor at Fort McMurray. At Fort McMurray, he supervised the operation to provide fuel to the Canadian Natural Resources Limited, Horizon facility.

[81] In 2010, he became the Petroleum Systems Manager at Fort Saskatchewan, where he was responsible for managing the complicated fuel tank, "lubetainer", and/or above-ground hydrocarbon separator builds. He explained that a lubetainer was a large shipping container with multiple fuel tanks, pumps meters, filters, and valves inside, from which fuel could be dispensed.

[82] In 2012, Mr. Power became the Vice-President of Business Development at AFD. He testified to the corporate history of AFD, describing that the two most significant events in AFD's recent history were the acquisition of a company located in Fort McMurray, and AFD's entrance into the retail fuel market. He also explained that, in both 2014 and 2015, AFD had been named one of Canada's Best Managed Companies, as well as one of Canada's Safest Employers in the transportation category.

[83] He stated that AFD's business focus is fueling oil and gas, industrial, pipeline, and road construction operations. He testified that AFD's guiding principle is to provide superior

customer service, combined with innovative equipment and technology, particularly to remote locations.

[84] On cross-examination, Mr. Power stated that he had been to the Global Petroleum Show in 2010, 2011, and 2012. Additionally, he admitted that he saw the Frac Shack System on display in 2012, and "stood at the door on one of the years talking to Mike Lovin", who was a former employee of AFD, and in 2010 to 2012 employed with Frac Shack.

[85] Mr. Power was a straightforward and credible witness.

D. *Dale Reimer*

[86] Mr. Reimer is the Vice-President, Prairie Region for AFD. Prior to joining AFD, he worked at DFI Corporation ("DFI", now DFI Inc.), a company whose business is primarily pile driving and foundations. While at DFI he was involved with building DFI's pipe mill, and managing the pipe mill's production.

[87] A few years after moving to AFD, he became a Manager in the Tank Division at Fort Saskatchewan. While managing the Tank Division, Mr. Reimer was responsible for sourcing parts and components for AFD products, and deploying equipment into the field. In 2013, he moved to his current position, where he manages five local branches of AFD, including the tank division.

[88] He stated that he was involved in the design and manufacture of the AFD Frac Trailer, and that before working on that project he had no experience with fracturing operations. He testified that the first idea that the AFD designers considered was to try to connect a main fuel tank to the supply line of the engine, and that this idea was rejected because it would require the company to modify a global fleet of equipment. He described AFD's tank sensor, pump, and overfill protection systems and explained that he went to the online sites of many equipment companies, such as Landel Controls and Banner, to find the components for the AFD Frac Trailer.

[89] He explained that the manual valve on the AFD Frac Trailer is an isolation valve that is used during repairs. To his knowledge, this valve is not used to start or stop the fuel flow into the tank of any frac equipment. He also testified that the "automatic feature" on the AFD Frac Trailer was disabled or removed, in October 2014, before the trailer was removed to Texas. He stated that this feature was removed because of the current litigation, and that the AFD Frac Trailer subsequently was the "manual version" of the trailer. The trailer had been moved to Texas because AFD had been having difficulty finding work for the trailer in Canada.

[90] He agreed, on cross-examination, that the valves in manual version of the AFD Frac Trailer are opened and closed by a worker pushing a button on the control panel—that is, the valves are opened and closed remotely via an electronic signal, and not by a worker physically interacting with the valve mechanism itself. He admitted that the AFD Frac Trailer may have had the "automatic features" enabled once it was in Texas.

[91] Mr. Reimer also described the adapter unit, which is the component that sits at the end of each of the fuel hose and connects to the equipment fuel tank. He stated that this component was also redesigned for the Texas market, removing the “J hooks” and replacing that method of securing the adaptor with rope and bungee cords. On cross-examination, Mr. Reimer agreed that AFD had sometimes called their adapter unit a cap, and that it functioned to hold the sensor, which determined the fuel level in the tank, and to be a universal connector between the hose and the tank.

[92] Since the design and construction of the AFD Frac Trailer needed to get regulatory approval, the company hired engineers, with the appropriate stamps, to engineer and build the trailer. The final assembly of the trailer occurred in March 2013. Mr. Reimer testified that the capital expenditure for the AFD Frac Trailer was over one million dollars, not including the business impact caused by the loss of a tank from their fleet during the construction of the trailer. He also estimated that AFD had spent approximately 60,000 dollars on operational costs (i.e., hotels for operators etc.) and 200,000 dollars in repair costs for the trailer, while it was still in Canada.

[93] Mr. Reimer stated that, in March 2013, AFD was marketing the trailer to all of the fracturing companies and oil companies. He recounted that the initial response was skeptical, because no one really wanted to be the first to try it, and that to entice Trican, with whom they already had a business relationship, to use the AFD Frac Trailer they offered it free of charge. Additionally, even though they got some interest from other companies in 2014, Trican had a

“good grip” on the unit, such that they were unable to use the AFD Frac Trailer for other customers.

[94] He testified that AFD continues to do manual hot refueling, and that the market for manual hot refueling is still fairly robust. However, on cross-examination, he admitted that AFD’s customers were requesting a safer refueling method than manual hot refueling and that there were specific requests to build something like the AFD Frac Trailer.

[95] He agreed, on cross-examination, that AFD was marketing their trailer as an “innovative system” that would increase worker safety by minimizing exposure time around the hot zones. Further, Mr. Reimer identified documents, submitted to the Canadian Government by AFD in 2013 for the purpose of obtaining a research and development grant for the AFD Frac Trailer (a Scientific Research and Experimental Development Tax Incentive Application or “SR&ED Application”), explicitly stating that there were obstacles to overcome and innovation required in designing the trailer.

[96] AFD, in their SR&ED Application, also represented that hot manual refueling was ineffective and dangerous due to hazards including fire, machinery shutdown, fuel spills, and worker health and safety. Additionally, Mr. Reimer identified a video, which was also included in the grant submissions, of frac equipment on fire at a fracturing site, and agreed that the purpose of the video was to show that fueling accidents and fuel spills during fracturing could lead to very serious consequences. On re-examination, he stated that he did not know how the fire in the video was started.

[97] Finally, Mr. Reimer admitted that AFD had received a cease and desist letter from Lambert Law, who were acting for Frac Shack in 2012, with regards to the AFD Frac Trailer, and that the company nevertheless pushed ahead with its development.

[98] Mr. Reimer was a straightforward and credible witness.

E. *Mark Bader*

[99] Mr. Bader is the Area Manager for Grande Prairie for AFD. He started with AFD in 2004, left the company in 2012 to work for All Peace Petroleum, and returned to AFD in Grande Prairie, in 2014. As the Area Manager, his task is to do sales and solicit business from customers who are in a business that needs fuel, such as construction companies, logging companies, oil rigs, and pipeliners.

[100] He stated that his first job involving fueling fracturing operations was in the fall of 2009 for the frac company Schlumberger, who was contracted for by Quicksilver Resources. He explained that at that time AFD was doing wheel-to-wheel manual hot refueling, an operation where they would bring a fuel truck to the site and fuel each pumper directly, moving the truck as necessary to access the equipment and waiting between each refueling. The fuel truck was pulled up to the front of the tractor units for each refueling.

[101] Mr. Bader testified that, during 2010, AFD designed some other systems as an alternative to wheel-to-wheel manual hot fueling. One of these systems involved the “octopus”, which comprised a main line that would deliver fuel to a series smaller hoses set up on “T manifolds” at

the front of the tractor units. On cross-examination, he explained that this system still required a worker to go into the hot zone between the pumpers, but mitigated the hazards associated with pulling heavy hoses from tank to tank.

[102] He testified that he had managed a site on which the AFD Frac Trailer had been used, and described one fuel spill that occurred during the operation of the trailer. He explained that the operators of the trailer had changed tank probes, and the volume of fuel had sucked down past the bottom of the probe, meaning that the refill of the tank had to be done manually and the operator overfilled the tank.

[103] On cross-examination, he identified a document outlining fracturing site job hazards. He agreed that it instructed the operators to attach hoses securely, to check that no leaks or spills are occurring, and to secure all fill caps.

[104] Mr. Bader was a credible witness.

F. *Curtis Small*

[105] Mr. Small is the Senior Area Manager, Fort McMurray for AFD. He started working for AFD in 2011, as the Area Manager for Hinton. In Hinton, he was responsible for overseeing the completion of a card lock (described above), and evolving AFD's business and customer base.

[106] He testified that Trican was one of AFD's customers who frequently used the card lock in Hinton. He stated that AFD supplied fuel from the start to finish on a well side for a number of

oil and gas customers, and that AFD was fueling fracturing equipment from the Hinton terminal in 2012 and 2013. At that time, the refueling was done through manual hot refueling.

[107] Mr. Small explained that the AFD Frac Trailer came to the Hinton yard in the first quarter of 2013, for the purposes of showing it to customers such as Baker Hughes. He testified that Baker Hughes did not use the AFD Frac Trailer, so AFD took the trailer to Trican's yard. He could not remember exactly when the trailer was moved to Trican.

[108] He stated that, during March or April 2014, AFD's Hinton terminal was still providing manual hot refueling for Trican because the AFD Frac Trailer was in use by Trican at another location. He recalled that it was Trican's dispatch that contacted the Hinton terminal about manual hot refueling. He was unaware as to whether AFD did any manual hot refueling for Trican in 2015.

[109] Mr. Small was a straightforward and credible witness.

VII. AFD Expert Witnesses

A. *Richard N. Berry*

[110] Mr. Berry is a professional engineer in the State of Texas and the President of Richard N. Berry, P.E., Inc., a company that provides engineering services in the area of fuel systems and environmental engineering. He received a B.Sc. in Civil Engineering from Texas A&M University, in 1983.

[111] In 1992, he began working in the refueling industry, where he designed, installed, and remediated fuel storage tanks. In 1995, he began teaching a course on underground storage tank installation and removal at Texas A&M Engineering Extension Service. Since starting Richard N. Berry, P.E., Inc. in 2000, Mr. Berry has specialized in the design of fuel storage and dispensing systems. He has designed fuel systems for a wide variety of end applications including: aviation, emergency generators, boilers at industrial facilities, rock quarries, and automotive service stations.

[112] Mr. Berry was qualified as an expert in the design and construction of fuel storage and dispensing systems. A *Mohan* objection was made to any of his testimony, on the basis that he had no expertise at all in fracturing operations at well sites.

B. *Andrew Colin Harington*

[113] Mr. Harington is a Principal in the Toronto office of the Brattle Group, and a part of their Litigation and Financial Advisory Practice. He received a B. Comm. (Hon.) and a Post Graduate Diploma in Accounting from the University of Cape Town, in 1992. He is a Charter Professional Accountant, a Chartered Financial Analyst, and a Chartered Business Valuator. Prior to joining the Brattle Group, he was a Managing Director at Duff & Phelps Canada Limited (which used to be Cole Valuation Partners Limited).

[114] Mr. Harington has been in the accounting profession for over 23 years, of which over 16 years have been dedicated to the practice of business and intellectual property valuation, and damages quantification. He is the co-author of a chapter on Monetary Relief – Quantum in

Ronald E. Dimock ed., *Intellectual Property Disputes: Resolutions and Remedies* (Carswell, 2012); and is the author of two monographs on damages and accounting of profits in intellectual property cases, published by Duff & Phelps Canada Limited. He has appeared as an expert witness numerous times, before both the Federal Court and the Ontario Superior Court of Justice.

[115] Mr. Harington was qualified as a Chartered Accountant, a Chartered Business Valuator, and a Chartered Financial Analyst with expertise in investigative and forensic accounting, business valuation and loss quantification in commercial and intellectual property disputes.

VIII. Preliminary Issues – Admissibility of the Expert Reports

A. *Infringement and Validity Reports of Douglas Smith and Kevin Matiasz*

[116] The Defendant argued that portions of the expert reports written by Mr. Smith and Mr. Matiasz failed to meet the requirements for admissibility set out in *R v Mohan*, [1994] 2 SCR 9 [*Mohan*]; and that portions of their validity reports are improper reply evidence.

[117] The Defendant submits that the following portions of Mr. Smith's reports should be struck:

a. Construction and Infringement Report ("Smith Report 1") – paragraphs 8, 30 to 41, and appendices A to C; and
b. Validity Report ("Smith Report 2") – entire report.

[118] The Defendant submits that the following portions of Mr. Matiasz's reports should be struck:

a. Construction and Infringement Report ("Matiasz Report 1") – paragraphs 10 to 17, 41 to 73, and appendix E; and
b. Validity Report ("Matiasz Report 2") – entire report.

(1) *Mohan* Objection

[119] In *Mohan*, the Supreme Court of Canada stated, at page 20, that "admission of expert evidence depends on the application of the following criteria: (a) relevance; (b) necessity in assisting the trier of fact; (c) the absence of any exclusionary rule; and (d) a properly qualified expert". The expert, to be properly qualified, must have "acquired special or peculiar knowledge through study or experience in respect of the matters on which he or she undertakes to testify" (*Mohan* at 25). Further, to be necessary in assisting the trier of fact, this knowledge must relate to material issues that are technical in nature and beyond the experience and knowledge of the Court (*Uponor AB v Heatlink Group Inc*, 2016 FC 320 at para 138 [*Uponor*]).

[120] A qualified expert's task is to help the Court understand who a POSITA is, what he or she would know at the relevant time (i.e., the common general knowledge), and construction issues surrounding the patents in suit. Witnesses on the subject need not be a POSITA themselves, so long as they can provide appropriate evidence to what a POSITA would have known (*Janssen-Ortho Inc v Novopharm Limited*, 2006 FC 1234 at para 90; *Halford v Seed Hawk Inc*, 2006 FCA 275 at para 17).

[121] The Defendant submits that, although Mr. Smith and Mr. Matiasz have expertise regarding what happens at a fracturing site, neither has expertise in designing fuel systems. Thus, the Defendant contends that neither expert is properly qualified to provide an opinion on the ‘567 Patent, because the patent relates to a fuel delivery system and a method of delivery. The Defendant asserts that the ‘567 Patent does not relate in any way to how fracturing operations are conducted.

[122] The Plaintiffs argue that the context of fracturing at a well site is a key component of the ‘567 Patent. They submit that the language of the disclosure, and the discussion of fracturing therein, narrows the application of the ‘567 Patent, such that the application of the technology should be limited to a fracturing site, or at the least to oil and gas applications at a well site.

[123] Further, the Plaintiffs point out that Mr. Matiasz has designed fuel delivery systems, understands fueling requirements during a fracturing operation, and has experience with manual hot refueling and the safety considerations involved in fueling. They also contend Mr. Smith was tendered as an expert in health and safety at fracturing sites, and suggest that, although he may not be a POSITA in the context of the ‘567 Patent, he could provide the court with evidence as to what a POSITA would have known about health and safety at a fracturing site.

[124] Mr. Matiasz certainly has technical knowledge, beyond the experience of the Court, relating to material issues in this action. He is a qualified expert in the areas of fueling at fracturing sites, completions engineering in the oil and gas industry, and in fuel delivery to fracturing equipment at a well site. Similarly, Mr. Smith is an expert in the area of environment,

health and safety on a fracturing site, and in fueling in general, which qualifies him to opine on fueling equipment that may improve health and safety at a well site, which is at the least relevant to alleged inventive elements disclosed in the ‘567 Patent. As such, the Defendant’s *Mohan* objection fails.

(2) Improper Reply Evidence

[125] It is clear that, to the extent reply affidavits engage in case-splitting, argument or are repetitive, they are improper (*AstraZeneca Canada Inc v Novopharm Limited*, 2009 FC 902 at para 26; *Merck-Frosst v Canada (Health)*, 2009 FC 914 at paras 22 to 25).

[126] The Defendant argued that the Plaintiffs had improperly split their case by submitting the following portions of the Smith and Matiasz Validity Reports:

a. Smith Report 2 – paragraphs 3 to 5, 54 to 91, and 106 to 110; and
b. Matiasz Report 2 – paragraphs 6 to 8 and 44 to 45.

[127] The Plaintiffs submit that the schedule set out before trial, in addition to two Orders of Case Management Judge Lafrenière—dated August 5, 2016 and September 26, 2016—gave them explicit permission to provide the evidence tendered in the Smith and Matiasz Validity Reports as reply evidence. They claim that all of the information presented in the paragraphs in dispute was in direct response to new information provided by the Defendant; to the amendments made by the Defendant to the Statement of Defence and Counterclaim (the Twice Amended Statement of Defence and Counterclaim); and/or as allowed in the original schedule, which had them exchanging rebuttal expert reports on validity and a reply on construction.

[128] The Plaintiffs argue that the Defendant was effectively asking the Court to parse large chunks of both reports to determine whether each paragraph falls within the scope of proper reply.

[129] Given that the Plaintiffs were allowed to file rebuttal expert reports on validity, and that the paragraphs in dispute contain information relating to the identity of the POSITA, the common general knowledge known by the POSITA, and the state of the art at the relevant time, this is not a clear instance of case splitting. Finally, while there may be some small amount of repetition in the description of the process of fracturing, admitting those potions into evidence causes no prejudice to the Defendant and does not affect the outcome of my decision.

B. *Expert Report of Richard Berry*

[130] The Plaintiffs also raise a *Mohan* objection to Mr. Berry's expert report ("Berry Affidavit"), claiming that he was not a properly qualified expert. They argue that Mr. Berry's lack of experience in fracturing made him a witness who is a generalist, and while he may have more knowledge than an ordinary trier of fact on refueling operations generally, he lacks a sufficient degree of knowledge in the particular subject matter (refueling during fracturing operations at well sites) to be a qualified expert. They stated that Mr. Berry's knowledge could not give the Court real assistance, because it was divorced from the context of fracturing and of the '567 patented invention.

[131] The Defendant contends that the invention disclosed in the '567 Patent has a broader application than just at fracturing sites. They highlighted the fact that claims 16, 20, and 32 are

not limited to fracturing sites, but extended to "work sites" generally, and argue that even the inventors of the '567 Patent did not have any significant prior experience with fracturing operations. They state that the art of the '567 Patent is related to fuel delivery systems and methods for fuel delivery, areas in which Mr. Berry is indisputably an expert.

[132] The Defendant correctly identifies claims in the '567 Patent that are not limited to fracturing operations at well sites. Given that a work site is certainly broader than a well site, and that Mr. Berry does have knowledge and experience in fuel systems and fuel delivery at generic work sites, he does have knowledge and experience about certain matters upon which he proposed to testify. Thus, he meets the threshold to qualify as an expert, at least insofar as the '567 subject matter extends to work sites generally.

C. *Conclusion – Preliminary Issues*

[133] Based upon the above, no parts of the expert reports are struck from evidence. Any deficiencies in the experts' knowledge and experience as they relate to specific construction issues, what a POSTIA would know at the relevant dates, and the applicable common general knowledge have been considered in weighing their evidence as discussed below.

IX. Claim Construction

[134] Construction is a question of law for the Court alone, and should be done before considering infringement or validity. The same interpretation of the claims applies to both

infringement and validity (*Pfizer Canada Inc v Canada (Minister of Health)*, 2005 FC 1725 at para 10, aff'd 2007 FCA 1).

[135] The Supreme Court of Canada determined the canons of claim construction in a trilogy of cases: *Whirlpool Corp v Camco Inc*, 2000 SCC 67 at paragraphs 49 to 55; *Free World Trust v Électro Santé Inc*, 2000 SCC 66 at paragraphs 44 to 54 [*Free World Trust*]; and *Consolboard Inc v MacMillan Bloedel (Saskatchewan) Ltd*, [1981] 1 SCR 504 at paragraph 27 [*Consolboard*].

[136] These decisions state that:

a. claims are to be read in an informed and purposive way, with a mind willing to understand and viewed through the eyes of a POSITA, as of the date of publication, having regard to the common general knowledge;
b. adherence to the language of the claims allows them to be read in the manner in which the inventor is presumed to have intended, and in a way that is sympathetic to accomplishing the inventor's purpose, which promotes both fairness and predictability; and
c. the whole of the specification should be considered, in order to ascertain the nature of the invention, and the construction of the claims must be neither benevolent nor harsh, but instead should be reasonable and fair to both the patentee and the public.

A. *Relevant Date*

[137] The relevant date for construing the claims of the '567 Patent is the publication date: October 21, 2010.

B. *Person of Skill in the Art (POSITA)*

[138] Both Mr. Smith and Mr. Matiasz stated that the POSITA would be a person who has experience with field operations at well sites, including hydraulic fracturing sites. Their POSITA would also have experience refueling fracturing equipment, such that he or she understands the hazards and risks of refueling, and would know the critical consequences in the event that equipment runs out of fuel. They both contend that a POSITA could, but need not necessarily, have post-secondary education, likely in an engineering field.

[139] Mr. Smith opined that the POSITA would have knowledge of equipment design, and background on the safety issues at a well site. Mr. Matiasz asserted that the POSITA would have experience in designing and operating equipment. Mr. Matiasz testified that this design experience was not necessarily specific to fluid delivery, and that any design experience that gave the POSITA an appreciation for how fracturing equipment operates would suffice. However, on cross-examination, he admitted that the POSITA would likely have experience designing and operating fueling systems.

[140] Mr. Berry stated that a minimum requirement for a POSITA would be a degree in engineering, or an equivalent post-secondary degree, with courses in fluid flow dynamics and at least four years of experience under the supervision of an engineer experienced in fuel storage and dispensing systems. A POSITA, in his opinion, would have field experience, and knowledge of the processes involved in fabrication, installation, and start-up of fuel systems. Mr. Berry

contended that it would be critical for the POSITA to have field experience because without such experience, the POSITA would be unable to assess whether a design is appropriate.

[141] All three experts opined that a POSITA would have some knowledge and experience with equipment design. However, they disagreed as to the amount of said experience, and the specific areas of experience. Mr. Berry asserted that the POSITA would not need to have specific experience in refueling fracturing equipment, whereas Mr. Matiasz and Mr. Smith both stated that it was essential for a POSITA to understand the environment of a fracturing pad.

[142] I agree with Mr. Matiasz and Mr. Smith that a POSITA would be an individual with an understanding of the hazards associated with refueling fracturing equipment. However, there is no evidence to support their claim that a POSITA must have experience actually refueling fracturing equipment. I disagree with Mr. Matiasz that any experience with designing fracturing equipment will suffice. The ‘567 Patent is directed to a fuel delivery system; therefore, a POSITA would have some experience designing fueling equipment for the applications covered by the ‘567 Patent, namely refueling equipment used in fracturing operations at a well site.

[143] Further, I disagree with Mr. Berry that a POSITA would have a minimum of a post-secondary degree in engineering or a similar field. The evidence of Mr. Reimer, who testified that he sourced many of the components for the AFD Frac Trailer, supports the finding that a POSITA could have significant experience in the oil and gas industry in lieu of post-secondary education.

[144] Having considered all the evidence before the Court, I find that a POSITA, in the context of the ‘567 Patent, would:

a. have a post-secondary degree in engineering or a similar degree, and some practical experience with fracturing operations, such that he or she had a clear understanding of the hazards associated with fueling and refueling fracturing equipment; or
b. have no formal degree, but significant (five to ten or more years) experience in the oil and gas industry, and specific experience with the operation and refueling of fracturing equipment, such that he or she had a clear understanding of the hazards associated with fueling and refueling fracturing equipment.

C. *Common General Knowledge*

[145] Common general knowledge is the knowledge generally known by the POSITA at the relevant dates when considering obviousness and construing the patent’s claims.

[146] What comprises common general knowledge has been articulated by this court in *Eli Lilly & Co v Apotex Inc*, 2009 FC 991, affirmed in 2010 FCA 240, at paragraph 97 (adopted from *General Tire & Rubber Co v Firestone Tyre & Rubber Co*, [1972] RPC 457 (UKHL) at 482 to 483):

> 1) Common general knowledge is distinct from what in patent law is regarded as public knowledge. Public knowledge is theoretical and includes each and every patent specification published, however unlikely to be looked at and in whatever language it is written. Common general knowledge, in contrast, is derived from a common sense approach to the question of what would be known, in fact, to an appropriately skilled person that could be found in real life, who is good at his or her job.
>
> 2) Common general knowledge will include patent specifications that are well known amongst those versed in the art. In particular industries, the evidence may show that all patent specifications form part of the relevant knowledge.
>
> 3) Common general knowledge does not necessarily include scientific papers, no matter how wide the circulation of the relevant journal or how widely read the paper. A disclosure in a

> scientific paper only becomes common general knowledge when it is generally known and accepted without question by the bulk of those engaged in the particular art.
>
> 4) Common general knowledge does not include what has only been written about and never, in fact, been used in a particular art.

[147] Mr. Berry expressed the view that the common general knowledge at the relevant time, for both claim construction and assessing obviousness included:

a. common types of fuel and the codes applicable to those fuels;
b. certain common types of fuel dispensing systems;
c. common types of equipment used in fuel dispensing systems and the manufacturers of that equipment; and
d. common design approaches and methods, including calculations required to design fuel dispensing systems.

[148] Mr. Berry also opined that a POSITA would know about the material requirements for different types of fuel, and the various codes that are applicable to the construction of fuel storage and dispensing systems (e.g., NFPA 30, NFPA 70, NFPA 407, and NFPA 418). Mr. Berry stated that health and safety regulations and best design practices would be part of the common general knowledge, but did not express that specific experience in fracturing operations was necessary.

[149] Mr. Smith opined that a skilled person would have knowledge of manual hot refueling, the types of equipment that would require fueling on a fracturing site, and the hazards associated with hot refueling. He stated that well site regulatory requirements, oil and gas industry recommended practices, well site hazard mitigating practices, and transportation of dangerous goods regulations would also be part of the common general knowledge.

[150] Mr. Smith disagreed with Mr. Berry that a person could be considered a POSITA without knowledge of the unique environment at a fracturing site. Further, he disagreed that the common general knowledge would include knowledge of fuels beyond Class II fuels (i.e., the class of fuels to which diesel belongs) because gasoline, avgas, and/or propane are not used as fuel sources for hydraulic fracturing. He also disagreed that the codes referred to by Mr. Berry would be part of the common general knowledge because many of those standards refer to fixed fueling installations. Finally, he stated that knowledge of common refueling systems, such as aviation fueling systems and commercial fueling systems, would not be part of the common general knowledge since those environments are different from and not relevant to refueling on a fracturing site.

[151] Mr. Matiasz stated that the common general knowledge would include knowledge of fracturing operations and the nature in which fracturing equipment operates. Manual refueling and manual hot refueling are fueling systems that would be part of the common general knowledge. He agreed with Mr. Smith that aviation refueling systems would not be part of the common general knowledge, because it is both a different fuel type and a fixed installation. Similarly, retail fueling systems and generator systems would not be part of the common general knowledge.

[152] The Defendant argues that the experience of the inventors showed that knowledge of fracturing would not be part of the common general knowledge of a POSITA. The Defendant submits that the inventors, who were the principals at ERS, all had fueling experience, but not fracturing experience. Further, the Defendant points out that Mr. Reimer, one of the designers

and manufacturers of the AFD Frac Trailer, had no personal experience with fracturing equipment or knowledge of the downhole consequences of fracturing equipment running out of fuel.

[153] I disagree with Mr. Berry and the Defendant's position that knowledge of fracturing and refueling of fracturing equipment would not be part of the common general knowledge of the POSITA. The fact that the inventors needed to hire a consultant to obtain information about fracturing operations, and that Mr. Reimer was working on a team that had knowledge of refueling during fracturing, indicates that the POSITA would have some knowledge of fracturing operations. Additionally, I find Mr. Berry's opinion on what constitutes the common general knowledge unpersuasive, given his lack of knowledge and experience with fracturing on well sites.

[154] Based upon the evidence given by the fact witnesses and the expert witnesses, the common general knowledge at the relevant date for the '567 Patent would have included:

a. general knowledge of fracturing operations, and the fracturing pad environment;
b. knowledge of the hazards associated with fueling, particularly the hazards associated with manual hot refueling systems;
c. general knowledge about Class II fuels; and
d. knowledge of regulatory requirements associated with transporting and supplying fuel at temporary fueling installations.

D. *Prior Art*

[155] Mr. Berry opined that the types of fittings and components used in fuel storage and dispensing systems available in 2010 had been in use and available for decades. Additionally, he stated that determining the appropriate components and layout for a fuel dispensing system

would be standard and ordinary practice for a skilled engineer, because ultimately it is simply a mass-balance problem. Therefore, he opined that existing multipoint fuel dispensing systems, such as those used at retail service stations and for generator systems, would be relevant prior art.

[156] The Defendant submits that the AFD "octopus system", which was described by Mr. Bader as a series of "T manifolds" that split a main line onto smaller hoses is relevant prior art. This octopus system minimized the time that operators had to be in the hot zone—depending upon their route to approach the fuel tank—and mitigated hazards associated with dragging heavy hoses between the fracturing equipment. The AFD octopus system, therefore, allowed manual hot refueling to be performed in an easier, more efficient, and safer manner than manual hot refueling with a single hose.

[157] As set out in the Berry Affidavit, and at paragraphs 10 to 13, 15, and 17 to 19 of the Twice Amended Statement of Defence and Counterclaim, the Defendant argues that fuel delivery systems for delivery of fuel to multiple fuel tanks of equipment or vehicles were well known prior to 2010. These systems included: (1) a fuel source tank; (2) a line between the source tank and a manifold/header; (3) valves on the manifold/header to control flow downstream of the manifold/header; (4) hoses or lines leading from the valves to the equipment/vehicles being refueled; and (5) a connection between the equipment/vehicle fuel tank and the hoses/lines. Therefore, the Defendant contends that the '567 Patent uses common equipment and components, in a common layout, to achieve a known, intended and predicable result. My decision on the relevance of the alleged prior art is dealt with below.

E. *Claim Terms Needing Construction*

[158] The experts agreed that most of the terms in the ‘567 Patent should be given their ordinary meaning. However, there were a number of terms that needed to be construed by the Court as used in the context of the ‘567 invention: “automatic”, “fuel cap”, “work site”, “valve arrangement”, and “pump on the line”.

(1) Automatic

[159] Claims 8, 11, 16, 20, and 32 refer to automatically operable valves, and automatic fuel delivery. Paragraph 15 of the disclosure states that

> In an embodiment with automatically operating valves 58, the control station 56 may comprise a conventional computer, input device (keyboard) and display or displays. In a manual embodiment, the operator may be provided with a valve control console with individual toggles for remote operation of the valves 58, and the valve control console, or another console, may include visual representations or displays showing the fuel level in each of the tanks.

[160] Paragraph 22 of the disclosure states:

> During re-fueling at a fracturing job, the manual valves 28 may remain open, and the operator may electrically signal the automatic valves 58 to open, using an appropriate console (not shown) linked to the valves 58.

[161] Mr. Berry opined that automatic fuel delivery means a system that is designed to operate without any need for human intervention to start or stop the flow of fuel in the system. He stated that it is the controller that starts or stops the fuel flow, upon receiving a signal from the fuel

level sensor. In contrast, in his opinion, an operator giving any input to the system would result in a manual fuel delivery system, and if the operator needed to push a button to open or close a valve, then this would be a manually operable valve.

[162] Mr. Smith asserted that a POSITA would understand the terms automatic and automatically in the context of a system that is replacing the manual refuelling method. He opined that the purpose of the automatic feature is to negate the requirement that an operator be at the fuel tank during the fueling process. Therefore, automatic means any method of remotely opening a valve that does not involve the operator physically operating the valve mechanism.

[163] On cross-examination, Mr. Smith explained that he believed an automatic fueling system could be divorced from automatic valves. That is, an operator could be getting information from an automatic system, but manually opening valves to dispense the fuel. He stated that his definition of automatic was any system where information from tank sensors informed either the programmed logic controller or an operator to start or stop fueling. However, he admitted that this definition was at odds with paragraph 15 of the disclosure.

[164] Mr. Matiasz agreed with Mr. Smith that the POSITA would understand the term automatic in reference to manual hot refueling. He stated that automatic fuel delivery is fuel delivery provided through electrically operable valves. These valves operate automatically whether they are actuated by a controller or by an operator. In comparison, a manual valve actually requires the operator to go to the valve and physically turn it open or closed.

Interestingly, the Defendant's closing submissions adopt Mr. Matiasz's definition of a manually operable valve as being one that is operated by turning the handle on the valve.

[165] Mr. Matiasz asserted that "in other words, 'automatic' in the '567 Patent means 'remote' and the term is used in contrast with the manual refueling method …". He disagreed with Mr. Berry's interpretation of automatic versus manual. He opined that a system where an operator pushes a button to start or stop fueling is an automatic system, so long as that button sends an electronic signal to the valve, causing it to open or close.

[166] On cross-examination, Mr. Matiasz admitted that there was a typo in his report, and that the statement "allows fuel delivery at the fracturing site to be conducted without an operator adjusting valves at the fuel tank on the equipment" describing automatic fuel delivery, should have read "without an operator adjusting valves at the manifold". However, he remained steadfast in his opinion that any valve that opened or closed by means other than direct physical intervention by an operator was an automatically operable valve.

[167] Paragraph 15 of the disclosure in part refutes to Mr. Smith's opinion that simply receiving information from a sensor made the fueling system automatic, and Mr. Matiasz's opinion that automatic is synonymous with remote. However, paragraph 22 of the disclosure clearly distinguishes manual valves from electrically controlled automatic valves, which tends to support a purposive construction favouring the Plaintiffs' experts' view of what constitutes automatic refueling.

[168] Further, claims 9, 12, and 26 disclose a system in which the controller is responsive to a low fuel level signal from each fuel tank to start fuel flow independently of flow to other tanks, and a high level signal to stop fuel flow. This suggests that this is an additional and distinct type of valve control by the controller on top of the level of control that is disclosed by the language automatically operable valves.

[169] Therefore, in the context of the ‘567 Patent, taking into account the testimony of the experts, and giving the term a purposive construction, I find that the term “automatically operable valves” means any valve that is operated remotely via an electric signal. Similarly, I find that the term “automatic fuel delivery” means fuel delivery that does not require an operator to stand at a fuel tank with the fuel hose—i.e., manually refuel in the hot zone of a fracturing site—and can be delivered by remote control of automatic valves that control fuel flow via hoses attached to the equipment tanks..

(2) Fuel Cap

[170] Claims 1, 5, 7, 10, 13 to 15, 17, 20, and 24 refer to a fuel cap that connects a hose onto a respective one of the fuel tanks for delivery of fuel.

[171] The fuel cap is described in paragraph 14 of the disclosure as follows:

> Each fuel cap 26 is provided with a coupling for securing the fuel cap 26 on a tank 12, and this coupler usually comprises a threaded coupling. The fuel cap 26 comprises a throat 44, threaded in the usual case from threading onto the fuel tank 12, and top end 46.

[172] Mr. Berry opined that the common understanding of a fuel cap would be a device used to close off the fuel tank to prevent unwanted objects from entering the tank and to prevent fuel from spilling out of the tank. He stated he had never heard the term "fuel cap" used to describe something that does not have either a threaded or twist lock coupling, and is secured by that coupling alone. Therefore, in his opinion, a POSITA would consider it to be a requirement that the fuel cap has a coupling that mechanically seals the cap to a corresponding coupling on the fuel tank. However, when asked during direct examination to explain the term coupling, Mr. Berry stated only that a coupling was "some way of mechanically attaching a fuel cap", with no reference to the idea of sealing the tank. Finally, he asserted that the POSITA would interpret fuel cap to be interchangeable with fuel delivery connection (found in claims 16 and 32).

[173] Mr. Smith agreed with Mr. Berry that the purpose of the fuel cap would be to close off the fuel tank to prevent debris from entering the tank and to prevent spills. However, he disagreed that a cap would need to have a threaded or a twist lock coupling. He stated that there were multiple effective methods to secure caps in place, including expansion plugs and bars across the top of the cap. He further disagreed that the fuel cap must provide a mechanical seal, because it is not used during transportation. He opined that an unsealed cap could also prevent accumulation of debris and spills, and pointed out that paragraph 14 of the disclosure only references the fuel cap "preferably" sealing the tank.

[174] Mr. Matiasz stated that the fuel cap serves the dual purposes of securing the hose and fuel sensor onto the fuel tank and limiting contaminants from entering the tank. He opined that the fuel cap had to have a coupling to secure it to the tank, but that the coupling was not necessarily

a threaded connection, because it had to fit different types of connection throats on the tanks. He asserted that the fuel cap does not need to be mechanically sealed to the tank, but that it does need to be anchored or secured to the tank such that the hose and sensor do not slide out during fueling operations.

[175] The Defendant argues that an essential feature of the fuel cap is that it prevents spills (see claim 13, "the method of claim 11 or 12 further comprising preventing spills at each fuel tank by providing fuel flow to each fuel tank through a fuel cap on the fuel tank", and contended that to perform this function, the fuel cap necessarily had to seal the equipment fuel tank. The Defendant states that the sealing function was the purpose of the fuel cap, and noted that every example of a fuel cap used at a fracturing site discussed by Mr. Smith and Mr. Matiasz sealed the fuel tank in question.

[176] Mr. Smith opined that the fuel cap prevented spills by negating the need to insert and remove a nozzle from the fuel tank to effect refueling, and also because it houses the fuel level sensor. He also explained that one of the ways that the cap prevents spills is by eliminating the manual insertion of the hose nozzle into the fuel tank. When pressed on cross-examination as to whether the fuel cap must actually prevent spills, Mr. Smith stated that the fuel cap would not prevent spills in all instances, such as in the event of a sensor failure.

[177] Mr. Matiasz stated that the fuel cap prevents fuel spills by securing the hoses to the tanks. He reiterated that without a means of securing the hoses, they could come loose during refueling, resulting in a spill. Additionally, he noted that the fuel cap prevents spills by securing the fuel

level sensor at the properly calibrated level, which ensures that the tanks are not overfilled. He also opined that the fuel cap reduces the likelihood that there would be a fuel spill on an operator. During cross-examination, Mr. Matiasz did not waiver from his opinion that the fuel cap prevents spills by securing the hose and the sensor. In his opinion, sealing the equipment fuel tank was not necessary for the fuel cap to perform its spill prevention function.

[178] The Defendant also argues that that the term fuel cap should be construed to only include caps that are secured via threading to the equipment tanks.

[179] The Plaintiffs cite paragraph 14 of the specification which states "each fuel cap 26 is provided with a coupling … and this coupler usually comprises a threaded coupling" as evidence that the inventors of the '567 Patent contemplated other means of securing the cap. They also highlight Mr. Van Vliet's testimony that the inventors wanted their cap to be adaptable to different styles of fuel tanks, requiring them to contemplate alternate methods of securing the cap. Further, it was clear from the testimony of the experts that a POSITA would have known of numerous different means of securing a cap to the tank.

[180] Reading the '567 Patent as a whole, with a mind willing to understand, and in light of the expert testimony, I do not find that the fuel cap must seal to the equipment fuel tank to prevent spills. I find that the term "fuel cap" describes any device that is by some means anchored or secured to the throat of an equipment fuel tank, through which fuel is delivered, and which limits contaminants from entering the tank and prevents fuel spills, under normal operation, through securing the hoses to the equipment tank and positioning the fuel level sensor.

[181] Additionally, I do not find that fuel cap is synonymous with the term fuel delivery connection—one only has to read dependent claim 17, which states that fuel caps are a type of fuel delivery connection, to reasonably come to this result.

(3) Work Site

[182] Claims 16 and 32 refer to a fuel delivery system for automatic fuel delivery at a work site.

[183] Mr. Berry opined that the term work site is very broad and would encompass any facility where people work, including commercial gas stations and aviation facilities. Both Mr. Smith and Mr. Matiasz disagreed with that interpretation of what the term work site encompasses.

[184] Mr. Smith asserted that there were numerous differences between the operations at fracturing sites and at commercial gas stations or aviation facilities: for example, at fracturing sites, fueling is done while the equipment is running and equipment to be fueled is brought to specifically designated areas with access to the fuel system. He stated that the ‘567 Patent should be interpreted in the context of hot fueling, because it is directed towards mitigating hazards associated with hot fueling. However, on cross-examination he admitted that he viewed the ‘567 Patent as being directed solely to fracturing operations, and would not consider an embodiment of the ‘567 Patent, involving work sites, such as would be used in the context of generator refueling, to be an infringement.

[185] Mr. Matiasz stated that, in the context of the ‘567 Patent, work site is a “site having portable equipment that sits in a semi-stationary fashion, that requires continuous refueling during the operation of multiple pieces of equipment”. He noted that fracturing sites are unique in the way that equipment is transported to a remote location, rigged up in close proximity to other pieces of equipment, and operated 24 hours-a-day, many days in a row. In his opinion, a POSITA’s experience would lead him or her to interpret the term work site to have similar characteristics as a fracturing site.

[186] However, the Plaintiffs also argue that the term work site should be limited to oil and gas applications, and Mr. Smith and Mr. Matiasz both opined that when reading the ‘567 Patent their only focus was on fracturing operations at well sites. I cannot agree that the term work site refers only to a well site. The language of the ‘567 Patent makes it clear that well sites are different from work sites: the scope of language used in claims 1 and 11, in contrast to claims 16 and 32, leaves no uncertainty that the inventors intended well sites, involving fracturing, to be construed differently from work sites. To find otherwise would be unreasonable and more akin to reading with a mind willing to misunderstand. Further, although Mr. Smith opined that applications outside of fracturing would be non-infringing, there was no evidence before the Court demonstrating that the inventors of the ‘567 Patent, in referring to work site in the impugned claims, limited their invention to use in well sites involving fracturing.

[187] Mr. Matiasz explained that there were three stages to oil or natural gas production: drilling, completions, and production. Fracturing is done during the completions stage of operations. The fact witness and expert testimony provided evidence of the fact that fracturing

sites are a unique environment with particular hazards. It is unclear from the evidence adduced at trial as to whether that unique environment and those hazards would be reproduced in other locations. However, the evidence does show that it is the characteristics of the fracturing site—i.e., the remote, semi-permanent location, and the hazards created by the need to continuously refuel with pressurized hoses or hot fuel, in a particular environment—that are relevant to interpreting the ‘567 Patent.

[188] Since there is no support in the ‘567 Patent specification to limit or otherwise purposively construe the term work site, as suggested by the Plaintiffs’ experts, I am not prepared to do so. Consequently, the claims referencing work sites (i.e., claims 16 and 32) will be considered in terms of being overly broad, discussed below.

(4) Valve Arrangement

[189] Claims 1 and 20 disclose a “valve arrangement at [each] fuel outlet controlling fluid flow through the hose at [the] fuel outlet”. The Parties disagree as to whether all of the valves on the valve arrangement—particularly the manual valves disclosed in claims 3, 18, 22, and 37 of the ‘567 Patent—had to be used control fluid flow during operation of the unit.

[190] The Plaintiffs submit that the valve arrangement is a combination of one or more manual and/or automatic valves situated on the fuel outlet. The Plaintiffs argue that the each valve only had to provide the system with the ability to control fluid flow, but did not have to be used to control fluid flow while the unit was in operation—i.e., the valves could be safety valves that prevent fluid flow through a particular hose.

[191] The Defendant states that to control the flow, the valves on the valve arrangement must both start and stop the flow of fuel into the equipment tanks. The Defendant contends that if a valve was continuously open during operation and only closed for repairs, then it is not part of the valve arrangement.

[192] Claim 3 states “the fuel delivery system of claim 2 in which each valve arrangement comprises a manually operable valve”. Similar language is found in claims 18, 22, and 37. This language suggests that, in these embodiments, the manual valve is the only valve present at the fuel outlet and consequently does control the start and stop of fluid flow.

[193] During cross-examination, Mr. Matiasz stated that it was good design practice to have a manual valve in parallel with each automatic valve, as a “safety” valve, in case there is a malfunction of the automatic system. However, he stated that this safety valve would not be used to enable fluid flow during refueling.

[194] Therefore, I find that the valves in the valve arrangement are only those that are used to control flow of fuel to the equipment tanks during refueling. Valves that are used as safety or back-up valves are not part of the valve arrangement.

(5) Pump On The Line

[195] Claims 2, 16, and 21 state that the fuel delivery system comprises a “pump on the line” or “pump on each fuel line”. The Parties disagree as to where a “pump on the line” has to be located relative to the source tank(s) and manifold(s).

[196] Mr. Berry did not provide an opinion as to how the term “pump on the line” should be interpreted. Mr. Smith opined that, to be “on the line”, the pump would have to be located adjacent to the fuel source and before the manifolds, but could not be located inside the fuel source. Mr. Matiasz stated that if the pump has a line that draws fuel from the source tank and delivers it to the manifold then it is “on the line”, regardless of where it is located relative to the source tank.

[197] Given that Mr. Smith has neither engineering nor fueling system design experience; I find the evidence of Mr. Matiasz more persuasive. I find that a “pump on the line” is a pump that is located anywhere such that it has a line to draw fuel from the source tank and delivers said fuel to the manifold(s).

X. The Law – Principles of Utility, Obviousness, and Infringement

A. *Utility – Sufficiency*

[198] The patent system is based on a bargain between the inventor and the public: “the inventor is granted exclusive rights in a new and useful invention for a limited period in exchange for disclosure of the invention so that society can benefit from this knowledge” (*Teva Canada Ltd v Pfizer Canada Inc*, 2012 SCC 60 at para 32 [*Teva*]). The role of the specification is to enable a POSITA to make the thing, so as to make it available for the public at the end of the protected period (*Teva*, above, at para 33).

[199] Section 27(3) of the *Patent Act*, RSC, 1985, c P-4 states that:

> The specification of an invention must
>
> a. correctly and fully describe the invention and its operation or use as contemplated by the inventor;
>
> b. set out clearly the various steps in a process, or the method of constructing, making, compounding or using a machine, manufacture or composition of matter, in such full, clear, concise and exact terms as to enable any person skilled in the art or science to which it pertains, or with which it is most closely connected, to make, construct, compound or use it;
>
> c. in the case of a machine, explain the principle of the machine and the best mode in which the inventor has contemplated the application of that principle; and
>
> d. in the case of a process, explain the necessary sequence, if any, of the various steps, so as to distinguish the invention from other inventions.

[200] The test for determining whether a disclosure is complete was stated in *Pioneer Hi-Bred Ltd v Canada (Commissioner of Patents*, [1989] 1 SCR 1623 at 1637 to 1638 [*Pioneer Hi-Bred*] as follows:

> The applicant must disclose everything that is essential for the invention to function properly. To be complete, it must meet two conditions: it must describe the invention and define the way it is produced or built. The applicant must define the nature of the invention and describe how it is put into operation… a failure to meet the second invalidates it for insufficiency. The description must be such as to enable a person skilled in the art of the field of the invention to produce it using only the instructions contained in the disclosure … and once the monopoly period is over, to use the invention as successfully as the inventor could at the time of his application.
>
> (citations omitted)

[201] Both application of the common general knowledge, at the relevant time, and routine experimentation are permissible to assist the skilled person in making the invention work (*Gilead Sciences Inc v Idenix Pharmaceuticals Inc,* 2015 FC 1156 at para 421; *Pioneer Hi-Bred*, above, at 1641). Finally, the Supreme Court of Canada, in *Consolboard* at 519 to 520, has affirmed that "where an invention is a new combination of old elements or devices, such a combination is sufficiently described if the elements or devices are all named and their mode of operation given and the new and useful result to be accomplished pointed out".

B. *Utility – Claims Broader*

[202] Section 27(4) of the *Patent Act* states "the specification must end with a claim or claims defining distinctly and in explicit terms the subject-matter of the invention for which an exclusive privilege or property is claimed". It is a well-established principle that a claim in a patent can be found to be invalid because it exceeds or is broader than the invention made or disclosed (*Pfizer Canada Inc v Canada (Minister of Health)*, 2007 FCA 209 at para 115 [*Pfizer*]; *Amfac Foods Inc v Irving Pulp & Paper Ltd* (1986), 12 CPR (3d) 193 (FCA)).

[203] Valid claims must not be broader than either (1) the new and useful invention as invented by the inventor; or (2) the invention as described in the patent (*Pfizer*, above, at para 116). Therefore, the Court must ask whether the claims read fairly on what has been disclosed and illustrated in the specification and drawing (*Pharmascience Inc v Pfizer Canada Inc*, 2011 FCA 102 at paras 40 to 41).

C. *Obviousness*

[204] Obviousness must be assessed on a claim-by-claim basis (*Zero Spill Systems (International) Inc v Heide*, 2015 FCA 115 at para 85). The four-part *Windsurfing-Pozzoli* test for obviousness was set down by the Supreme Court of Canada in *Apotex Inc v Sanofi-Synthelabo Canada Inc*, 2008 SCC 61 [*Sanofi*] at paragraph 67:

> 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 be readily 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 items which would have been obvious to the person skilled in the art or do they require a degree of invention?

[205] Obviousness is a difficult test to meet, and where an expert is hired for the purpose of testifying a court must be wary of his or her hindsight bias (*Bridgeview Manufacturing Inc v 931409 Alberta Ltd (Central Alberta Hay Centre),* 2010 FCA 188 at para 50 [*Bridgeview*]). It is not fair to a person claiming to have invented a combination invention to break it down into its constituent parts and find that, because the parts are well known, the combination is obvious (*Bridgeview*, above, at para 51). The question to be asked is would a POSITA, in the light of the state of the art and the common general knowledge, at the claimed date of the invention, have

come directly and without difficulty to the invention in the patent (*Beloit Canada Ltd v Valmet Oy* (1986), 8 CPR (3d) 289 at 294).

D. *Infringement*

[206] In order to determine whether any claim of a patent is infringed, the court must purposively construe the claims of the patent and then determine whether the allegedly infringing product falls within the scope of those claims (*Mobil Oil Corp v Hercules Canada Inc* (1995), 63 CPR (3d) 473 at 289; *Free World Trust* at paras 48 to 49). In *Free World Trust*, at paragraph 30, Mr. Justice Binnie enumerated six propositions to be considered when construing claims for the purposes of determining whether there is infringement, to ensure that a fair and predicable result is achieved:

1. The Patent Act promotes adherence to the language of the claims.

2. Adherence to the language of the claims in turn promotes both fairness and predictability.

3. The claim language must, however, be read in an informed and purposive way.

4. The language of the claims thus construed defines the monopoly. There is no recourse to such vague notions as the "spirit of the invention" to expand it further.

5. The claims language will, on a purposive construction, show that some elements of the claimed invention are essential while others are non-essential. The identification of elements as essential or non-essential is made:

    a. on the basis of the common general knowledge of the worker skilled in the art to which the patent relates;

    b. as of the date the patent is published;

c. having regard to whether or not it was obvious to the skilled reader at the time the patent was published that a variant of a particular element would not make a difference to the way in which the invention works; or

d. according to the intent of the inventor, expressed or inferred from the claims, that a particular element is essential irrespective of its practical effect;

e. without, however, resort to extrinsic evidence of the inventor's intention.

6. 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.

XI. Sufficiency of the '567 Patent

[207] The Defendant argues that the '567 Patent describes the components of the fuel delivery system in terms that are too broad and generic to constitute a sufficient disclosure. The Defendant identifies two particular components that it argues were insufficiently described: (1) the pump(s) and (2) the fuel level sensor(s).

[208] The Defendant contends that the disclosure does not contain a description of what type of pump is used or how the pump is controlled within the system. The Defendant alleges that ERS's SR&ED Application showed that finding the appropriate pump was not a straightforward task, indicating that a POSITA would not be able to produce the invention with only the '567 Patent. With regard to the fuel level sensor, the Defendant points out that ERS had to have a sensor remanufactured to meet the needs of the invention.

[209] However, the experts all agreed that they would be able to build the invention of the ‘567 Patent based upon the disclosure.

[210] Mr. Berry opined that his POSITA (i.e., a person with training in engineering) would be able to look at the ‘567 Patent and, given general information about the tanks, “come up with the pumps and whatnot”. Mr. Smith testified that a POSITA would either know how to calculate the pump/valve sizing requirements, or would be able to get that information from a pump supplier or manufacturer. Mr. Matiasz stated that it was standard engineering practice to look at and compare components when designing a system, and that a POSITA would be able to identify appropriate pumps and hoses.

[211] Regarding the fuel level sensor, Mr. Smith opined that a POSITA would be able to identify several suitable sensors based on the information in the ‘567 Patent and the common general knowledge. However, on cross-examination, he admitted that some experimentation may be required. Mr. Matiasz testified that in identifying a suitable sensor the POSITA would know to consider a number of factors, including the complexity of the design desired, the proximity of the sensor to the receiver, and the power supply to be used. He conceded that a POSITA would likely have to talk to vendors, but stated that this would be standard procedure for constructing a system.

[212] Further, the Plaintiffs point out that, although the inventors manufacture a fuel sensor, this is simply the combination of two off-the-shelf technologies, the brands of which are explicitly disclosed in the ‘567 Patent.

[213] Therefore, given the testimony of the experts—particularly Mr. Matiasz, who most credibly and best represented what a POSITA would understand reading the ‘567 Patent at the relevant date—I find that the ‘567 Patent is not invalid for insufficiency.

XII. Claims Broader in the ‘567 Patent

[214] The Defendant advances six arguments for why certain claims of the ‘567 Patent are overly broad:

A. claims 1 to 6 do not include the necessary fuel level sensor;
B. claims 11 to 15 do not include the control valve at the required location on the fueling unit;
C. claims 16 to 18 and 32 to 37, do not limit the invention to use at a well site, but rather specify the location as a work site;
D. claims 20 to 26 do not limit the invention to use at any specified location;
E. claims 1 and 20 do not limit the fuel cap to being a cap with a threaded connection; and
F. claims 1, 13, 17, 20, and 32 do not specify that the hoses are connected via a dry-break connection.

[215] The Plaintiffs contend that the Defendant’s allegations of claims broader are an improper attempt to confine the inventors to the preferred embodiments of the ‘567 invention, and represent an unfair reading of the ‘567 Patent

A. *Fuel Level Sensor*

[216] Claims 1 to 6 disclose an invention that is lacking a fuel level sensor. The fuel level sensor is the component that allows an operator, or the computer logic controller, to monitor the amount of fuel in one of the equipment tanks remotely. Without the fuel level sensor, an operator would have to go into the hot zone to determine the level of fuel in a tank, and would have to physically monitor the filling of the tank to ensure that there was no overflow.

[217] The Defendant states that according to Mr. Van Vliet, one of the inventors of the ‘567 Patent, the purpose of the invention was to reduce the hazards of manual hot refueling by removing people from the hot zone. Additionally, both Mr. Smith and Mr. Matiasz opined that one of the inventive aspects of the ‘567 invention was recognizing and addressing the hazards of manual hot refueling. The Defendant argues that because an essential part of the invention is the removal of workers from the hot zone, an invention that fails to recite a means of monitoring fuel levels is not useful.

[218] I agree. Without a remote means of monitoring the fuel level in an equipment tank, the ‘567 invention is broader than any invention made or disclosed. I find that claims 1 to 6, which do not include a fuel level sensor, are invalid because they are overly broad.

B. *Valve at Fueling Unit*

[219] Claims 11 to 15 disclose a method for fuel delivery and disclose that this method includes “automatically controlling fluid flow in each hose in response to receiving signals representative of fuel levels in the fuel tanks”.

[220] The Defendant submits that the language of these claims include a method by which the fluid flow is regulated by a valve at the equipment tank end of the hose, as opposed to at the supply tank. In this situation, the hoses would be pressurized by fuel, which would increase the risk of a fire in the event that a hose was ruptured or acquired a pin-hole leak. The Defendant argues that because the inventors made the deliberate decision to have the control valves at the source tank side in the description and in other claims (i.e., on the fuel outlets in claims 1, 20,

and 32; and at paragraph 12 of the Description) that claims 11 to 15, by encompassing a situation where the hoses could be pressurized, are broader than the invention made or disclosed.

[221] The Plaintiffs contend that the language in the claims disclosing that the valves are at the fuel outlets does not limit their location to the source tank. They point to claims that disclose that fuel outlets are found on the manifold(s) (e.g., claims 2, 4, and 16). Additionally, they point to the testimony of Mr. Van Vliet, who said that the inventors conceived of a number of different locations to put the valves, including anywhere along the length of the hose and at the equipment tank end of the hose.

[222] Mr. Van Vliet's testimony shows that the inventors conceived of the invention covered by claims 11 to 15. Although having pressurized hoses anywhere in the invention is possibly not optimal from a safety perspective, whether or not an invention, or part of an invention, is optimal is not relevant to the question of whether claims are overly broad (*Pfizer* at para 117).

[223] Further, although there is language in the specification describing where certain of the outlets and valves may preferentially be, there is no indication that they are required to be located at a particular place in the system. A POSITA, with the common general knowledge at the relevant date, would know where to place the valves in order to make the invention work in the manner that the inventor intended, and in a way that is useful.

[224] Therefore, I do not find that claims 11 to 15 are overly broad for failing to specify the location of the valves.

C. *Work Site*

[225] As discussed above in the section on claim construction, there was significant argument around the construction of the term work site. The Defendant argues that all claims that specify use at a work site—claims 16 to 18 and 32 to 37— are overly broad, because the purpose of the '567 Patent is to improve safety and efficiency of fueling at a well site, specifically a fracturing site.

[226] Both independent claims 16 and 32 disclose "a fuel delivery system for automatic fuel delivery to multiple [equipment fuel tanks] at a work site …"

[227] The Plaintiffs argue that the term work site is to be understood in the context of fracturing operations. Further, they submit that the Court should "read in" language limiting claims 16 and 32 to work sites in the oil and gas industry. Thus, they contend the claims are not overly broad, because work sites would have the same problems of running out of fuel, and the same hazards associated with hot fueling as contemplated by the inventors of the '567 Patent.

[228] However, the Plaintiffs' objection to Mr. Berry's expert evidence is premised on the argument that his lack of experience at fracturing sites made him unqualified to opine upon the '567 Patent. This demonstrates an interpretation of the '567 Patent that is limited to well sites, since Mr. Berry may be an expert in refueling at work sites, properly construed.

[229] It is clear from the evidence proffered by the witnesses at trial that some of the sites covered by the term work site may not have the same equipment-related space constraints and/or hazards as a fracturing site. Many of the fact and expert witnesses stressed the unique conditions and hazards at a fracturing site. Both Mr. Smith and Mr. Matiasz opined that part of the inventiveness of the ‘567 Patent was the fact that it enabled parallel fueling of multiple tanks, which eliminated the time an operator had to be in the hot zone.

[230] The ‘567 Patent makes no mention of uses besides fracturing for the ‘567 invention. Mr. Matiasz stated that when he read the ‘567 Patent it “stands out clear in my mind that [fracturing sites are] what (sic) the intention of the patent”. Additionally, the term work site could encompass sites where only one piece of equipment needs to be fueled at any given time and where there is no hot zone due to the type of equipment. Finally, the fact that the Plaintiffs are asking the Court to read in language that would narrow the claim is yet another indication that these claims are overly broad.

[231] In some cases, patentees and their agents come to the Court seeking validation of claims that are purposefully drafted broader than any invention conceived of, developed, or made by the inventors. They hope to secure the broadest protection possible for new, unobvious, and useful inventions, knowing that if some claims are overly broad, the cascading, narrower dependent claims, or other narrower independent claims, can survive the scrutiny of the Court. Claims construction is done by the Court “in the interest of fairness to both the patentee and the public” (emphasis added; *Free World Trust* at para 50). Therefore, these overly broad claims cannot, and should not, be upheld by “reading in” language or limitations not included within the fence posts

of the claims being construed, based on a fair and purposive reading of the supporting patent specification—nothing in the ‘567 Patent supports the Plaintiffs’ proposed narrow construction of work site.

[232] I find that claims 16 to 18 and 32 to 37, which cover a fuel delivery system for use at a work site, are broader than any invention made or disclosed.

D. *No Location*

[233] Claims 20 to 26 disclose a fuel delivery system, the use of which is not limited to any specific location.

[234] The invention disclosed in these claims could, therefore, be for use at fixed commercial gas stations, aviation facilities, and other locations beyond well sites and fracturing operations at well sites. As discussed above, the ‘567 invention is directed to fuel delivery systems at well sites during the fracturing of wells. Therefore, claims 20 to 26 are overly broad.

E. *Threaded Fuel Cap*

[235] The Defendant also argues that claims 1 and 20 are too broad because the inventors did not invent a fuel cap that was secured by means other than via threading, which is not disclosed in the claims.

[236] As discussed above, a fuel cap, in the context of the ‘567 Patent, can be secured to the equipment fuel tank by means other than threading. I agree with the Plaintiffs that this is an attempt to limit the invention to what is described as a preferred embodiment. Therefore, I find that the claims disclosing a fuel cap are not broader than any invention made or claimed for failing to limit the means of securing the cap by a threaded coupler.

F. *Dry-break Connections*

[237] The Defendant contends that claims 1, 13, 17, 20, and 32 are too broad because they do not specify that the hoses are connected to the fuel cap via a dry-break connection. The Plaintiffs state that, although the inventors ended up using dry-break connections, and cite dry-break connections as an example of how to connect the hoses to the fuel caps, a POSITA would have known of a number of different ways to connect the hoses and fuel caps, based on the state of the art and the common general knowledge.

[238] Mr. Van Vliet testified that the inventors considered both cam locks and dry locks as alternatives to the dry-break connection. Mr. Smith opined that a POSITA would easily understand that the connection could be secured via threaded, cam and grove, hammer union, or other means.

[239] In my opinion, this allegation of overbreadth is similar to the argument regarding the proper construction of the term fuel cap. As such, I find that claims 1, 13, 17, 20, and 32 are not overly broad for failing to disclose a dry-break connection.

G. *Conclusion on Claims Broader Than Any Invention Made or Disclosed*

[240] Based upon the proper construction of the claims in the ‘567 Patent, I find that claims 1 to 6, 16 to 18, 20 to 26, and 32 to 37 are invalid because they are broader than any invention made or disclosed.

XIII. Obviousness

[241] The experts all agreed that the individual components comprising the ‘567 Patent were all known and established in the state of the art in October 2010. Mr. Van Vliet testified that all elements except the fuel cap, and the fuel level sensor, could be easily purchased from well-known supply companies.

[242] The Defendant takes the position that, because all of these components are used in their conventional manner, the invention is obvious. The Defendant also argues that the fact that Mr. Berry, before he was told about the ‘567 Patent, was able to come up with a design for a refueling system that was substantially similar to the ‘567 invention (Exhibit M to the Berry Affidavit), indicates that the invention is obvious. Further, the Defendant contends that there is nothing new in the use of automatic fuel delivery in general, since such systems had been in use for many years prior to 2010, for applications such as refueling emergency generators.

[243] The Plaintiffs argue that the ‘567 invention is both an innovative combination of the individual claimed elements, and an innovative solution to the problem of having operators working in the hot zone to manually refuel equipment at fracturing operations on well sites. They

point to the evidence of the fact witnesses who work, or had worked, in the fracturing industry, which showed that no one in the industry had thought to remove operators from the dangerous hot zone by October 21, 2010, the relevant date for considering obviousness.

[244] Mr. Smith opined that the state of the art, prior to October 21, 2010, was to equip the fueling operator with an increasing amount of personal protective equipment. Therefore, in his view, the inventive concept of the ‘567 Patent was to create a system and method to provide a safe and effective means for remotely refueling fracturing equipment, while said equipment was in operation. He stated that the inventive concept of the independent claims (i.e., claims 1, 11, 16, 20, and 32) was to provide a portable fuel system, capable of being deployed to remote locations, to fuel multiple pieces of different equipment, without putting an operator into a hazardous situation.

[245] Mr. Matiasz substantially agreed with Mr. Smith. He commented that the inventive concept was a system and method that provided an improvement in refueling operations, during fracturing operations at well sites, allowing for efficient fueling in remote and semi-permanent fueling locations that significantly reduced the time operators spent refueling in the hot zone.

[246] Mr. Berry, in contrast, stated that he believed that a POSITA would have considered the ‘567 Patent to be a routine and ordinary design for a fuel storage and dispensing system, not necessarily confined to fracturing operations at well sites.

[247] As I noted above, Mr. Berry lacks experience with fracturing operations and fracturing equipment, and is unable to identify the unique hazards associated with fueling at fracturing sites. His opinion on what would have been inventive in the fracturing industry, in 2010, is, therefore, less persuasive than the opinions of Mr. Smith and Mr. Matiasz. I agree that the inventive concept of the ‘567 Patent is to design a system and method for efficient and safe hot fueling to multiple pieces of equipment, in remote and semi-permanent well site locations, that removes the operators from the hot zone during fracturing operations at a well site.

[248] The testimony of the fact witnesses, all of whom were working in the fracturing industry in some capacity in 2010, established that the state of the prior art, before the ‘567 invention, was manual hot refueling.

[249] There are numerous differences between manual hot refueling and the system disclosed by the ‘567 Patent. The most important of these differences is that an operator is not continuously required to be in the dangerous hot zone while refueling is taking place. Additionally, the testimony of Mr. Garland supported finding that there were other differences, including the ability increase the efficiency of the fracturing operation, and to gather accurate data about fueling during fracturing.

[250] Although there was evidence presented to the Court that a number of fueling companies were improving manual hot refueling via the addition of “T-manifolds” or the “octopus system”, which reduced some of the lifting hazards associated with fueling, those methods did not negate the hazards of being in the hot zone, and the testimony of the Frac Shack fact witnesses supports

finding that a POSITA would not have found claims 1 to 15, 19, 27 to 31, and 38 of the ‘567 Patent obvious in light of that prior art.

[251] For example, Mr. Chernik stated that the Frac Shack System, compared to manual hot refueling, was like “night and day. There is no comparison”. Similarly, Mr. Lamberton testified that Encana chose to use the Frac Shack System because it was “a new innovative technology that helped make operations safer by getting guys out of the hot zone and increasing efficiencies as well”.

[252] Further, and persuasive to the Court, AFD admitted to the Canadian Government, in a SR&ED Application submitted for the 2012 fiscal year, that they had to overcome several design obstacles, and that research and experimentation had been necessary to achieve the AFD Frac Trailer. Mr. Reimer conceded that AFD was representing in their SR&ED Application that innovation had been required to design the trailer.

[253] Finally, the Defendant argues that a schematic for a refueling system, designed for this action by Mr. Berry while blinded to any knowledge of the ‘567 Patent (Exhibit M to the Berry Affidavit), was evidence that a POSITA would have found the ‘567 invention obvious. However, as counsel for the Plaintiffs’ observed, Mr. Berry was given the instructions to “design a fuel system that would be capable of simultaneously supplying fuel to multiple fuel tanks on vehicles or equipment”. These instructions are based on hindsight, which the Federal Court of Appeal cautions against in *Bridgeview* at paragraph 50.

[254] Therefore, it would be incorrect to suggest that Mr. Berry came up with the inventive concept of the ‘567 Patent. He was not in the position of a POSITA, because, in 2010, no one was focusing on how to solve the problems associated with manual hot refueling through the use of a technology like the ‘567 invention. The fact that a system similar to the ‘567 invention was designed easily by Mr. Berry, once the question was identified, indicates that the question itself—how to design a fuel system that can simultaneously supply fuel to multiple pieces of equipment at a fracturing well site—was not obvious.

[255] Additionally, Mr. Berry’s design missed, in his words, allegedly 5% of the ‘567 Patent, including the fuel cap, which he admitted was inventive. Because his design lacked the fuel cap, and the associated fuel level sensor, it required a fluid return line to take fuel from the equipment tank back to the source tank, to prevent the equipment tanks from overfilling. Mr. Matiasz testified that this return line would be undesirable in the design from a well site safety perspective, since it would have created an additional tripping hazard on the fracturing site. Further, because it lacked the fuel cap, Mr. Berry’s Exhibit M design would require modification of the equipment fuel tanks so that the hoses could be secured. Mr. Matiasz explained that companies such as Encana would have been resistant to modifying their equipment fuel tanks because of the initial capital expenditure and the time it would take to do the modifications, during which the equipment could not be in use.

[256] Therefore, based on the evidence of the fact and expert witnesses, I find that claims 1 to 15, 19, 27 to 31, and 38 of the ‘567 Patent are not obvious.

XIV. Infringement

[257] The Plaintiffs assert that claims 1 to 4, 7 to 13, 15 to 23, and 26 to 38 of the ‘567 Patent are infringed by the AFD Frac Trailer. Given my finding on the invalidity of claims 1 to 6, claims 16 to 18, claims 20 to 26, and claims 32 to 37, only the following valid claims need to be considered with respect to infringement:

a. claims 7 to 9;
b. claim 10 as it depends on any of claims 7 to 9;
c. claims 11 to 13,
d. claim 15, as it depends on any of claims 11 to 13;
e. claim 19;
f. claim 27 as it depends on any of claims 7 to 10, or 19;
g. claim 28 as it depends on any of claims 7 to 9, or 19;
h. claim 29 as it depends on any of claims 8, 9, or 19;
i. claim 30 as it depends on
    i. any of claims 7 to 10, or 19,
    ii. claim 27, as it depends on any of claims 7 to 10, or 19,
    iii. claim 28, as it depends on any of claims 7 to 9, or 19, and
    iv. claim 29, as it depends on any of claims 8, 9, or 19;
j. claim 31 as it depends on
    i. any of claims 7 to 10, or 19,
    ii. claim 27, as it depends on any of claims 7 to 10, or 19,
    iii. claim 28, as it depends on any of claims 7 to 9, or 19,
    iv. claim 29, as it depends on any of claims 8, 9, or 19, and
    v. claim 30, as it depends on any of claims 7 to 10, 19, 27 (as it depends on any of claims 7 to 10, or 19), 28 (as it depends on any of claims 7 to 9, or 19), and 29 (as it depends on any of claims 8, 9, or 19); and
k. claim 38.

(collectively, the “Valid Claims”).

[258] As noted above, the ‘567 Patent has five independent claims: 1, 11, 16, 20, and 32. Dependent claims include:

- claims 2 to 10, which are dependent on claim 1;
- claims 12 to 15, which are dependent on claim 11;
- claims 17 to 19, which are dependent on claim 16;
- claims 21 to 26, which are dependent on claim 20;
- claims 27 to 31, which are dependent on claims 1, 16, or 20; and

- claims 33 to 38, which are dependent on claim 32.

[259] At trial, counsel for the Plaintiffs estimated that there were 952 different combinations of independent and dependent claims, that would create a useful invention, within the ‘567 Patent. For the benefit of the Court, the Parties agreed that the AFD Frac Trailer contained the following elements, which in combination with the elements in dispute, discussed below, could lead to infringement of the Valid Claims:

A fuel delivery system for delivering fuel to fuel tanks of equipment at a well site during fracturing of a well, comprising:

a) a fuel source having plural fuel outlets;
b) a hose on each fuel outlet of the plural fuel outlets;
c) the fuel source comprising at least a fuel source tank and a manifold connected via a line to the fuel source tank;
d) some or all of the fuel outlets being located on the manifold;
e) the fuel source comprising at least a fuel source tank and at least two manifolds;
f) each manifold being connected via a respective line to the fuel source tank;
g) plural fuel outlets being located on each manifold;
h) a display receiving information from the fuel level sensors to show the fuel level of each fuel tank being filled (disclosed in claim 28); and
i) the fuel delivery system mounted on a trailer at a well site during fracturing of a well (disclosed in claim 31).

A method of fuel delivery of fuel to selected fuel tanks of equipment at a well site during fracturing of a well, the method comprising:

a) pumping fuel from a fuel source through hoses in parallel to each of the fuel tanks; and
b) controlling fluid flow through each hose independently of flow in other hoses.

[260] The Parties are in dispute over whether the AFD Frac Trailer contains the following elements:

1. a pump on a line – without which none of claims 7 to 10 (as they depend on any of claims 2 to 4), 19 (as it depends on either claim 16 or 17), and 27 to 31 (as they depend on any of claims 7 to 10 (as they depend on any of claims 2 to 4), or 19 (as it depends on either claim 16 or 17)) are infringed;
2. a fuel cap or fuel delivery connection – which would infringe claims 7, 13, 15, 19 (as it depends on either claim 16 or 17), and 38 (as it depends on claim 32);
3. automatic valves – which would infringe claims 8, 19 (as it depends on either claim 16 or 17), and 38 (as it depends on claim 32);

4. a controller – which would infringe claims 8, 19 (as it depends on either claim 16 or 17), and 38 (as it depends on claim 32);
5. controller enabled automated refueling – which would infringe claim 9;
6. dry-break connections between the hoses and fuel caps – which would infringe claim 10;
7. automatically controlled fluid flow – which would infringe claim 11;
8. automated fluid flow – which would infringe claim 12;
9. multiple fuel source tanks – which would infringe claim 27, as it depends on any of claims 7 to 10, and 19;
10. a controller that logs the fuel requirements of each fuel tank – which would infringe claim 29, as it depends on any of claims 8, 9, or 19; and
11. a pressure gauge at each fuel outlet – which would infringe claim 30, as it depends on any of claims 7 to 10, 27 (as it depends on any of claims 7 to 10, or 19), 28 (as it depends on any of claims 7 to 9, or 19), and 29 (as it depends on any of claims 8, 9, or 19).

A. *Pump On The Line*

[261] The pumps in the AFD Frac Trailer are located in the source tank. The Defendant argues that this means that the pumps are not "on the line".

[262] On cross-examination, Mr. Smith agreed that a pump located within a fuel tank would not be "on the line", and opined that the AFD Frac Trailer does not infringe the "pump portion" of the '567 Patent.

[263] As I discussed above, Mr. Matiasz was of a different view and more persuasive than Mr. Smith. He stated that a POSITA would consider any pump that had a fuel line in and out to be a "pump on the line", regardless of where it was located with respect to the source tank. Mr. Reimer, on cross-examination admitted that, although the pumps were suspended in the source tank, they did have a line submerged in the tank to draw in fuel, and a line out to the hoses.

[264] Properly construed, I find that the term “pump on the line” is a pump that is located anywhere such that it has a line to draw fuel from the source tank and delivers said fuel to the manifold(s).

B. *Fuel Cap or Fuel Delivery Connection*

[265] The AFD Frac Trailer contains a component that the Defendant describes as the “AFD Adapter”. The AFD Adapter is the piece of the AFD Frac Trailer that connects to the equipment fuel tank. The Defendant argues that the AFD Adapter is neither secured in place with a coupling, nor a component that prevents spills. The evidence of Mr. Reimer was that the adapter was secured to the equipment fuel tanks using either a J-hook connection, or by a rubber tie. As such, the AFD Adapter does not seal to the equipment tank; however, it does secure the fueling hose to the tank and limit the amount of contaminants that can get into the fuel tank. The fuel level sensor is also located on the AFD Adapter.

[266] Above, I construed the term fuel cap to mean any device that is anchored or secured to the throat of an equipment fuel tank, through which fuel is delivered, which limits contaminants from entering the tank and prevents fuel spills under normal operation, through securing the hose to the equipment tank and positioning the fuel level sensor.

[267] There was also discussion at trial around whether the Defendant ever called the AFD Adapter a “cap”. The language of the claims is read in an informed and purposive way to define the monopoly, and the determination of whether a claim is infringed is based upon what a component is construed to be, not what it is called, unless defined in a reasonably specific

manner in the patent specification itself. However, there was documentary evidence produced at trial showing that AFD had called the AFD Adapter a cap at various points during the development of the AFD Frac Trailer, including in the SR&ED Application submitted to the government, where AFD called it a "universal cap".

[268] Having considered the design and function of AFD Adapter, I find that it infringes:

a. claim 7;
b. claim 13;
c. claim 15, as it depends on claim 13;
d. claim 19, as it depends on either claim 16 or 17;
e. claim 28, as it depends on either claim 7 or 19 (as it depends on either claim 16 or 17);
f. claim 31, as it depends on any of claims 7, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on either claim 7 or 19 (as it depends on either claim 16 or 17)); and
g. claim 38, as it depends on claim 32.

C. *Automatic Valves*

[269] On October 18, 2014, the Defendant modified the AFD Frac Trailer such that the controller logic program was removed. This resulted in human intervention being necessary to start and stop fuel flow. The Defendant argues that this "Version 2" trailer is a "manual version" of the AFD Frac Trailer.

[270] The Defendant concedes that, prior to October, 18, 2014, the AFD Frac Trailer operated such that the controller was programmed to manage refueling in response to low and high fuel level signals from each equipment tank (Version 1), in a manner that infringed at least claim 11 of the '567 Patent. Mr. Reimer admitted, on cross-examination, that the Defendant had intended to design a system that would perform automated refueling.

[271] Above, I found that the term "automatically operable valves" means any valve that is operated via a remote electrical signal. During trial, the Plaintiffs showed a video of an AFD operator opening and/or closing valves on the AFD Frac Trailer Version 2. The video depicted an operator sitting at a screen, in the trailer cab, on which he or she could monitor the fuel level sensors in each individual equipment tank to determine whether any tank needed to be refueled. When refueling was needed, the operator pushed a button on the screen, which sent an electrical signal to the appropriate valve to open. Similarly, once fueling was finished, the operator pushed a button to close the valve in question.

[272] This video showed that the valves on the AFD Frac Trailer Version 2 are opened and closed via a remote electrical signal. Therefore, they are encompassed by the term "automatically operable valves" as properly construed. Similarly, the AFD Frac Trailer Version 2 is a system that automatically controls fluid flow. Thus, the AFD Frac Trailer Version 1 and Version 2 infringe:

a. claim 8;
b. claim 11;
c. claim 19, as it depends on either claim 16 or 17;
d. claim 28, as it depends on either claim 8 or 19 (as it depends on either claim 16 or 17);
e. claim 31, as it depends on any of claims 8, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on either claim 8 or 19 (as it depends on either claim 16 or 17)); and
f. claim 38, as it depends on claim 32.

D. *Controller and controller enabled automated refueling*

[273] The AFD Frac Trailer Version 2 lacked the controller logic program. Thus, the Defendant argues that Version 2 of the trailer did not have a controller as disclosed in the '567 Patent. However, there is no dispute that the AFD Frac Trailer Version 2 has a screen that displays the

fuel levels in the tanks, and enables the operator to control the refueling process by interacting with the graphical user interface.

[274] The Plaintiffs submit that the reference character that relates to the controller also denotes the control station, suggesting that there are two types of controller within the ‘567 Patent. Therefore, they contend that the controller that is essential, within the context of the ‘567 Patent, is the device that can receive and send signals and has a display.

[275] A comparison of claims 8 and 9 show that there are two levels of control contemplated within the ‘567 Patent. Claim 8 discloses a controller that is responsive to signals from the fuel level sensor, and can provide control signals to the appropriate valves. Claim 9 discloses a controller responsive to the fuel level in an equipment tank and programmed to effect refueling without operator intervention—i.e., a system with a controller logic program, which is controller enabled automated fueling. Therefore, only the controller described in claim 8 is essential in both Version 1 and Version 2 of the AFD Frac Trailer. Controller enabled automated refueling, disclosed in claim 9, was only present in Version 1 of the AFD Frac Trailer; therefore, is not infringed by Version 2 of the AFD Frac Trailer.

[276] Having considered the controller (i.e., the display and interface) of the AFD Frac Trailer Version 1 and Version 2, I find that it infringes:

a. claim 8;
b. claim 19, as it depends on either claim 16 or 17;
c. claim 28, as it depends on either claim 8 or 19 (as it depends on either claim 16 or 17);
d. claim 31, as it depends on any of claims 8, 19, (as it depends on either claims 16 or 17), or 28 (as it depends on either claim 8 or 19 (as it depends on either claim 16 or 17)); and
e. claim 38, as it depends on claim 32.

E. *Conclusion on Infringement*

[277] In addition to claims 6, 14, and 25, which disclosed a fuel cap with a breather port comprising a downwardly extending line, and which the Plaintiffs do not claim were infringed, as this element is not present on the AFD Frac Trailer. The Defendant also highlights a number of features claimed in the ‘567 Patent for which the Defendant submits that there was no evidence adduced at trial suggesting, on a balance of probabilities, that they are a part of the AFD Frac Trailer: the manual valve in claims 3, 18, 22, and 37; the dry connection at the fuel outlet in claim 10; the multiple source tanks in claim 27; the controller that can log fuel amounts in claims 29 and 34; the manifolds comprising more than one manifold in claim 33; and the pressure gauge in claims 30, 35, and 36. I agree and I find that these claims are not infringed.

[278] The Defendant concedes that, for the period up to October 18, 2014, the operation of the AFD Frac Trailer Version 1 infringed or was deemed to infringe claims 11 and 12 of the ‘567 Patent. Further the following claims were also infringed:

a. claim 7;
b. claim 8;
c. claim 9;
d. claim 13;
e. claim 15, as it depends on claim 13;
f. claim 19, as it depends on either claim 16 or 17;
g. claim 28, as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17);
h. claim 31, as it depends on any of claims 7, 8, 9, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17)); and
i. claim 38, as it depends on claim 32.

[279] The only difference between Versions 1 and 2 of the AFD Frac Trailer is the removal of the controller logic program.

[280] Based on my analysis above, I find that the AFD Frac Trailer Version 2 infringes:

a. claim 7;
b. claim 8;
c. claim 11;
d. claim 13, as it depends on claim 11;
e. claim 15, as it depends on claim 13 (as it depends on claim 11);
f. claim 19, as it depends on either claim 16 or 17;
g. claim 28, as it depends on any of claims 7, 8, or 19 (as it depends on either claim 16 or 17);
h. claim 31, as it depends on any of claims 7, 8, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on any of claims 7, 8, or 19 (as it depends on either claim 16 or 17)); and
i. claim 38, as it depends on claim 32.

XV. Monetary Relief

[281] Due to the timing of the infringement in this action, there are two distinct time periods that must be considered when determining the appropriate monetary relief:

1. Pre-Grant Period – the period prior to September 23, 2014; and
2. Post-Grant Period – September 24, 2014 to December 13, 2014.

A. *Accounting for Profits*

[282] The equitable remedy of accounting for profits acts as "a deterrence tool and a mechanism for restorative justice in the commercial world" (*Varco Canada Limited et al v Pason Systems Crop et al*, 2013 FC 750 at para 398 [*Varco*]) Equitable remedies are discretionary; however, "absent proof of a bar to equitable relief, a claimant can expect to be granted the remedy it seeks in accordance to the principles governing its availability" (*Apotex Inc v Bristol-*

Myers Squibb Co, 2003 FCA 263 at para 14). In *Philip Morris Products SA v Marlboro Canada Limited*, 2016 FCA 55, the Federal Court of Appeal held, at paragraph 17, that profits made from infringement are the source of the infringer's unjust enrichment.

[283] Whether or not accounting for profits is an appropriate remedy varies according to the circumstances of the case and is at the discretion of the Court (*Merck & Co Inc v Apotex Inc*, 2006 FCA 323 at para 133). The list of factors that can be considered in determining whether an award of accounting for profits is appropriate includes:

1. the patentee's conduct, including whether there was any delay in commencing an action (*Unilever PLC et al v Proctor & Gamble Inc et al* (1993), 47 CPR (3d) 479 at 525, aff'd (1995), 61 CPR (3d) 499 (FCA) [*Unilever*]);
2. the infringer's conduct, including whether the infringer knowingly infringed and the only defence would be patent invalidity (*Varco* at paras 406 to 408); and
3. whether the patentee practiced the invention of the patent in Canada (*Unilever,* above, at 525).

[284] The Plaintiffs argue that the Defendant has not provided any meaningful evidence for why an accounting of profits should not be awarded. Further, they assert that they had dutifully marked their technology as "patent pending" from the beginning of commercialization, and that they have acted fairly and promptly throughout this action. They submit that, in contrast, the Defendant has acted inequitably by knowingly infringing, making a minor change to the operation of the AFD Frac Trailer to attempt to circumvent the '567 Patent, and moving the unit to Texas despite the ongoing law suit.

[285] The Defendant argues that until the '567 Patent was issued on September 23, 2014, their conduct was legal, and there can be no element of blameworthiness for anything occurring prior to the issuance of the '567 Patent. The Defendant admits that, in 2012, the Plaintiffs had

informed it of the pending patent application, but the Defendant points out that the Plaintiffs did not inform it prior to commencing this action that the ‘567 Patent was about to be, or had been, granted. The Defendant also contends that the change from Version 1 of the AFD Frac Trailer to Version 2 was not, as the Plaintiffs characterize it, an act in bad faith, but rather an attempt to stop infringing. Finally, the Defendant states that the move of the unit to Texas was simply because of a lack of work available in Canada, and not an attempt to place the unit outside of the jurisdiction of the Court.

[286] Additionally, the Defendant raises three points that it submits that the Court should consider when determining whether an accounting of profits is the appropriate remedy:

i. Frac Shack does not sell fuel as part of their business model. Mr. Van Vliet testified to the fact that ERS, when creating FSH and FSI, decided to retain the fuel sales portion of the business. Therefore, the Defendant contends that the Plaintiffs should be disentitled to the Defendant’s profits on fuel sales.
ii. Since FSI is the operating company and FSH only owns the intellectual property, the patentee and the only plaintiff to this action until October 2015 did not practice the patent at the relevant time.
iii. The Court should draw an adverse inference against the Plaintiffs and hold that the Frac Shack System does not fall within the claims of the ‘567 Patent, because no evidence was adduced at trial supporting the fact that the Frac Shack System is an embodiment of the ‘567 Patent.

[287] Although it is incontrovertible that the Defendant’s actions up until September 23, 2014 were not illegal, it is disingenuous for the Defendant to claim that the letter notifying them of the ‘567 Patent’s patent pending status was not sufficient to put it on notice that it was on a course to potentially infringe the Plaintiffs’ intellectual property. The issues of use by FSH and the short infringement period are not persuasive arguments for why the Plaintiffs should not be allowed to elect for profits. Additionally, while both parties raised *Mohan* objections, those objections were dismissed.

[288] Additionally, I decline to make an adverse inference based on the fact that the Plaintiffs did not lead expert evidence showing that the Frac Shack System falls within the scope of the ‘567 Patent. Mr. Van Vliet provided extensive evidence as to the construction and operation of the Frac Shack System. Counsel for the Defendant did not cross-examine him on the matter of whether the Frac Shack System embodied the ‘567 Patent. Nor did Mr. Berry adduce any evidence supporting the conclusion that the Frac Shack System is not an embodiment of the ‘567 Patent.

[289] Finally, Frac Shack is not in the business of selling fuel. There was evidence adduced at trial that the Defendant discounted the rental cost of the trailer to Trican for at least one fueling job. However, there was no evidence to support the finding that the Defendant would not have done that job using manual hot refueling, had the AFD Frac Trailer not been available. Therefore, I find that it is not appropriate to award the Plaintiffs the profits that the Defendant made from selling the fuel associated with the use of the AFD Frac Trailer.

[290] Considering the Defendant’s arguments, I agree with the Plaintiffs that there is no reason that they should not be allowed to elect for accounting of profits, not including profits made from fuel sales.

B. *Calculation of Profits*

[291] An inventor is only entitled to the portion of the infringer’s profits that is causally attributable to the infringer’s use of the patented invention (*Monsanto Canada v Schmeiser*, 2004 SCC 34 at para 101 [*Monsanto*]). If there is a non-infringing alternative, the amount to be paid

by the infringing party is calculated using the differential profit approach. This is the difference between the infringing party's profit attributable to the use of the invention and the infringing party's profit had it used the best non-infringing option (*Monsanto*, above, at para 102).

[292] In a situation where there is no non-infringing alternative, the infringer must turn over all profits made from the infringing act, less legitimate expenses incurred (*Apotex Inc v Lundbeck A/S*, 2013 FC 192 at paras 282 to 283).

[293] In the context of this case, the term "profits" means the incremental profits in the Post-Grant Period, before tax and before pre-judgement interest, actually earned by AFD from the use of the AFD Frac Trailer to the extent that those profits exceeded those that could and would have been earned from use of an available non-infringing alternative.

[294] In *Varco*, at paragraph 417, Mr. Justice Michael Phelan stated that the "differential profit approach" requires the Court to look at six factors:

1. Causal connection: there must be a causal connection between the profits made and the infringement.
2. Gross profits from infringement: based on calculating the gross revenues from infringement and deducting the incremental costs of earning that revenue.
3. Non-infringing option: whether such an option exists.
4. Disgorgement: absent a non-infringing option, the gross profits are paid to the patentee.
5. Gross profits from non-infringement: only relevant if there is a non-infringing option.

6. Disgorgement (net): only relevant where there is a difference between the gross profits of infringement and the gross profits of non-infringement.

[295] As discussed above, there is a causal connection between the Defendant's profits, made from rental of the AFD Frac Trailer during the infringing period, and their infringing actions.

(1) Gross Profits from Infringement

[296] The accounting experts generally agreed upon the method of calculating the gross profits. However, there were two points of disagreement: (1) the calculation of rental days in September; and (2) the calculation of depreciation.

[297] Mr. Harington disagreed with Ms. Basden's use of October 1, 2014, as an estimate for the start date of infringement. He opined that because an accurate calculation could be done from September 24, 2014 that those days should be counted.

[298] In September 2014, the AFD Frac Trailer was rented for 16 days, seven of which fell on or after September 24, 2014. Thus, he would add 7/16ths of the profit made by the Defendant in September to the profit made from October to December 13, 2014. I agree that it is appropriate to add the profit made in September 2014 to the gross profit from infringement.

[299] The main disagreement between Mr. Harington and Ms. Basden was the method of calculating the depreciation of the AFD Frac Trailer. Depreciation is an accounting term used to describe how the value of an asset is reduced with the passage of time, particularly because of

wear. The computation of depreciation relies on two assumptions: the expected economic life of the asset, and the rate at which depreciation occurs over the asset's expected life. Ms. Basden and Mr. Harington agreed on neither of these assumptions.

[300] Ms. Basden opined that the expected economic life of the AFD Frac Trailer should be estimated to be ten years. She testified that she had reached this conclusion based upon evidence given by Mr. Smith as to the expected economic life of fracturing equipment, and her experience with equipment used in the mining industry.

[301] Mr. Harington concluded that Ms. Basden's estimate was too long, and proposed that the appropriate expected economic life would be six years. He reached this estimate based upon Frac Shack's audited financial statements, which indicated that Frac Shack estimated the useful lives of their equipment between three to ten years. Additionally, he took into account the Frac Shack Canadian pricing model for the Frac Shack System, which was prepared on the assumption of a three year economic life, and Frac Shack internal correspondence, which assumed a four year economic life. He noted that the Defendant did not provide documentation indicating the expected economic life of the AFD Frac Trailer.

[302] During the hearing, Mr. Van Vliet testified that the very first Frac Shack System unit (A1) was still operational and had been used in North Dakota as recently as summer 2016, six years after it had been completed. There was no evidence adduced at trial to suggest that the A1 unit had been significantly refurbished, or that it needed significantly more maintenance than

newer units. Further, there was no evidence that would lead the Court to conclude that an AFD Frac Trailer would have a shorter expected economic life.

[303] Based upon the evidence provided by Mr. Van Vliet, and the expert opinions of both Ms. Basden and Mr. Smith, I find that the expected economic life of an AFD Frac Trailer is eight years for the purposes of calculating depreciation.

[304] With respect to the rate of depreciation, Ms. Basden used the straight line approach, which assumes that the value of a piece of equipment declines equally in each year of its expected economic life. She asserted that the straight line method was the preferred approach when dealing with an asset such as the AFD Frac Trailer, which is not intended for resale, and which generates revenue that would be expected to increase over time. She stated that depreciation for such an asset is not an allocation of value, because there is no resale value, but rather an allocation of cost, where the goal is to match cost with revenue to generate profit.

[305] In her opinion, the straight line approach is better at matching revenue, since it would be expected that revenue for a new unit would increase over time. Additionally, she testified that mining companies generally used a straight line approach when calculating the depreciation of equipment, such as dump trucks.

[306] On cross-examination, Ms. Basden clarified that her depreciation calculations did not include the cost of repairs or replacements during the expected economic life of the unit. She stated that, with her approach, if there was a replacement or repair the particular component(s)

would be capitalized at the time of repair, and then the depreciation calculation would start again. She explained that her calculations did take into account routine maintenance that would be needed over the unit's ten year life. However, she stated that the maintenance costs were not built into the depreciation model as an estimate; rather she proposed using the exact cost of maintenance, at the relevant time, provided by the Defendant.

[307] Mr. Harington opined that it was more accurate to depreciate the AFD Frac Trailer according to the "declining rate" or "sum of the digits" method. He stated that this method provides a more reasonable estimate for the purposes of computing profits because a vehicle typically loses a disproportionately large portion of its value upon "leaving the showroom floor" and in the early years of its expected economic life; and because the cost of maintenance must be built into the depreciation model. He asserted that a higher depreciation in the early years balances out the higher maintenance costs in later years, which holds the annual cost of ownership constant over the life of the asset. Mr. Harington stated that, from a business perspective, the declining rate method is preferred; otherwise the cost of maintenance would result in the cost of ownership increasing as the asset reached the end of its life.

[308] Based upon testimony of the experts, I find that the gross profits should be calculated as follows:

a. including the rental days in September, calculated based upon the formula proposed by Mr. Harington; and
b. calculating depreciation based upon the middle ground between Ms. Basden's estimate of the expected economic life of the AFD Frac Trailer and Mr. Harington's (i.e., eight years), using the "declining rate" method proposed by Mr. Harington.

[309] The Parties are asked to reach an agreement as to the calculation of gross profits based upon the above. If the Parties cannot agree, the Parties are invited to make submissions to the Court, within two weeks from the date of this judgment.

(2) Non-infringing alternative

[310] The Defendant argues that manual hot refueling is a non-infringing alternative to use of the AFD Frac Trailer. AFD cited a not insignificant amount of evidence that many companies, including the fracturing companies Trican and Calfrac, still do manual hot refueling, despite the availability of the Frac Shack System. However, Mr. Ohman admitted that it was not in a fracturing company's best interest to choose a method of fueling that allowed them to work more efficiently, because they were getting paid according to the time spent on the operation.

[311] The Plaintiffs argue that a system with significant risk to worker safety and health cannot be a true non-infringing alternative, when the purpose of the invention is to minimize the risks to operators. A few of the Defendant's fact witnesses testified that they had not experienced any problems with manual hot fueling, therefore, they believed that the two methods of fueling were more or less interchangeable. However, Mr. Brodersen admitted that his opinions on the interchangeability of the '567 invention with manual hot refueling were partly based upon the fact that his employees were not the ones who had to go into the hot zone.

[312] I agree with the Plaintiffs that manual hot refueling is not a non-infringing alternative to using the '567 invention. Even if accidents due to manual hot refueling are rare, the fact that reducing the risk of an accident creates a significant improvement over the alternative hot fueling

system, because the consequences of such an accident can be life threatening or cause millions of dollars' worth of damage to the fracturing operation.

(3) Conclusion

[313] Since manual hot refueling is not a non-infringing alternative to the use of the '567 invention, *Varco* factors five and six are not pertinent to the calculation of profits. Therefore, the gross profits made by AFD, from September 24, 2014 to December 13, 2014, from the rental of the AFD Frac Trailer, not including the profits associated with fuel sales, are to be paid to the Plaintiffs.

C. *Reasonable Compensation for the Pre-Grant Period*

[314] For those sales made by an infringer that the patentee would not have made, the patentee is entitled to a reasonable royalty (*Jay-Lor International Inc v Penta Farm System Ltd*, 2007 FC 358 at para 119 [*Jay-Lor*]). Additionally, a patentee is entitled to "reasonable compensation for infringement during the laid open period" (*Jay-Lor*, above, at para 120). The Parties agree that a reasonable royalty would be the appropriate measure of compensation to the Plaintiffs during the Pre-Grant Period.

[315] The amount of a reasonable royalty is based on the rate that would have resulted from negotiations between a willing licensor and a willing licensee, taking place as a one-time negotiation on the eve of first infringement (*Merck & Co Inc v Apotex Inc*, 2013 FC 751 at paras 150 and 155, aff'd 2015 FCA 171). In *Jay-Lor*, Madam Justice Judith Snider, held that the

anticipated profits approach was the best way to estimate a reasonable royalty (*Jay-Lor* at para 149).

[316] Both experts agreed that the factors enumerated by Mr. Justice Darrel Heald in *Alliedsignal Inc v du Pont Canada Inc* (1998), 78 CPR (3d) 129 at paragraph 34, were relevant to calculating the rate of the reasonable royalty:

1. presence of competing products in the market;
2. advantages of the patented product over competing products;
3. advantages of the infringing product over the patented product;
4. market position of the patentee;
5. market position of the infringer;
6. market share of the patentee before and after the infringing product entered the market;
7 size of the market before and after the infringing product entered the market; and
8. capacity of the patentee to produce additional products.

[317] Mr. Harington opined that customers were attracted to neither the Frac Shack technology nor the AFD Frac Trailer. He also stated that the availability of manual hot refueling as a non-infringing alternative would have a significant impact on the rate that Frac Shack would be able to negotiate. Additionally, he set the date of "first infringement" in March or April of 2011, when AFD started building their trailer, rather than in September 2014, when the Defendant actually first infringed the '567 Patent. Based upon these considerations, he estimated that the royalty rate should be 10%.

[318] Ms. Basden stated that, for patented technology, a commonly considered royalty range is 25% to 33.3%, regardless of the technology at issue. She concluded that licencing to the Defendant would represent direct competition for Frac Shack; however, she noted that Frac Shack would have an interest in growing market awareness. Further, she acknowledged that the capital cost of making an AFD Frac Trailer is significant, such that the Defendant may not have agreed to a licence at a high royalty rate. Ms. Basden estimated that the royalty rate would have been negotiated at 29%.

[319] Mr. Reimer testified that, when the Defendant received the letter informing them of the fact that the ‘567 Patent was pending, the CEO of AFD, Parker McLean, did not stop developing the AFD Frac Trailer, nor did AFD consider negotiations with Frac Shack then or once the ‘567 Patent was granted. This evidence makes Mr. Harington’s position, that the appropriate date at which to consider negotiations is March or April 2011, unpersuasive.

[320] Mr. Harington also factored in the availability of manual hot refueling as an alternative. As discussed above, I do not find that manual hot refueling is a non-infringing alternative to use of the invention disclosed in the ‘567 Patent. Given the testimony of Mr. Van Vliet, I am of the opinion that Frac Shack would likewise not have considered the availability of manual hot refueling as a significant factor in their negotiations.

[321] As such, I prefer the assumptions relied upon by Ms. Basden, and find that her value for estimated royalty rate (29%) is appropriate. Neither Ms. Basden nor Mr. Harrington had access to AFD’s actual Pre-Grant Period rental revenue. Therefore, the Court requests that the Parties

reach an agreement as to the amount of reasonable compensation payable by the Defendant to the Plaintiffs based upon: (1) the actual rental profit made by the Defendant in the Pre-Grant Period (not including profit from fuel sales); (2) an estimated royalty rate of 29%; and (3) pre-judgement interest.

[322] If the Parties cannot agree, the Parties are invited to make submissions to the Court, within two weeks from the date of this judgment.

D. *Punitive Damages*

[323] Counsel for the Plaintiffs argued that this is a case where punitive and exemplary damages are appropriate. I disagree.

[324] Punitive damages may be awarded in exceptional cases for "malicious, oppressive and high-handed" misconduct that "offends the court's sense of decency" (*Hill v Church of Scientology of Toronto*, [1995] 2 SCR 1130 at para 196). The three objectives of punitive damages are retribution, deterrence, and denunciation, which are meant to punish the wrong doer, rather than compensate the damaged party (*Whiten v Pilot Insurance Co*, 2002 SCC 18 at para 43 [*Whiten*]).

[325] In *Whiten*, above, Mr. Justice Binnie writing for the majority of the Supreme Court of Canada surveyed other common law jurisdictions and arrived at ten general principles to assist

decision makers in understanding how punitive damages should function within the Canadian legal system (*Whiten*, at paras 66 to 77). These principles can be summarized as follows:

1. Punitive damages are appropriate in exceptional circumstances, where the conduct of the defendant merits the condemnation of the court.
2. The purposes of punitive damages are punishment, denunciation, and deterrence.
3. Punitive damages should be assessed having regard to other fines or penalties imposed on the defendant.
4. The terms "high-handed", "oppressive", "vindictive", etc. are insufficient guidance to determine whether punitive damages are appropriate.
5. Punitive damages, in an amount that is the lowest that would serve the purpose, are rational if such an award would further one of the objectives of the law.
6. It is rational to use punitive damages where compensatory damages would amount to nothing more than a licence fee to earn greater profits through outrageous disregard of the legal or equitable rights of others.
7. When determining the amount of punitive damages the proper focus is on the defendant's conduct, not the plaintiff's loss.
8. The governing rule for quantum is proportionality.
9. Juries need to receive more guidance and help from judges when asked to determine whether punitive damages are appropriate and the quantum of said damages.
10. An appellate court is entitled to intervene if an award exceeds the outer boundaries of a rational and measured response.

[326] Mr. Justice Binnie further stated that the blameworthiness of a defendant's conduct may be influenced by many factors, including (*Whiten* at para 113):

> (1) whether the misconduct was planned and deliberate;
>
> (2) the intent and motive of the defendant;
>
> (3) whether the defendant persisted in the outrageous conduct over a lengthy period of time;
>
> (4) whether the defendant concealed or attempted to conceal its misconduct;
>
> (5) the defendant's awareness that what he or she was doing was wrong;
>
> (6) whether the defendant profited from its misconduct; and
>
> (7) whether the interest violated was known to be deeply personal to the plaintiff.

[327] In this case, the Plaintiffs argue that AFD's conduct merits the condemnation of the court, and that AFD's actions rise to a high level of blameworthiness. The Plaintiffs state that AFD (1) appropriated the '567 invention and marketed it as its own; (2) knew about Frac Shack's patent application; (3) marketed the AFD Frac Trailer as being innovative; and (4) submitted documents to the government representing that the AFD Frac Trailer technology was innovative. Further, the Plaintiffs suggest that the Defendant moved the AFD Frac Trailer outside the jurisdiction of the Court when this action was commenced, to prevent the Plaintiffs from pursuing an order for delivery up of the trailer. Finally, they submit that the Court should consider the fact that the Defendant had knowledge of the Plaintiffs' patent application as early as 2012, and count the period of misconduct as starting from that time.

[328] The evidence presented at trial showed that while the infringing actions of the Defendant are blameworthy, the Defendant's conduct does not merit the condemnation of the Court. The period of infringement was short, and a significant portion of the marketing of the AFD Frac Trailer that is highlighted by the Plaintiffs was conducted prior to the issue date of the '567 Patent. Additionally, although the Defendant's actions in removing the AFD Frac Trailer to Texas are questionable, the Plaintiffs provided was no evidence proving, on a balance of probabilities, that this was for the purpose of preventing the Plaintiffs from getting full relief and not simply a business decision by AFD. In fact, by moving the AFD Frac Trailer out of Canada, AFD was likely acting for the purposes of mitigating their damages and halting their infringement.

[329] Therefore, after considering the actions of the Defendant and the objectives of the law of punitive damages, I find that the circumstances for awarding punitive damages are not present in this case.

XVI. Injunctive Relief

[330] The Plaintiffs are entitled to a permanent injunction restraining the Defendant from further infringing the ‘567 Patent.

XVII. Costs

[331] Given the success of the Plaintiffs in this action, I see no reason why costs should not follow the event, assessed at the mid-point of Column IV of Tariff B. If the Parties cannot agree on a costs disposition, they may make submissions on costs to the Court within two weeks of the date of this judgment.

JUDGMENT

THIS COURT'S JUDGMENT is that:

1. The following claims of the '567 Patent are invalid:
   a. claims 1 to 6, which fail to disclose a fuel level sensor, are broader than any invention made or disclosed;
   b. claims 16 to 18 and 32 to 37, which disclose use at a work site, not fracturing operations at a well site, are broader than any invention made or disclosed;
   c. claims 20 to 26, which disclose a fuel delivery system, the use of which is not limited to any specific location, are broader than any invention made or disclosed.
2. Claims 7 to 15, 19, 27 to 31, and 38 are valid.
3. Between September 23, 2014 and October 18, 2014, the following claims were infringed by AFD:
   a. claim 7;
   b. claim 8;
   c. claim 9;
   d. claims 11 to 13;
   e. claim 15, as it depends on claim 13;
   f. claim 19, as it depends on either claim 16 or 17;
   g. claim 28, as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17);
   h. claim 31, as it depends on any of claims 7, 8, 9, 19 (as it depends on either claim 16 or 17), or 28 (as it depends on any of claims 7, 8, 9, or 19 (as it depends on either claim 16 or 17); and

i. claim 38, as it depends on claim 32.

4. After October 18, 2014, the following claims were infringed by AFD:

a. claim 7;

b. claim 8;

c. claim 11;

d. claim 13, as it depends on claim 11;

e. claim 15, as it depends on claim 13 (as it depends on claim 11);

f. claim 19, as it depends on either of claim 16 or 17;

g. claim 28, as it depends on any of claims 7, 8, or 19 (as it depends on either claim 16 or 17); and

h. claim 31, as it depends on any of claims 7, 8, 19 (as it depends on either claim 16 or 17) or 28 (as it depends any of claims 7, 8, or 19 (as it depends on either claim 16 or 17)); and

i. claim 38, as it depends on claim 32.

5. The Plaintiffs are entitled to injunctive relief, an accounting of profits for infringement, and reasonable compensation for use prior to September 23, 2014 from the Defendant, to be calculated as set out in the Reasons.

6. The Plaintiffs are not entitled to punitive damages.

7. Costs of the proceedings follow the event and are to be assessed at the mid-point of Column IV of Tariff B. If the parties cannot agree on a costs disposition, concise written cost submissions, not exceeding 5 pages in length, shall be submitted to the Court no later than 14 days of the date of this Judgment.

"Michael D. Manson"
Judge

FEDERAL COURT

SOLICITORS OF RECORD

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