Trials@uspto.gov
571-272-7822

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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BAKER HUGHES INCORPORATED,
Petitioner,

v.

LUBRIZOL SPECIALTY PRODUCTS, INC.,
Patent Owner.

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Case IPR2016-00734
Patent 8,022,118 B2

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Before GRACE KARAFFA OBERMANN, KRISTINA M. KALAN, and MICHELLE N. ANKENBRAND, *Administrative Patent Judges.*

ANKENBRAND, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
*37 C.F.R. § 42.108*

# I. INTRODUCTION

Baker Hughes Inc. ("Petitioner") requests an *inter partes* review of claims 1–11 of U.S. Patent No. 8,022,118 B2 ("the '118 patent," Ex. 1001). Paper 2 ("Pet."). Lubrizol Specialty Products, Inc. ("Patent Owner") filed a Preliminary Response. Paper 8 ("Prelim. Resp.").

We have jurisdiction under 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." Applying that standard, and upon consideration of the information presented in the Petition and the Preliminary Response, we institute an *inter partes* review of claims 1–11.

## *A. Related Proceedings*

Petitioner identifies the following pending litigation involving the '118 patent: *Lubrizol Specialty Products, Inc. v. Baker Hughes Inc.*, No. 4:15-cv-02915 (S.D. Tex.) and *Lubrizol Specialty Products, Inc. v. FLOWCHEM LLC*, No. 4:15-cv-02917 (S.D. Tex.). Pet. 2–3. Petitioner also identifies U.S. Patent Application No. 13/209,119, filed on August 12, 2011, as pending, and represents that the '119 application claims benefit to, and is a continuation in part of, the application from which the '118 patent issued. *Id.* at 3.

## *B. The '118 Patent*

The '118 patent, titled "Drag reduction of asphaltenic crude oils," issued on September 20, 2011. The '118 patent relates to "reducing pressure drop associated with the turbulent flow of asphaltenic crude oil through a conduit" by "treating the asphaltenic crude oil [i.e., crude oil having an asphaltene content of at least 3 weight percent and/or an API gravity of less

than about 26°] with a high molecular weight drag reducing polymer that can have a solubility parameter within about 20 percent of the solubility parameter of the heavy crude oil." Ex. 1001, Abstract.

According to the specification, "[w]hen fluids are transported by a pipeline, there is typically a drop in fluid pressure due to the friction between the wall of the pipeline and the fluid." *Id.* at 1:14–16. The pressure drop increases with increasing flow rate, resulting in energy losses and inefficiencies that increase equipment and operation costs. *Id.* at 1:16–26. The problems associated with pressure drop are most acute when fluids are transported over long distances. *Id.* at 1:24–25.

Before the '118 patent, it was known to use drag reducing polymers in the fluid flowing through a pipeline to alleviate the problems resulting from pressure drop. *Id.* at 1:28–30. A drag reducing polymer "is a composition capable of substantially reducing friction loss associated with the turbulent flow of a fluid through a pipeline" and such a composition works by "suppress[ing] the growth of turbulent eddies, which results in higher flow rate at a constant pumping pressure." *Id.* at 1:32–34. Drag reduction generally "depends in part upon the molecular weight of the polymer additive and its ability to dissolve in the hydrocarbon under turbulent flow." *Id.* at 1:39–41.

According to the specification, because conventional drag reducing polymers do not perform well in crude oils having a low API gravity[1] and/or a high asphaltene content (i.e., heavy crude oils), there exists a need for

[1] The specification defines API gravity as "the specific gravity scale developed by the American Petroleum Institute for measuring the relative density of various petroleum liquids." *Id.* at 3:61–64.

improved drag reducing polymers capable of reducing the pressure drop associated with the turbulent flow of heavy crude oils through pipelines. *Id.* at 1:46–49. The subject matter of the disclosed invention, therefore, "relates generally to high molecular weight drag reducers for use in crude oils." *Id.* at 1:7–8. More specifically, the '118 patent discloses a method for reducing the pressure drop associated with flowing a liquid hydrocarbon through a conduit, such as a pipeline. *Id.* at 2:58–60. The method comprises introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° (i.e., heavy crude oil) to produce a treated liquid hydrocarbon having a viscosity that is not less than the viscosity of the liquid hydrocarbon prior to treatment with the drag reducing polymer. *Id.* at 19:32–42. An example of suitable heavy crude oil includes Bow River heavy crude, which, according to Table I of the '118 patent, has an asphaltene content of 10.3 or 11.4 weight percent and an API gravity of 21.8°. *Id.* at 4:37–40, Table I.

The specification further explains that, "[i]n order for the drag reducing polymer to function as a drag reducer, the polymer should dissolve or be substantially solvated in the liquid hydrocarbon." *Id.* at 11:38–40. The liquid hydrocarbon and the drag reducing polymer, therefore, have solubility parameters that can be determined according to known methods, and the claims set forth certain solubility parameters and ranges of solubility parameters. *Id.* at 4:19–32 (setting forth known methods for determining the solubility parameter of the liquid hydrocarbon), 11:46–12:23 (setting forth known methods for determining the solubility parameter of the drag reducing polymer); *see, e.g., id.* at 19:43–45 ("the drag reducing polymer

has a solubility parameter within 4 $MPa^{1/2}$ of the solubility parameter of the liquid hydrocarbon").

*C. Illustrative Claim*

Claims 1, 10, and 11 are independent claims of the '118 patent. Claim 1 is illustrative of the challenged claims and recites:

> 1. A method comprising:
>
> introducing a drag reducing polymer, into a pipeline, such that [sic] such that the friction loss associated with the turbulent flow through the pipeline is reduced by suppressing the growth of turbulent eddies, into a liquid hydrocarbon having an asphaltene content of at least 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon wherein the viscosity of the treated liquid hydrocarbon is not less than the viscosity of the liquid hydrocarbon prior to treatment with the drag reducing polymer;
>
> wherein the drag reducing polymer has a solubility parameter within 4 $MPa^{1/2}$ of the solubility parameter of the liquid hydrocarbon and
>
> the drag reducing polymer is added to the liquid hydrocarbon in the range from about 0.1 to about 500 ppmw.

Ex. 1001, 19:32–47.

Claims 2–9 depend ultimately from claim 1 and, therefore, inherit the limitations of claim 1. Claims 2–4 further require a drag reducing polymer (1) having a solubility parameter of "at least about 17 $MPa^{1/2}$," (2) comprising "at least about 25,000 repeating units," and (3) having a weight average molecular weight of "at least $1x10^6$ g/mol," respectively. *Id.* at 19:48–54. Claim 5 narrows the solubility parameter of the drag reducing polymer to one that is "within 2.5 $MPa^{1/2}$ of the liquid hydrocarbon." *Id.* at 19:55–57. Claims 6 and 7 set forth equations for determining the solubility parameters of the liquid hydrocarbon and drag reducing polymer,

respectively. *Id.* at 19:58–20:7. Claim 8 narrows the method of claim 1 to one in which a plurality of the drag reducing polymer's repeat units comprise a heteroatom, and claim 9 further limits the heteroatom to one "selected from the group consisting of an oxygen atom, a nitrogen atom, a sulfur atom and/or a phosphorus atom." *Id.* at 20:8–12. Independent claims 10 and 11 recite methods similar to claim 1, and incorporate some of the additional limitations recited in the dependent claims. Claim 10 incorporates the limitations for the drag reducing polymer solubility parameter, repeat units, and molecular weight set forth in claims 2–4, as well as the heteroatom limitations of claims 8 and 9. *Id.* at 20:13–36. Claim 11 incorporates the limitations of claims 6 and 7. *Id.* at 20:37–64.

*D. Proposed Grounds of Unpatentability*

Petitioner asserts that the challenged claims of the '118 patent are unpatentable based upon the following grounds:

| Reference(s) | Statutory Basis | Claims Challenged |
|---|---|---|
| Eaton[2] | § 102(b) | 1, 3, 4, 6, 7, 11 |
| Eaton and Strausz[3] | § 103(a) | 1–7 and 11 |
| Eaton, Strausz, and Naiman[4] | § 103(a) | 8–10 |

[2] U.S. Patent No. 6,015,779, issued January 18, 2000 ("Eaton") (Ex. 1002).

[3] OTTO P. STRAUSZ & ELIZABETH M. LOWN, THE CHEMISTRY OF ALBERTA OIL SANDS, BITUMENS AND HEAVY OILS 464–480 (2003) ("Strausz") (Ex. 1003).

[4] U.S. Patent No. 4,983,186, issued January 8, 1991 ("Naiman") (Ex. 1004).

The Petition is supported by the Declaration of Thomas H. Epps, III, Ph.D. (Ex. 1005). Patent Owner's Preliminary Response is supported by the Declaration of Kenneth W. Smith, Ph.D. (Ex. 2001).

## II. ANALYSIS

We address below whether the Petition meets the threshold showing for institution of an *inter partes* review under 35 U.S.C. § 314(a). We consider each ground of unpatentability in view of the understanding of a person of ordinary skill in the art. Petitioner's declarant, Dr. Epps, testifies that a person of ordinary skill in the art would have had familiarity with basic principles related to polymers and polymer synthesis, including chemical composition of monomers and polymers, common types of polymerization processes, types of polymerization catalysts, and solubility properties of polymers. Ex. 1005 ¶ 14 (citing Ex. 1007). The ordinarily skilled artisan, according to Dr. Epps, also would have been aware of and consulted technical publications directed to the physical and chemical properties of drag reducing polymers and the study of polymer flow properties in solution, and utilized the techniques in those publications to determine properties such as the solubility parameters of polymers. *Id.* ¶ 15–16 (citing Ex. 1003; Ex. 1008; Ex. 1009). Moreover, such a person typically would have had a Bachelor of Science degree in chemical engineering, polymer science and engineering, or a closely related field and at least two years of work experience or further academic experience with drag reducing polymers or polymer flow properties in solution for any fluid. *Id*. ¶ 18.

Patent Owner contends that Petitioner and Dr. Epps "overstate[] the level of ordinary skill back in 2005-06" and imbue the person of ordinary

skill with extraneous requirements, but Patent Owner does not provide a definition or testimony regarding the level of ordinary skill in the art. *See* Prelim. Resp. 13–15. At this stage of the proceeding, it is not necessary to resolve the dispute to reach a determination on the merits, because we find that the prior art itself is sufficient to demonstrate the level of ordinary skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art, itself, can reflect appropriate level of ordinary skill in art).

*A. Claim Construction*

The Board interprets claims in an unexpired patent using the "broadest reasonable construction in light of the specification of the patent." 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, claim terms are given their ordinary and customary meaning in view of the specification, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only those terms which are in controversy need be construed, and only to the extent necessary to resolve the controversy. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner submits that we need not construe any claim term for purposes of this decision. Pet. 16. Patent Owner proposes that we construe the term "pipeline" in accordance with its plain and ordinary meaning. Prelim. Resp. 15–17. Because the parties do not direct us to any claim terms

that are in controversy, we determine that no claim term requires express construction for purposes of this decision. *Id.*

### *B. Overview of the Asserted References*

#### *1. Eaton*

Eaton discloses "methods for improving the flow of hydrocarbons through conduits, particularly viscous crude oil flowing through pipelines," including methods for making improved drag reducing agents having ultra-high molecular weight. Ex. 1002, 1:11–18, 1:66–2:9. The drag reducing agent, which is added to the hydrocarbon at a concentration from 1–250 parts per million by weight (ppmw), improves flow by "reducing frictional pressure losses, or frictionally generated energy bursts, associated with movement of fluid within the conduit." *Id.* at 2:32–39, 5:13–17. In other words, the drag reducing agent "tend[s] to reduce the impact of turbulence through direct interaction and absorption of some or most of the[] energy bursts thus improving flow characteristics in the conduit." *Id.* at 5:20–24.

Eaton discloses that the drag reducing agent should have the right combination of properties to provide drag reduction and flow improvement. *Id.* at 5:24–26. For instance, the drag reducing agent should be non-crystalline and amorphous, have an ultra-high molecular weight (at least 10 or 15 million g/mol), and provide superior flow improvement. *Id.* at 5:26–30, 6:15–32. Eaton further discloses methods of making the drag reducing agents, which Eaton describes as compositions that include at least a polyalphaolefin polymer. *Id.* at 4:56–59. The methods employ a catalyst system that includes a transition metal catalyst and a co-catalyst mixture, preferably containing an alkylaluminoxane co-catalyst. *Id.* at 6:57–60.

In Example 1, Eaton compares four different drag reducing agents (compositions A, B, C, and D) for their ability to increase flow of various hydrocarbons, including Bow River crude oil, which Eaton describes as "a highly viscous crude oil from the IPL pipeline in Canada." *Id.* at 13:57–58, 14:33–38. Compositions A and B are polyalphaolefins made using the described methods with alkylaluminoxane as a co-catalyst, and compositions C and D are commercially available drag reducing compositions made without an alkylaluminoxane. *Id.* at 13:63–14:5. Each of the drag reducing agents was measured for percent flow increase in a one-inch or quarter-inch hydraulic flow loop. *Id.* at 14:33–39. The one-inch loop was used to test the Bow River crude oil because it is too viscous to generate turbulent flow in a quarter-inch loop. *Id.* at 14:40–42. According to Eaton, "indicative of the superior drag reducing capabilities of the present invention in an actual commercial setting, Compositions 'A' and 'B' both increased the flow rate of BOW RIVER crude oil, while neither compositions 'C' nor 'D' were able to increase the flow of the BOW RIVER crude oil." *Id.* at 14:62–67. Table 1 is reproduced below.

TABLE I

| | PERCENT FLOW INCREASE | | |
|---|---|---|---|
| DRA | ANS @3 ppm | BOW RIVER @4.6 ppm | HEXANE @1 ppm |
| A | 15.0 | 3.0 | 40.1 |
| B | 12.0 | 5.5 | 37.5 |
| C[1] | 10.8 | –0.5 | 31.1 |
| D[2] | — | 0.0 | 27.1 |

[1]LIQUID POWER ™ commercial DRA from Conoco Inc.
[2]FLO-1005 ™ commercial DRA from Baker-Hughes, Inc.

Table 1 indicates that compositions A and B increased the flow rate of Bow River crude oil by 3.0% and 5.5%, respectively, when added at a concentration of 4.6 ppmw. *Id.* at 15:1–12 (Table 1).

*2. Strausz*

Strausz is a book containing relationships and parameters that would have been useful to one working to solubilize materials, such as polymers, in crude oil. Strausz discloses that "[t]he ability of a solvent to solubilize asphaltene or, in general, to dissolve a solid or to form a homogeneous solution with another liquid, may be expressed in terms of solubility parameters." Ex. 1003, 465. Strausz provides several equations for determining solubility parameters, including the equation provided in the specification of the '118 patent for determining the solubility parameter of a liquid hydrocarbon. *Id.* at 465–66. Strausz explains that, although the solubility parameter theory "would not be expected to be applicable for colloidal aggregate solutions of polar, random, polydispersed macromolecules like asphaltene . . . the correlation between the solubility of asphaltene and solvent solubility parameter is quite good for nonpolar and low-polarity solvents." *Id.* at 466.

In that regard, Strausz describes a study of the correlation between asphaltene solubility and solubility parameters. *Id.* at 467. The study determined that "asphaltene becomes completely soluble in hydrocarbons with [a solubility parameter] $\geq$ 17.1 $MPa^{1/2}$" and that the solvation energy of hydrocarbon solvents with a solubility parameter "in the 17.1–22.1 $MPa^{1/2}$ range is sufficiently large to overcome the cohesion energy of asphaltene

and cause solubilization." *Id.* The study also established the solubility parameter of asphaltene "as not less than 19.6 $MPa^{1/2}$." *Id.*

*3. Naiman*

Naiman describes the problems associated with frictional pressure drop during the long distance transport of crude oil through pipelines, and the use of drag reducing agents to produce a less turbulent flow, thereby reducing the pressure loss due to friction. Ex. 1004, 1:14–27. Naiman explains that conventional drag reducing agents suffer drawbacks. For example, although effectiveness of the agents increases with increasing molecular weight, solubility in the hydrocarbon fluid decreases with increasing molecular weight. *Id.* at 1:39–47. To that end, Naiman discloses new additives for reducing "friction encountered in the flow of hydrocarbon fuels through conduits." *Id.* at 1:7–12. In particular, Naiman discloses adding to the hydrocarbon fluid "an effective amount of an oil-soluble polyamine and a terpolymer of styrene, alkyl acrylate and a carboxylic acid." *Id.* at Abstract. The styrene component increases the molecular weight of the polymer and the alkyl acrylate provides the polymer with improved oil solubility. *Id.* at 2:56–62. Naiman explains that the drag reducing polymer "has sufficient molecular weight to be effective, yet is soluble in hydrocarbons." *Id.* at 2:6–10.

According to Naiman, preferred polymers are oil-soluble, even at concentrations that are significantly higher than those encountered in drag-reducing applications. *Id.* at 3:58–62. The polymers have a molecular weight of about 3,000,000 to about 5,000,000. *Id.* at 3:46–48. The polymer is added, at a concentration from about 3 ppmw to about 35 ppmw, to a

hydrocarbon fluid (e.g., crude oil) flowing through a conduit. *Id.* at 4:1–4, 12–21.

Naiman also teaches that a carboxylic acid can be introduced into the polymer and a basic polyamine can be reacted with the polymer to form an oil-soluble salt of higher effective molecular weight than the original polymer. *Id.* at 26–34. According to Naiman, the salt is "an especially effective high molecular weight, oil-soluble drag reducing agent." *Id.* at 4:34–37.

In Example 2, Naiman reports the results of an experiment in which 100 ppmw of (a) various polymers and (b) combinations of polymer and polyamine were introduced into kerosene, and the percentage of drag reduction over the untreated fluid was measured. *Id.* at 5:20–25. Tables I and II show that polymer consisting of about 62–63 wt. percent 2-ethyl-hexyl acrylate and about 37–38 wt. percent styrene achieved a drag reduction of about 21–26%. *Id.* at 5:9–17 (Table I), 5:43–52 (Table II, polymers 1 and 5). Similar polymers that were made acidic and reacted with polyamine achieved a drag reduction of about 19–39%. *Id.* at 5:43–52 (Table II, polymers 2–4 and 6). Drag reduction was determined by measuring the difference between the pressure drop over a length of pipe for untreated kerosene and the drop over a length of pipe for treated kerosene, and comparing the difference. *Id.* at 5:35–41.

*C. Asserted Anticipation by Eaton*

Petitioner argues that Eaton discloses every limitation of claims 1, 3, 4, 6, 7, and 11. Pet. 23–40. Petitioner supports its argument with citations to Eaton that correspond to each limitation of the claims and with Dr. Epps's Declaration. *Id.* (citing Ex. 1002, 1:30–33, 1:66–2:9, 2:35–40, 5:8–23,

6:15–36, 11:43–67, 14:13–19, 14:33–38, 14:55–59, 15:1–12; Ex. 1005 ¶¶ 32, 45, 48, 50–56, 58, 62, 63, 66–75). To establish anticipation, each limitation in a claim must be found in a single prior art reference, arranged as recited in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008).

*1. "introducing a drag reducing polymer, into a pipeline, such that the friction loss associated with the turbulent flow through the pipeline is reduced by suppressing the growth of turbulent eddies"*

All of the challenged claims recite a method comprising "introducing a drag reducing polymer, into a pipeline, such that the friction loss associated with the turbulent flow through the pipeline is reduced by suppressing the growth of turbulent eddies." Patent Owner argues we should deny the Petition because Eaton does not disclose introducing "a drag reducing polymer 'into a pipeline' containing the claimed heavy, asphaltenic liquid hydrocarbon to cause 'suppress[ion] [of] the growth of turbulent eddies'—but instead only into a 'flow loop' to cause a 'flow increase' in a hydrocarbon with unspecified parameters." Prelim. Resp. 2, 24–27. More particularly, Patent Owner points to the Bow River crude oil test in Example 1 of Eaton, which was conducted in a flow loop, and asserts that it is the only disclosure in Eaton that Petitioner alleges practices the claimed methods. *Id.* at 24. Patent Owner further contends that showing a small flow increase through a flow loop "does not show substantial drag reduction by 'suppressing the growth of turbulent eddies' in an actual 'pipeline' in the field" and that the "marginal flow increase" illustrated in Eaton's Table 1 could have been caused by phenomena other than reducing friction loss, particularly given that Eaton does not disclose pressure measurements or

that turbulent flow was achieved during the testing. *Id.* at 24–26 (citing Ex. 2001 ¶¶ 21–24).

Patent Owner's arguments are based on the premise that Petitioner relies on Example 1 of Eaton for disclosing that particular limitation. Petitioner, however, does not rely on Eaton's Example 1 but, rather, relies on Eaton's disclosure that "it has been discovered that a drag reducing agent (DRA) made in accordance with the methods of this invention can produce as much as about thirty percent (30%) or greater flow improvement when added to a hydrocarbon flowing through a conduit." Pet. 24 (quoting Ex. 1002, 1:66–2:6), 33 (claim chart). Petitioner also points to Eaton's teaching that:

> the DRA can be introduced into the conduit to improve flow conditions by reducing frictional pressure losses, or frictionally generated energy bursts, associated with movement of fluid within the conduit. These frictionally generated energy bursts typically emanate from throughout the turbulent core of the flowing hydrocarbons and include lateral turbulent microbursts generated from or near the conduit walls. More simply stated, the DRAs tend to reduce the impact of turbulence through direct interaction and absorption of some or most of these energy bursts thus improving flow characteristics in the conduit.

*Id.* at 25, 33 (quoting Ex. 1002, 5:8–23). Dr. Epps testifies that the energy bursts described by Eaton are understood to cause turbulent eddies, and we credit that testimony at this stage of the proceeding. Ex. 1005 ¶ 45. Accordingly, Petitioner shows sufficiently, on this record, that Eaton discloses introducing a drag reducing polymer into a pipeline, such that the friction loss associated with the turbulent flow through the pipeline is reduced by suppressing the growth of turbulent eddies.

*2. "a liquid hydrocarbon having an asphaltene content of at least 3 weight percent and an API gravity of less than about 26°"*

All of the challenged claims require "a liquid hydrocarbon having an asphaltene content of at least 3 weight percent and an API gravity of less than about 26°." Petitioner argues Eaton expressly discloses that limitation of claim 1, but does not point to any portion of Eaton teaching a range of values for asphaltene content and API gravity of the Bow River crude oil used in Eaton's Example 1. *See* Pet. 25–27. Rather, Petitioner relies on the asphaltene content and API gravity properties of Bow River crude oil reported in Table 1 of the '118 patent. *Id.* at 26–27.

When an anticipatory reference "is silent about an asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence," which "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Cont'l Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991). Table 1 of the '118 patent specifies that Bow River crude oil generally has an asphaltene content of 10.3 or 11.4 weight percent—which shows sufficiently a content greater than 3 weight percent as required by the claim limitation—and an API gravity of 21.8°. Pet. 26–27; *see* Ex. 1001, Table 1. The '118 patent further explains that Bow River crude oil is a suitable example of a heavy crude oil liquid hydrocarbon that can be used in the disclosed methods. *Id.* at 4:37–42. In addition, Dr. Epps testifies that, in 2005, the term "heavy crude" oil referred to oil having a low API gravity; that is, the API gravity recited in claim 1 "merely indicates that the hydrocarbon liquid is a heavy crude oil." Ex. 1005 ¶¶ 27–28. We credit that testimony at this stage of the proceeding.

Patent Owner argues that Eaton does not disclose the asphaltene content or API gravity of the Bow River crude oil sample used in Example 1. Prelim. Resp. 18–23. Specifically, Patent Owner argues that Eaton omits details regarding the particular Bow River crude oil sample that was tested, which "is especially problematic" because the characteristics of Canadian crude oils, such as API gravity, can vary over time. *Id.* at 19. Patent Owner relies on an article explaining some of the qualities of Canadian bitumen and synthetic crude oils as support. *Id.* (citing Ex. 2019, 104). That article, however, explains that the varying properties of crude oil are observed in blended heavy crude oil streams, such as DilBits and SynBits, which are not categorized as conventional heavy sour crudes. Ex. 2019, 103–104. As Patent Owner acknowledges, Bow River crude oil, on the other hand, "is a '[c]onventional heavy sour crude produced in the WCSB' (the Western Canadian Sedimentary Basin)." Prelim. Resp. 18 (quoting Ex. 2019, 103). Thus, on this record, we are not persuaded by Patent Owner's argument.

Patent Owner also points to several industry publications, which describe Bow River heavy crude oil as having an API gravity of 26.7°, and contends that evidence refutes Petitioner's showing that Bow River crude oil has an API gravity of 21.8°. *Id.* at 21 (citing Ex. 2005, 120; Ex. 2006, 4; Ex. 2007, 1; Ex. 2008, 95; Ex. 2010). Patent Owner also argues that the value 26.7° falls outside the scope of the '118 patent claims. *Id.* at 20–21. Patent Owner, however, does not explain at this stage of the proceeding how an API gravity value of 26.7° falls outside of the range of API gravity values that is "less than about 26°."

Given the API gravity value provided in the '118 patent, Patent Owner's evidence establishes a factual dispute regarding whether the API

gravity of Bow River crude oil is less than about 26°. Patent Owner's arguments also implicate claim construction of the phrase "less than about 26°," which the parties do not address in the Petition or Preliminary Response. We find those disputes best resolved during trial based upon review of the entire record. Accordingly, on this record, Petitioner shows sufficiently that Eaton discloses a liquid hydrocarbon having the asphaltene content and API gravity ranges recited in claim 1.

*3. "wherein the drag reducing polymer has a solubility parameter within 4 MPa$^{1/2}$ of the solubility parameter of the liquid hydrocarbon" (the "solubility parameter limitation")*

All of the challenged claims include a solubility parameter limitation. Petitioner acknowledges that Eaton does not expressly disclose the solubility parameters of the drag reducing polymers in Example 1 (i.e., Compositions A and B). Pet. 31. Notwithstanding that acknowledgement, Petitioner asserts that Eaton's disclosure of the polymers is a disclosure of all of the properties of those polymers, even those properties not disclosed expressly. *Id.* (citing *In re Papesch*, 315 F.2d 381, 391). Petitioner supports its assertions with Dr. Epps's calculations of Eaton's Composition A and Composition B solubility parameters, as well as Dr. Epps's explanation regarding how an ordinarily skilled artisan would have understood and applied the solubility relationships described in Strausz. *Id.* at 31–32 (citing Ex. 1005 ¶¶ 68–74).

Patent Owner contends that because Eaton does not provide enough information to quantify the solubility parameter of the Bow River crude oil that was tested, Petitioner and Dr. Epps "resort[] to a secondary reference" and "employ[] guesswork to arrive at varying opinions about its [Bow River crude oil's] solubility parameter range." Prelim. Resp. 33; *see id.* at 28. As

explained above, extrinsic evidence may be used to fill gaps regarding asserted inherent characteristics of the prior art. *Cont'l Can*, 948 F.2d at 1268. Here, Petitioner relies on the solubility relationships and parameters provided in Strausz to fill such a gap. Pet. 31–32, 36. As such, we are not convinced that Petitioner's use of Strausz is improper.

Patent Owner argues that the Petition does not set forth sufficient support for the solubility parameter limitation but, instead, incorporates "a lengthy expert declaration" that violates 37 C.F.R. §§ 42.6(a)(3) and 42.104(b)(2). Prelim. Resp. 28–29. We are not persuaded that the Petition violates either rule. As previously noted, Petitioner's use of Strausz is not improper. Therefore, the Petition sets forth the statutory ground on which the challenge is based and the evidence relied upon for that ground, as required by 37 C.F.R. § 42.104(b)(2). We also find Petitioner's citations to Dr. Epps's declaration proper. Rule 37 C.F.R. § 42.6(a)(3) prohibits one document from incorporating an argument by reference into another document. Here, Petitioner sets forth its inherency argument in the Petition, and utilizes Dr. Epps's testimony, not for additional argument, but to support the inherency argument. *See* Pet. 31–32; Ex. 1005 ¶¶ 68–74.

Patent Owner argues that Dr. Epps's testimony regarding the solubility parameter of Bow River crude oil "is based on the unsupported assumption that asphaltene was 'fully solubilized' by the Bow River crude oil sample in Eaton." Prelim. Resp. 29–30. In that regard, Patent Owner contends Strausz contradicts Dr. Epps's assumption because Strausz describes asphaltenes in petroleum as colloidal systems that are not fully solubilized in the oil. *Id.* at 30. Patent Owner's arguments, however, are not consistent with Strausz's statements regarding asphaltene solubility.

Specifically, as Petitioner points out, Strausz discloses that: (1) "asphaltene becomes completely soluble in hydrocarbons with [a solubility parameter] ≥ 17.1 $MPa^{1/2}$"; and (2) the solvation energy of hydrocarbon solvents with a solubility parameter "in the 17.1–22.1 $MPa^{1/2}$ range is sufficiently large to overcome the cohesion energy of asphaltene and cause solubilization." Ex. 1003, 466–67; *see* Pet. 31–32, 36; Ex. 1005 ¶¶ 68–74.

Patent Owner argues that Dr. Epps's testimony is contrary to Petitioner's anticipation argument because the solubility parameters Dr. Epps calculated for Eaton's drag reducing polymers (i.e., 16.11 $MPa^{1/2}$ for Composition A and 16.31 $MPa^{1/2}$ for Composition B) are not always "within 4 $MPa^{1/2}$" of the Bow River crude oil solubility parameter. Prelim. Resp. 31. In particular, Patent Owner asserts that Eaton's disclosure cannot meet the "within 4 $MPa^{1/2}$" limitation if the solubility parameter of the Bow River crude oil falls above 20.31 $MPa^{1/2}$. *Id.* We are not persuaded by that argument on the present record, as it addresses only a portion of Dr. Epps's testimony regarding the solubility parameter limitation. Dr. Epps also explains how an ordinarily skilled artisan would have understood from the numerical relationships described in Strausz that Eaton's Compositions A and B must be at least reasonably soluble in Bow River crude oil and, therefore, must have solubility parameters that are within about 3.5 $MPa^{1/2}$ of the solubility parameter of the crude oil. Ex. 1005 ¶¶ 71–74; *see Cont'l Can*, 948 F.2d at 1268; *In re Graves*, 69 F.3d 1147, 1152 (Fed. Cir. 1995) (a reference anticipates a claim "if it discloses the claimed invention such that a skilled artisan could take its teaching in combination with his own knowledge of the particular art and be in possession of the invention.") (emphasis and internal quotations omitted). Accordingly, on this record,

Petitioner shows sufficiently that Eaton discloses the solubility parameter limitation.

> 4. *"the solubility parameter of the liquid hydrocarbon is determined by the following equation:* $\delta_2 = [(\Delta H_v\text{-}RT)/V]^{1/2}$ *where* $\Delta H_v$ *is the energy of vaporization, R is the universal gas constant, T is the temperature in Kelvin, V is the molar volume and* $\delta_2$ *is the solubility parameter."*

Claim 6 recites that "the solubility parameter of the liquid hydrocarbon is determined by the following equation: $\delta_2 = [(\Delta H_v\text{-}RT)/V]^{1/2}$ where $\Delta H_v$ is the energy of vaporization, R is the universal gas constant, T is the temperature in Kelvin, V is the molar volume and $\delta_2$ is the solubility parameter." Ex. 1001, 19:58–65. Claim 11 incorporates that limitation of claim 6. *Id.* at 20:50–56. Petitioner, with support from Dr. Epps's declaration, asserts that the solubility parameter equation was "well known in 2005" and that an ordinarily skilled artisan would have used that equation "to determine the solubility parameter of Bow River crude oil." Pet. 39 (citing Ex. 1005 ¶¶ 34, 68–69).

Patent Owner argues that Eaton does not disclose the recited solubility parameter equation and that Dr. Epps does not use the equation to calculate the solubility parameter of Bow River crude oil. Prelim. Resp. 33. In that regard, Patent Owner further argues that Dr. Epps's testimony contradicts the Petition because Dr. Epps testifies that the solubility parameter of Bow River crude oil "'could not be directly calculated using this [the recited solubility parameter] equation.'" *Id.* at 34 (quoting Ex. 1005 ¶ 68).

We are not persuaded by Patent Owner's argument because, at this stage of the proceeding, Patent Owner fails to explain how "determin[ing]" the solubility parameter by the equation recited in claims 6 and 11 requires calculating directly the solubility parameter using that equation. On this

record, we credit Dr. Epps's testimony that an ordinarily skilled artisan "would recognize that . . . the solubility parameter for a liquid hydrocarbon, such as Bow River heavy crude oil, would follow the [solubility equation recited in claims 6 and 11]," even though it cannot be calculated directly using that equation because not all of the components of the crude oil vaporize (i.e., components would lack a $\Delta H_v$). Ex. 1005 ¶ 68. Accordingly, at this stage of the proceeding, Petitioner shows sufficiently that Eaton discloses that the solubility parameter of the liquid hydrocarbon is determined by the equation recited in claims 6 and 11.

*5. Additional Claim Limitations*

We also find, on this record, and for purposes of this decision, that Petitioner shows sufficiently how Eaton discloses the additional limitations of claim 1, and the limitations of claims 3, 4, and 7, which Patent Owner does not contest separately at this stage of the proceeding. Pet. 37–40. Accordingly, at this stage of the proceeding, and based on the current record, Petitioner establishes a reasonable likelihood that it would prevail in showing that claims 1, 3, 4, 6, 7, and 11 are anticipated by Eaton.

*D. Asserted Obviousness Based on Eaton and Strausz*

Petitioner, with supporting testimony from Dr. Epps, asserts that a person of ordinary skill in the art would have been led from the above-referenced disclosures of Eaton and Strausz to a method comprising all of the elements recited in claims 1–7 and 11. Pet. 40–47 (citing Ex. 1005 ¶¶ 32, 41, 81–93). For most of the limitations of claim 1, as well as claims 3, 4, 6, and 7, Petitioner relies on the same arguments and evidence addressed previously in connection with Petitioner's assertion that Eaton anticipates those claims. *Id.* at 40. For the solubility parameter limitation,

Petitioner relies on the combination of Eaton and Strausz, more specifically, Strausz's disclosure of solubility parameters as properties "commonly used to assess the solubility of one material in another." *Id.* at 41 (citing Ex. 1005 ¶ 32). Petitioner argues that determining the solubility parameters recited in claims 2, 5, and 10 would have been routine given the solubility relationships Strausz discloses, and that an ordinarily skilled artisan would have combined the teachings of Eaton and Strausz to make a more effective drag reducing polymer for heavy crude oil. *Id.* at 47–48.

Patent Owner disagrees and argues that Petitioner fails to explain adequately why or how an ordinarily skilled artisan "considering the drag reducing polymers of Eaton would have been led to create new and different polymers using a second reference about asphaltene solubility, Strausz, that does not even mention drag reduction or drag reducing polymers." Prelim. Resp. 36–37, 40. Patent Owner, pointing to Dr. Smith's testimony, further argues there is no indication that an ordinarily skilled artisan would have recognized, prior to the invention of the '118 patent, that asphaltene content was important or should guide the making of a drag reducing polymer. *Id.* at 38, 40–41 (citing Ex. 2001 ¶¶ 15–16).

At this stage of the proceeding, we are persuaded by Petitioner's arguments. First, Petitioner does explain why one of ordinary skill would have combined the teachings of Eaton and Strausz—to optimize or make Eaton's drag reducing polymer as effective as possible by taking advantage of the relationships Strausz discloses for hydrocarbon solubility. Pet. 45–47; Ex. 1005 ¶¶ 84, 85, 92, 94. Further, we do not understand Petitioner's argument for combining the teachings of Eaton and Strausz as one that is based on using asphaltene content to make a drag reducing polymer. Rather,

it appears to be based on applying the solubility properties and relationships that Strausz discloses for asphaltene to other hydrocarbons (i.e., a drag reducing polymer made by Eaton's process and heavy crude oil). In any event, at this stage of the proceeding, Patent Owner's argument that it was not known asphaltene content was important or should guide the making of a drag reducing polymer prior to the '118 patent rests on unsupported declaration testimony, as Dr. Smith provides no citations, experiments, or other evidence to support his assertions. Such bare opinion testimony is of little probative value. *See* 37 C.F.R. § 42.65(a) (opinion testimony that does not disclose underlying facts or data "is entitled to little or no weight").

Patent Owner argues Petitioner fails to show that an ordinarily skilled artisan would have had a reasonable expectation of success in achieving the claimed invention. Prelim. Resp. 41–46. In particular, Patent Owner asserts that Petitioner provides no evidence that the drag reducing polymers made by following the teachings of Eaton and Strausz would "**actually work**" to provide drag reduction. *Id.* at 42–43. In that regard, Patent Owner explains that Dr. Smith conducted an experiment to assess the solubility of polystyrene in Bow River crude oil and the results of the experiment demonstrate that polystyrene is insoluble in the crude oil. *Id.* at 43 (citing Ex. 2011 ¶¶ 25–30). Patent Owner also argues that Eaton "exposes the flaw in Petitioner's assumption" about solubility because Eaton discloses that Composition C of Example 2 is an ineffective drag reducer in Bow River crude oil, even though it has a solubility parameter that is closer to the target range of Bow River crude oil than Eaton's Compositions A and B. *Id.* at 44. Thus, argues Patent Owner, solubility parameter does not, by itself,

demonstrate that a polymer will provide drag reduction in a given crude oil; it is just one of a number of factors in an unpredictable art. *Id.* at 44–45.

As an initial matter, Patent Owner's arguments regarding Eaton's Composition C are unpersuasive because Petitioner does not rely on Eaton's Composition A or Composition B (and their calculated solubility parameters) for this ground. Rather, Petitioner relies on the polystyrene polymer disclosed in Eaton and its calculated solubility parameter of 17.98 $MPa^{1/2}$, which is closer to the 17.1–19.6 $MPa^{1/2}$ solubility parameter range of Bow River crude oil than the solubility parameter of Eaton's composition C, which, according to the '118 patent, is 16.49 $MPa^{1/2}$. Pet. 43–45 (citing Ex. 1005 85–93); Ex. 1001, 14:8–9.

Further, it is not imperative that Petitioner show that a drag reducing polymer made by combining the teachings of Eaton and Strausz actually works, because a reasonable expectation of success does not require absolute predictability or a showing of actual success. *In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988). Moreover, as Petitioner argues, by claiming that the drag reducing polymer has a solubility parameter similar to the solubility parameter of the liquid hydrocarbon, the '118 patent teaches an ordinarily skilled artisan that the drag reducing polymer should be soluble in the liquid hydrocarbon. Pet. 41–42. Other evidence in the record supports Petitioner's argument and Dr. Epps's testimony that solubility in the fluid being treated was an important requirement for a drag reducing polymer. Ex. 1005 ¶ 41 (citing Ex. 1008, 800–02; Ex. 1009, 1550); *see* Ex. 1001, 1:39–41 (Description of the prior art stating "[i]n general, drag reduction depends in part upon the molecular weight of the polymer additive and its ability to dissolve in the hydrocarbon under turbulent flow."). Indeed, Patent Owner's

statements regarding Dr. Smith's experiments highlight the importance of solubility in the fluid being treated: "polystyrene did not even dissolve in a sample of Bow River crude oil, which precludes it from being capable of drag reducing this crude oil, which is required by the claims." Prelim. Resp. 43. We also credit, at this stage of the proceeding, Dr. Epps's testimony that an ordinarily skilled artisan, following the combined teachings of Eaton and Strausz, would have reasonably expected a polymer having a solubility parameter close to that of Bow River crude oil (i.e., one that dissolves in the Bow River crude oil) to reduce frictional pressure losses in the Bow River crude oil. Ex. 1005 ¶ 94.

Moreover, although Dr. Smith testifies the results of his experiment show that polystyrene does not dissolve in Bow River crude oil, Ex. 2001 ¶¶ 25–30, Patent Owner does not provide data from that experiment or point to other record evidence supporting that testimony. *See generally* Prelim. Resp. We find that Dr. Smith's testimony creates a disputed issue of fact as to whether Eaton's polystyrene polymer is soluble in Bow River crude oil. At this stage of the proceeding, we view such testimonial evidence that creates a genuine issue of material fact in the light most favorable to the Petitioner. 37 C.F.R. § 42.108(c). Accordingly, on this record, Petitioner establishes a reasonable likelihood that it would prevail in showing that the subject matter of claims 1–7 and 11 would have been obvious over Eaton and Strausz.

*E. Asserted Obviousness Based on Eaton, Strausz, and Naiman*

Petitioner, with supporting testimony from Dr. Epps, asserts that a person of ordinary skill in the art would have been led by the above disclosures of Eaton, Strausz, and Naiman to a method comprising all of the

elements recited in claims 8–10. Pet. 47–60 (citing Ex. 1005 ¶¶ 83, 84, 107–118, 120–24). For example, with respect to the limitations requiring a plurality of repeat units comprising a heteroatom and narrowing the heteroatom to one selected from the group consisting of an oxygen atom, a nitrogen atom, a sulfur atom and/or a phosphorus atom, Petitioner points to Naiman's polymers, which are made up of (1) styrene and alkyl acrylate units or (2) styrene, alkyl acrylate, and carboxylic acid units that are then reacted with polyamine, noting that each of the alkyl-acrylate units includes an oxygen heteroatom. *Id.* at 47.

Petitioner further explains that an ordinarily skilled artisan would have known that Eaton's drag reducing polymers are prepared using a Ziegler-Natta polymerization process, which limits the type of useful monomers and requires an expensive catalyst system. *Id.* at 48. Thus, asserts Petitioner, an ordinarily skilled artisan would have been led to look for other drag reducing polymers that would be effective in heavy crude oil, but made using a more commercially desirable process. *Id.* at 48–49. Thus, Petitioner asserts that an ordinarily skilled artisan would have been led to substitute Naiman's drag reducing polymer for that disclosed in Eaton. *Id.* at 49–50, 59–60.

Patent Owner asserts that a person of ordinary skill in the art would not have been led to combine the teachings of Naiman and Eaton because the references teach away from one another. Prelim. Resp. 47–51. In particular, Patent Owner asserts that (1) Eaton teaches away from drag reducing polymers containing heteroatoms because Eaton expressly limits its definition of a drag reducing agent to a polyalphaolefin polymer, which does not contain heteroatoms; (2) replacing Eaton's drag reducing polymers with

those described in Naiman would also replace the co-catalyst alkylaluminoxane, which Eaton describes as critical to providing the polymers with superior flow improving properties; (3) Eaton teaches away from polymers with heteroatoms because an ordinarily skilled artisan would have considered those polymers incompatible with Eaton's Ziegler-Natta polymerization method; (4) the approach to making some of the polymers in Naiman is "fundamentally different" from the approach used in Eaton; and (5) Eaton and Naiman teach "substantially different, non-overlapping ranges for polymer molecular weight." *Id.* at 48–51.

On this record, we are persuaded by Petitioner's presentation of its arguments and evidence. The fact that Eaton and Naiman disclose drag reducing polymers made from different types of monomers and processes does not mean that they teach away from one another. A reference does not teach away if it merely expresses a general preference for an alternative invention from amongst the options available to the ordinarily skilled artisan, and the reference does not discredit or discourage investigation into the invention claimed. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Patent Owner does not point to any statements in Eaton criticizing or discrediting the use of polymers containing heteroatoms or polymers made by processes that other than the Zeigler-Natta process. In other words, the fact that Eaton and Naiman disclose different solutions to a similar problem (i.e., different polymers to reduce frictional pressure drops in the flow of crude oil through pipelines) does not teach away from their combination. *See id.*

In addition, the fact that Eaton and Naiman disclose different ranges for polymer molecular weight is not a teaching away from either range. As

Naiman recognizes, tradeoffs exist between polymer molecular weight and solubility of the polymer in oil. Ex. 1004, 1:41–44 (although effectiveness of a drag reducing polymer "generally increases with increased molecular weight" of the polymer, "the hydrocarbon or oil solubility characteristically decreases with higher molecular weight"). A person of ordinary skill in the art would have understood and weighed this tradeoff in benefits when making a drag reducing polymer. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate the motivation to combine").

As with the combination of Eaton and Strausz, Patent Owner argues that Petitioner fails to explain adequately why or how an ordinarily skilled artisan would have been led to the different polymers and approach disclosed in Naiman. Prelim. Resp. 52. Patent Owner again points to Dr. Smith's declaration, *id.* at 53, particularly the testimony that prior to 2005–2006, "it was not generally known in the field that asphaltene content was important for drag reduction of crude oils or that the design of drag reducing polymers should be guided by asphaltene content." Ex. 2001 ¶¶ 15–16. Patent Owner also argues that Petitioner's proposed combination is nothing more than a hindsight reconstruction based on the disclosure of the '118 patent and that, in any event, Petitioner provides no showing of a reasonable expectation of success in achieving the claimed invention. Prelim. Resp. 52–56.

For the same reasons identified above with respect to the combination of Eaton and Strausz, at this stage of the proceeding, we are persuaded by Petitioner's arguments on this ground. In addition, based on the current

record, we find that replacing Eaton's polymers with the polymers described in Naiman would have been a substitution of one known drag reducing polymer for another with the predictable result of improving flow through a pipeline (i.e., reducing the frictional loss associated with turbulent flow through a pipeline by suppressing the growth of turbulent eddies). *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

Patent Owner argues that the combination of Eaton, Strausz, and Naiman fails because Petitioner does not identify any particular polymer from Naiman that satisfies the claim limitations. Prelim. Resp. 57–59. In particular, Patent Owner contends that Petitioner's omission is fatal to the asserted ground because "Petitioner provides no basis to assume that this art was so predictable that the Board can just assume . . . that an unspecified polymer from Naiman would actually work to provide effective drag reduction of a heavy asphaltenic hydrocarbon as claimed." *Id.* at 58. Patent Owner relies on *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999 (Fed. Cir. 2006) and *Moses Lake Indus., Inc. v. Enthone, Inc.*, Case IPR2014-00246, slip op. at 13 (PTAB June 18, 2014), to support its position.

Patent Owner's cases are distinguishable, however, because they address issues relating to anticipation, not obviousness. *See Atofina*, 441 F.3d at 998–1000 (considering whether the prior art's disclosure of a broad temperature range inherently disclosed every temperature within the range and, therefore, anticipated a narrower temperature range); *Moses Lake*, slip. op., 11–13 (addressing Petitioner's anticipation challenge to the claims). Here, in contrast, Petitioner's challenge is based on obviousness. Patent Owner's argument also is not commensurate in scope with the claims, as the claims do not recite a specific drag racing polymer. Ex. 1001, 19:32–20:64.

Accordingly, on this record, Petitioner establishes a reasonable likelihood that it would prevail in showing that the subject matter of claims 8–10 would have been obvious over Eaton, Strausz, and Naiman.

## III. CONCLUSION

Taking account of the information presented in the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner establishes a reasonable likelihood that it will prevail in showing that claims 1–11 of the '118 patent are unpatentable. Our factual findings and conclusions at this stage of the proceeding are based on the evidentiary record developed thus far, and may change upon consideration of the full record developed during trial. This decision is not a final decision as to the patentability of any claim for which *inter partes* review is instituted. Our final decision will be based on the full record developed during trial.

## IV. ORDER

In consideration of the foregoing, it is hereby

ORDERED that an *inter partes* review is instituted as to:

Claims 1, 3, 4, 6, 7, and 11 of the '118 patent, on the ground of anticipation by Eaton under 35 U.S.C. § 102;

Claims 1–7 and 11 of the '118 patent, on the ground of unpatentability over Eaton and Strausz under 35 U.S.C. § 103;

Claims 8–10 of the '118 patent on the ground of unpatentability over Eaton, Strausz, and Naiman under 35 U.S.C. § 103;

FURTHER ORDERED that no other ground of unpatentability is authorized; and

FURTHER ORDERED that notice is hereby given of the institution of a trial commencing on the entry date of this decision, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4.

FOR PETITIONER:

Herbert Hart
hhart@mcandrews-ip.com

George Wheeler
gwheeler@mcandrews-ip.com

Peter Lish
plish@mcandrews-ip.com

Aaron Barkoff
abarkoff@mcandrews-ip.com

FOR PATENT OWNER:

Doug McClellan
doug.mcclellan@weil.com

Elizabeth Weiswasser
elizabeth.weiswasser@weil.com