

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WEATHERFORD INTERNATIONAL, LLC, WEATHERFORD/LAMB, INC.,
WEATHERFORD US, LP, and WEATHERFORD ARTIFICIAL LIFT
SYSTEMS, LLC,
Petitioners

v.

PACKERS PLUS ENERGY SERVICES INC.,
Patent Owner

Case IPR2016-01509
Patent 7,861,774

EXCLUSIVE LICENSEE'S NOTICE OF APPEAL

Pursuant to 35 U.S.C. §§ 141 and 142 and 37 C.F.R. §§ 90.2(a), 90.3 and 104.2, Exclusive Licensee, Rapid Completions LLC, (“Rapid Completions”) hereby provides notice of its appeal to the United States Court of Appeals for the Federal Circuit for review of the Final Written Decision of the United States Patent and Trademark Office (“USPTO”) Patent Trial and Appeals Board (“PTAB”) in Inter Partes Review 2016-01509, concerning U.S. Patent 7,861,774 (“the ’774 patent”), entered on February 22, 2018, attached hereto as Appendix A.

ISSUES TO BE ADDRESSED ON APPEAL

- A. Whether the PTAB erred in concluding that claims 1, 3–7, 9–10, 12 and 16 would have been obvious under 35 U.S.C. § 103 over Yost, Thomson and Ellsworth?
- B. Whether the PTAB erred in concluding that claims 1, 3–7, 9–10, 12 and 16 would have been obvious under 35 U.S.C. § 103 over Thomson and Ellsworth?
- C. Whether the PTAB erred in giving insufficient weight to Patent Owner’s secondary considerations of non-obviousness?
- D. Whether the PTAB erred in concluding that Patent Owner did not demonstrate commercial success?
- E. Whether the PTAB erred in concluding that Patent Owner did not

demonstrate a long-felt but unsolved need?

- F. Whether the PTAB erred in concluding that Patent Owner did not show that the claimed invention was contrary to accepted wisdom and produced unexpected results?
- G. Whether the PTAB erred in concluding that a person of ordinary skill in the art would have been motivated to combine the teachings of the prior art and would have achieved the claimed invention with a reasonable expectation of success?
- H. Whether the Board erred in considering new evidence submitted for the first time in Petitioners' Reply?

Rapid Completions reserves the right to challenge any finding or determination supporting or related to the issues listed above, and to challenge any other issues decided adversely to Rapid Completions in the Final Written Decision and/or any orders, decisions or rulings underlying the Final Written Decision.

Simultaneous with submission of this Notice of Appeal to the Director of the United States Patent and Trademark Office, this Notice of Appeal is being filed with the Patent Trial and Appeal Board. In addition, this Notice of Appeal, along with the required docketing fees, is being filed with the United States Court of Appeals for the Federal Circuit.

Dated: April 20, 2018

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned certifies that in addition to being filed electronically through the Patent Trial and Appeal Board's E2E system the foregoing NOTICE OF APPEAL was served on the Director of the United States Patent and Trademark Office, at the following address (in accordance with 37 C.F.R. §§ 90.2(a), 104.2):

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450 Alexandria, Virginia 22313-1450

CERTIFICATE OF FILING

The undersigned certifies that on April 17, 2018, a true and correct copy of the foregoing NOTICE OF APPEAL was filed electronically with the Clerk's Office of the United States Court of Appeals for the Federal Circuit at the following address:

Clerk of Court
United States Court of Appeals for the Federal Circuit
717 Madison Place NW
Washington, DC 20005

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing NOTICE OF APPEAL was served on April 20, 2018, by filing this document through the PTAB's E2E system as well as by delivering a copy via electronic mail to the attorneys of record for the Petitioners as follows:

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Appendix A

PUBLIC VERSION – REDACTED

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WEATHERFORD INTERNATIONAL, LLC,
WEATHERFORD/LAMB, INC., WEATHERFORD US, LP, and
WEATHERFORD ARTIFICIAL LIFT SYSTEMS, LLC,
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PACKERS PLUS ENERGY SERVICES INC.,
Patent Owner.

Case IPR2016-01509
Patent 7,861,774 B2

Before SCOTT A. DANIELS, NEIL T. POWELL and
CARL M. DEFRANCO, *Administrative Patent Judges*.

DANIELS, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

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I. INTRODUCTION

A. *Background*

Weatherford International LLC, and others, (“Weatherford” or “Petitioner”) filed a Petition (Paper 1, “Pet.”) challenging claims 1, 3–7, 9–10, 12, and 16 of the ’774 patent and supporting its challenge with the testimony of Dr. Vikram Rao, Ph.D. (Ex. 1007). We instituted trial for claims 1, 3–7, 9–10, 12 and 16 of the ’774 patent on certain grounds of unpatentability alleged in the Petition. Paper 23 (“Decision to Institute” or “Inst. Dec.”).

After institution of trial, Rapid Completions LLC, (“Rapid” or “Patent Owner”) the exclusive licensee of the ’774 patent, filed a Patent Owner Response, along with a Declaration by Mr. Harold E. McGowen, PE, (“McGowen Declaration”).¹ Petitioner filed a Reply (Paper 39, “Pet. Reply”) and both parties filed motions to exclude certain evidence. *See* Papers 44, 46.

A consolidated hearing for IPR2016-01509, IPR2016-01514 and IPR2016-01517, each involving the same Petitioner and the same Patent Owner, was held on November 2, 2017. The ’774 patent is a continuation of U.S. Patent No. 7,534,634, which is in turn, a continuation of U.S. Patent No. 7,134,505, which are at issue in the latter two proceedings. The transcript of the consolidated hearing has been entered into the record. Paper 61. (“Tr.”).

¹ Packers Plus is the owner of the ’774 patent, however, because Rapid asserts itself as the exclusive licensee with all substantial rights to enforce the ’774 patent, we refer to Rapid as the respondent in this proceeding.

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We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a).

Weatherford has shown by a preponderance of the evidence that claims 1, 3–7, 9–10, 12 and 16 of the '774 patent are unpatentable.

B. Additional Proceedings

In addition to this petition, The '774 patent is involved in a concurrent district court action, *Rapid Completions LLC v. Baker Hughes Incorporated*, No. 6:15-cv-00724 (E.D. Tex.), which was filed July 31, 2015. Pet. 4. The '774 patent is also challenged in IPR2016-00598 and IPR2016-01506. *Id.*

C. The '774 Patent

The '774 patent describes a method for fluid treatment of a well bore, namely “fracing,” or “fracturing” and a tubing string tool for treating and stimulating flow from particular segments of the well bore in an oil or gas formation while sealing off other segments. Ex. 1001, Abstract. The well bore can be either an open hole or a cased hole. *Id.* at 3:66–4:3. Typically, a tubing string is run into a well bore as a conduit for oil and gas products to flow to the surface. *Id.* at 1:28–48. But when natural formation pressure is insufficient to obtain a desired product flow, a well “stimulation” technique is employed, i.e. fracing, which involves injecting fracturing fluids into the formation to enlarge existing channels and thereby improve inflow into the well bore. *Id.* at 1:35–39. And, because a well bore may cross multiple zones within an oil or gas formation, only some of which contain desirable products, the ability to inject “treatment fluids wherein fluid is injected into selected intervals of the well bore, while other intervals are closed,” is key to controlling and optimizing production from the well. *Id.* at 2:28–30.

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Figure 1b of the '774 patent is reproduced below. We note that Figure 1b as illustrated has a vertical orientation, and referring to Figure 1a and other figures as well as the claims, the well bore can be configured also in a non-vertical orientation, for example horizontal.

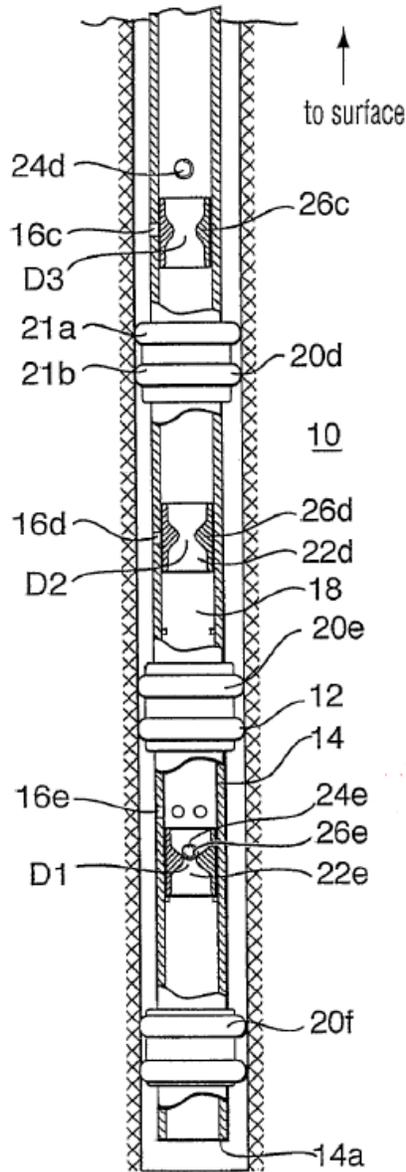


FIG. 1b

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As shown, above, in Figure 1b, and described in the '774 patent, tubing string 14 includes a series of ports 16c, 16d, 16e, along its length, with a ball-actuated sliding sleeve 26c, 26d, 26e, mounted over each port, for selectively permitting the release of fluid from certain segments of the tubing string. *Id.* at 2:39–65, 6:37–7:31. Special sealing devices, called “solid body packers” or “SBPs,” 20d, 20e, 20f, are mounted along the length of the tubing string downhole and uphole of each port. *Id.* at 2:39–65, 6:4–36. The solid body packers are disposed about the tubing string and seal the annulus between the tubing string and the well bore wall, thereby dividing the well bore into a series of isolated segments, also called stages. *Id.* at 6:18–24.

As further observed in Figure 1b, when sliding sleeve 26e covering port 16e is activated by ball 24e to an open position as shown, fluid can pass into one segment of the well bore but is prevented from passing into adjacent segments by packers 20e and 20f positioned on either side of the port. *Id.* at 6:50–57. Thus, ball 24e, as the smallest ball passes through sleeves 26c and 26d before activating sliding sleeve 26e. With port 16e open, as shown above, a stimulation of this segment of the well bore can be undertaken.

With this structure, sequential stimulation of the adjacent well bore segments can be implemented because “[e]ach of the plurality of sliding sleeves has a different diameter seat and therefore each accept different sized balls.” *Id.* at 7:14–15. In other words, working uphole, each consecutive sliding sleeve has a slightly larger seat and is activated by a slightly larger ball than the previous sliding sleeve. *Id.* Hence, a sequential stimulation of each adjacent uphole segment of the well bore is achieved with the increasing sleeve seat and ball diameter.

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D. Illustrative Claim

Of the challenged claims, claim 1 is the only independent claim. Each of dependent claims 3–7, 9–10, 12 and 16 depend directly from claim 1.

Claim 1, as set forth in substantive part below, illustrates the claimed subject matter:

1. A method for fracturing a hydrocarbon-containing formation accessible through a well bore, the method comprising:

running a tubing string into an open hole and uncased non-vertical section of the well bore, the tubing string having a long axis and an inner bore and comprising:

a first port opened through the tubing string wall,

a second port opened through the tubing string wall, the second port downhole from the first port along the long axis of the tubing string,

a first sliding sleeve having a seat with a first diameter . . .

a second sliding sleeve having a seat with a second diameter smaller than the first diameter . . .

a first solid body packer . . .

a second solid body packer . . .

a third solid body packer . . .

wherein the tubing string is run into the well bore . . .

expanding radially outward the first, second and third solid body packers until each of the first, second and third packers sets and seals against the well bore wall in the open and uncased, non-vertical section of the well bore . . . and create a first annular well bore segment between the first and second solid body packers and a second annular well bore segment between the second and third solid body packers . . .

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conveying a fluid conveyed sealing device through the tubing string to pass through the first sliding sleeve and to land in and seal against the seat of the second sliding sleeve moving the second sliding sleeve to the open port position permitting fluid flow through the second port, and

pumping fracturing fluid through the second port and into the second annular well bore segment to fracture the hydrocarbon-containing formation.

E. The Alleged Grounds of Unpatentability

Petitioner contends that the challenged claims are unpatentable on the following specific grounds.

References	Basis	Claims Challenged
Yost ² Thomson, ³ and Ellsworth ⁴	§ 103	1, 3–7, 9–10, 12, and 16
Thomson and Ellsworth	§ 103	1, 3–7, 9–10, 12, and 16

² Ex. 1002, A.B. Yost et al., *Production and Stimulation Analysis of Multiple Hydraulic Fracturing of a 2,000-ft Horizontal Well*, SPE 19090, Society of Petroleum Engineers, Gas and Technology Symposium, Dallas TX, (June 7–9, 1989) (“Yost”).

³ Ex. 1003, D.W. Thomson et al., *Design and Installation of a Cost-Effective Completion System for Horizontal Chalk Wells Where Multiple Zones Require Acid Stimulation*, SPE 37482, © Society of Petroleum Engineers (1997) (“Thomson”).

⁴ Ex. 1004, B. Ellsworth et al., *Production Control of Horizontal Wells in a Carbonate Reef Structure*, © 1999 CIM 1999 Horizontal Well Conference (“Ellsworth”).

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II. CLAIM CONSTRUCTION

A. *Legal Standard*

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC.*, 778 F.3d 1271, 1278–82 (Fed. Cir. 2015) (“Congress implicitly adopted the broadest reasonable interpretation standard in enacting the AIA,” and “the standard was properly adopted by PTO regulation.”). Claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc) (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). We apply this standard to the claims of the ’774 patent.

Petitioner offers interpretations for several terms, “solid body packer,” “without tripping in a string or wire line” and “without setting any slips.” Pet. 26–27. Patent Owner disputes Petitioner’s interpretation of “solid body packer,” and argues that the “second annular well bore segment” must be “in an open hole, non-vertical section of the well bore.” PO Resp. 3–6.

B. *Solid body packer*

Referring to U.S. Provisional Application No. 60/404,783, to which the ’774 patent claims priority, Petitioner contends that “solid body packer”

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means “a tool to create a seal between tubing and casing or the borehole wall using a packing element which is mechanically extruded, using either mechanically or hydraulically applied force.” Pet. 26 (citing Ex. 1015, 4; Ex. 1007 ¶¶ 58–66; Ex. 1001 at 4:4–7, 6:29–30, 8:34–43, 9:1–4, 10:38–39).

Patent Owner disagrees with Petitioner’s construction stating that the parties “dispute what distinguishes solid body packers from other types of packers.” PO Resp. 3. Patent Owner asserts specifically that “solid body packer” should be construed “to mean ‘a packer including a solid, extrudable packing element.’” *Id.*

Despite the parties disagreement as to the specific definition of “solid body packer,” and whether a definition provided in a related provisional application should carry the day as argued by Petitioner, the parties apparently agree that a solid body packer” as recited in the claims, does not cover an inflatable, hollow, or swellable, type of packer that has a packing element which expands due to fluid force. *Compare* Pet. Reply 2–3 with PO Resp. 30. What is clear from the specification of the ’774 patent is that a solid body packer is distinguishable from an inflatable, or swellable, packer because it does not use an inflatable bladder. *See* Ex. 1001, 1:45–48 (explaining that inflatable packers “are inflated with pressure using a bladder.”). And, consistent with the specification, the claims expressly recite a “solid body packer.” *Id.* at 14:23. We agree, therefore, with the parties’ contentions that a solid body packer, as recited in the claims of the ’774 patent, does not cover an inflatable packer.

Beyond this, our decision does not rely on any specific definition of a solid body packer and neither do the parties advance any substantive arguments based on their respective definitions. This term, therefore, needs

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no further construction. *See* 35 U.S.C. § 314(a); *see also Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”).

C. Second annular well bore segment

Petitioner does not dispute Patent Owner’s contention that the “second annular well bore segment” must be an open hole, non-vertical segment of the well bore. *See* PO Response 5–6, *and see* Pet. Reply 1–3. A reasonable reading of claim 1 supports Patent Owner’s contention, specifically the clause describing “the first and second annular well bore segments providing access to the hydrocarbon-containing formation *along the well bore wall in the open hole and uncased, non-vertical section of the well bore.*” Ex. 1001, 14:61–64 (emphasis added).

Beyond the correct interpretation of this claim term, our decision does not rely on a specific definition of “second annular well bore segment,” and therefore no express definition of this term is necessary. *See Vivid Techs.*, 200 F.3d at 803.

D. Other Constructions

We do not provide explicit constructions for the remaining claim terms asserted by Petitioner because they are not disputed and a construction is not necessary for our determinations in this proceeding. *See id.*, *see also* Pet. 26–27.

III. MOTIONS TO EXCLUDE EVIDENCE

Weatherford and Rapid each move to exclude evidence proffered by their respective opponents. We address, below, each of their motions in turn.

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A. *Petitioner’s Motion to Exclude Exhibits 2004–2020, 2045–2047, 2051–2055, 2058–2059, 2061, 2081, 2083, 2085–2089, 2091, and 2097*

Exhibits 2051 and 2081

Petitioner moves initially to exclude portions of Exhibits 2051 and 2081, which are declarations by Patent Owner’s declarant, Mr. McGowen, under FRE 702, 705, and the PTAB’s Trial Practice Guide at § II(A)(4) and also under 37 C.F.R. § 42.65(a). Pet. Mot. 3–7. Petitioner argues specifically that portions of Mr. McGowen’s declarations relating to commercial success and estimates of revenue due to competitors’ allegedly infringing products, are “expert testimony for which it refuses to disclose the underlying facts or data.” *Id.* at 4.

It is not clear that Mr. McGowen’s estimates of Baker Hughes’s revenue from its IsoFrac and FracPoint well completion systems, are inadmissible under FRE 702 and 705. FRE 705 states that “an expert may state an opinion — and give the reasons for it — without first testifying to the underlying facts or data.” Further, 37 C.F.R. § 42.65(a) states that “[e]xpert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.” Thus, Petitioner’s arguments with respect to Exhibits 2051 and 2081 go more to weight of the declarant’s testimony rather than admissibility. We do not, therefore exclude Exhibits 2051 and 2081. We appreciate that Mr. McGowen’s initial estimates are based on information not available to Petitioner in this proceeding. *See* Pet. Mot. 4, *see also* Ex. 2051 42, n. 6 (“In arriving at this revenue estimate, I identified, analyzed, and summarized Baker Hughes confidential data containing information on the cost and/or profit derived from the sale of equipment that was run into a well.”).

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However, Mr. McGowen’s subsequent reliance on only publically available Baker Hughes’s marketing sources and a cash estimate of “revenue per frac stage” is reasonably within Mr. McGowen’s experience and expertise in the field. *See* Ex. 2081 23–24, *see also* Ex. 2051, 1–3. Because the actual revenue value is admittedly a “rough estimate,” we accord little if any weight to the asserted financial figure itself. *Id.* We do credit, to some extent, Mr. McGowen’s inference that Baker Hughes has derived certain business revenue from its FracPoint system. *See* Ex. 2051, 41–42, *see also* Ex. 2081, 22–24.

*Exhibits 2004–2012, 2014, 2020, 2045–2047,
2054, 2061, and 2086–2089*

Petitioner next moves to exclude Exhibits 2004–2012, 2014, and 2020 asserting that Patent Owner failed to properly authenticate these exhibits under FRE 901. Pet. Mot. 7. Specifically, Petitioner argues that Exhibits 2083 and 2091, declarations attesting to the authenticity of certain other of the documents represented in these exhibits, were filed with Patent Owner’s Response, and not filed within 10 days of Petitioner’s objections, and are thus untimely under 37 C.F.R. § 42.64(b)(2). *Id.*

We are not persuaded that Exhibits 2083 and 2091 are untimely. The Board has previously determined that prior to filing a patent owner response it is not always necessary for a patent owner to serve supplemental evidence within the 10 business days afforded by 37 C.F.R. § 42.64(b)(2). *See Nuvasive, Inc. v. Warsaw Orthopedic, Inc.*, IPR2013-00206, Paper 22 at 3 (PTAB Oct. 15, 2013) (In *Nuvasive*, the Board explained that “the potential prejudice to Patent Owner (e.g., submitting its new testimonial evidence several weeks prior to the due date for patent owner response) outweighs

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any potential prejudice to Petitioner.”). Petitioner has not, in this proceeding, argued that it has suffered any prejudice or asserted that the declarations do not authenticate the noted exhibits, only that Exhibits 2083 and 2091 were not filed in accordance with 37 C.F.R. § 42.64(b)(2). We decline to exclude these exhibits on this basis alone.

To the extent Exhibits 2004–2012, 2014, and 2020, are not sufficiently authenticated by a declarant, we determine that these documents are also industry publications, periodicals and text books containing publication numbers, printing dates and publisher indicia, all of which are understood at least under FRE 902 (6) as characteristics of self-authenticating documents.

Petitioner argues also that Exhibits 2004–2012, 2014, 2020, 2045–2047, 2054, 2061, and 2086–2089 are not relevant under FRE 401. Pet. Mot. 7–10. Specifically, Petitioner contends that these documents, offered to show industry praise, have not been sufficiently shown as relating to StackFRAC tools and system covered by the claims of the ’774 patent. *Id.* at 8. (“Petitioner alleges that [n]ot one of these exhibits mentions the long list of steps recited in claim 1 of the ’774 Patent, which requires a series of steps performed in a horizontal, open hole using three solid body packers and two ball drop sliding sleeves.”). Petitioner’s arguments are not persuasive because these exhibits are replete with references to Packers Plus’s StackFRAC system. *See for example* Exs. 2004, 2005, 2009. Exhibit 2009 is an article from the June 2015 issue of New Technology Magazine and states that

[t]he open-hole ball-drop system is typically associated with Calgary-based Packers Plus Energy Services Inc., though a

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number of competitors also run similar systems. A packer is set in the external casing, uncemented. In the case of the Packers Plus StackFRAC system, balls made of thermal-plastic material such as Teflon are dropped into the well to shift a sleeve, isolate the previous frac and open the next frac port up-hole.

Ex. 2009, 1. And, although this is not an element-by-element comparison of StackFRAC with the claims recited in the '774 patent, this article fairly explains that StackFRAC is a multi-stage open hole horizontal well completion system using solid body (as opposed to swellable) packers, and a continuous frac ball drop process using moveable sleeve and port opening tools. *Id.* Further, as discussed in greater detail below with respect to nexus and secondary considerations, we credit Mr. McGowen's testimony and claim charts at Exhibit A of his declaration showing persuasive evidence corroborating the assertion that StackFRAC is most likely the commercial embodiment used in the claimed method recited in the '774 patent. *See* Ex. 2051, Ex. A.

Additionally, and to address Petitioner's contention that Exhibit 2014 is not relevant because it is dated 2007, many years after the filing of the '774 patent, we note that Patent Owner relies upon this exhibit in the context of open hole multi-stage ("OHMS") being contrary to accepted wisdom, and mainly to show that even as of 2007 a person of ordinary skill in the art would *still* have understood casing and cementing a well bore as conventional and necessary. *See* PO Resp. 22. We are therefore not apprised of a persuasive reason or facts upon which to exclude as irrelevant any of Exhibits 2004–2012, 2014, 2020, 2045–2047, 2054, 2061, and 2086–2089.

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Exhibits 2010, 2013, 2015, 2016–2019, 2045, 2047, 2052–2055, 2058–2059, 2085, and 2097

Petitioner moves to exclude Exhibits 2010, 2013, 2015, 2016-2019, 2045, 2047, 2052–2055, 2058–2059, 2085, and 2097 because they “are out of court statements offered for the truth of the matter asserted that do not fall within any hearsay exception and thus should be excluded under FRE 802.” Pet. Mot. 10.

With respect to Exhibits 2010, 2085, and 2097 our Decision does not rely upon these exhibits and therefore Petitioner’s Motion is moot as to these exhibits.

Exhibit 2013, similar to Exhibits 2015, 2017, 2045, 2047, and 2055, is an industry publication, in this case a technical paper published by the Society for Petroleum Engineers, SPE 164009. *See* Ex. 2013 (SPE 164009 is titled “Open Hole Multi-Stage Completion System in Unconventional Plays: Efficiency, Effectiveness and Economics.”). This paper is relied upon by Patent Owner to support its contention that the patented technology operates contrary to the conventional wisdom. *See* PO Resp. 23. The statement in SPE 164009 relied upon by Patent Owner to support this contention states that “[s]ome of the features of the OHMS approach are often depicted as disadvantages, such as the inferred inability to control the initiation point of the fractures”). Ex. 2013, 5. This statement is not, however, being offered for the truth of the matter asserted in the statement itself, i.e., whether or not the inability to precisely control fracture points in OHMS completions “are often depicted as disadvantageous.” *Id.* Whether or not the statement is true, it is offered mainly for the sake that it was espoused and printed in an industry publication, and represents a state of

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mind, i.e. that in 2001 a person of ordinary skill in the art would have understood that accepted wisdom was to use cemented casing plug and perf completion methods, as opposed to OHMS. It is not hearsay for Patent Owner to infer from this statement that a person of skill in the art would have been skeptical of using OHMS completion techniques due to its inability to control fracture point initiation. *Id.* For the same and similar reasons, we are not persuaded that Exhibits 2015, 2017, 2045, 2047, and 2055 are inadmissible as hearsay.

Exhibits 2016 and 2085 are transcripts of videotaped depositions of Ali Daneshy, a witness for Baker Hughes in other IPR proceedings also involving Packers Plus. Mr. Daneshy's testimony, under oath in the other IPR proceedings is submitted here essentially as a declaration, and his testimony in those proceedings relates also to the '774 patent. *See* Ex. 2016, 8:21–25. Petitioner had the opportunity also in this proceeding to depose Mr. Daneshy and did not. Mr. Daneshy's sworn deposition testimony in these exhibits are his own recollections, not that of another, and because Petitioner had the opportunity to cross-examine Mr. Daneshy in this proceeding, his prior testimony is not inadmissible.

Exhibits 2018–2019 and 2052–2053, 2058–2059 are various technical documents, advertisements, and a slideshow relied upon by Patent Owner to show copying by Baker Hughes. Pet. Mot. 13. For example Exhibit 2052 is alleged to be a Packers Plus's internal document, which is provided for comparison with Exhibit 2053, a Baker Hughes document. These documents Patent Owner contends, are the same technical drawings, with Exhibit 2053 allegedly having an altered product label, crediting the Packers Plus's technical drawing to Baker Hughes Iso-Frac system. PO Resp. 31–

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34. Again, to the extent there are statements in these documents, the documents are not hearsay as the documents are used for purposes of comparison, to allege copying, not for the truth of the matter, statements or otherwise, depicted in the documents themselves. This same analysis applies to the video comparison provided by Patent Owner in Exhibits 2058–2059, as well as the marketing and slide show documents in Exhibits 2018 and 2019. *See* PO Resp. 34–35. This is not hearsay under FRE 802.

For these reasons, we deny Petitioner’s Motion to Exclude.

B. Patent Owner’s Motion to Exclude Exhibits 1008 and 1011–1014

Patent Owner filed a Motion to Exclude 1008 and 1011–1014. Paper 46. Petitioner file an Opposition to Patent Owner’s Motion to Exclude. Paper 48. Patent Owner responded by filing a Reply to Its Motion to Exclude, in which Patent Owner states “to the extent the Board overrules [Petitioner’s] hearsay and authentication objections . . . , [Patent Owner] withdraws the present motion.” Paper 53, 1. Thus, given that we deny Petitioner’s Motion to Exclude, Patent Owner’s Motion to Exclude is withdrawn.

IV. ANALYSIS

A. Claims 1, 3–7, 9–10, 12 and 16 — Alleged obviousness over Yost, Thomson, and Ellsworth

Petitioner asserts that claims 1, 3–7, 9–10, 12 and 16 would have been obvious over Yost, Thomson, and Ellsworth.

A patent is invalid for obviousness:

if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was

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made to a person having ordinary skill in the art to which said subject matter pertains.

35 U.S.C. § 103. Obviousness is a question of law based on underlying factual findings: (1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the art; and (4) objective indicia of nonobviousness. *See Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). Courts must consider all four Graham factors prior to reaching a conclusion regarding obviousness. *See Eurand, Inc. v. Mylan Pharms., Inc. (In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.)*, 676 F.3d 1063, 1076–77 (Fed. Cir. 2012). As the party challenging the patentability of the claims at issue, Weatherford bears the burden of proving obviousness by a preponderance of the evidence. *See* 35 U.S.C. § 316(e).

1. Scope and Content of the Prior Art

Yost

Yost discloses a U.S. Department of Energy sponsored stimulation test (“stimulation test”) of a horizontal well bore in the Devonian shales of Wayne County, West Virginia. Ex. 1002, 2. In the stimulation test, a casing string with 14 sliding sleeve ported collars was inserted into a horizontal uncased, i.e. open hole, well bore. *Id.* The casing string included eight inflatable casing packers (“ECP’s”) providing eight separate open hole zones along the length of the casing string. *Id.* According to the report, only seven of the ECP’s properly inflated so that only seven zones were available for testing. *Id.* The casing string and zones 1–8 are illustrated in Yost’s Figure 2, titled “Completion & Testing Procedures,” reproduced below.

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Completion & Testing Procedures

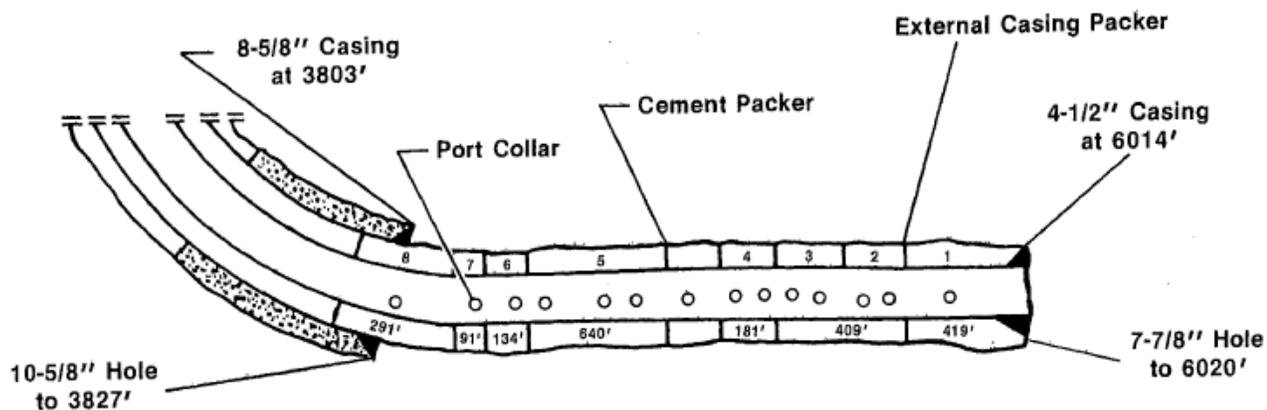


Fig. 2—Schematic diagram of completion configuration.

Figure 2 of Yost, above, depicts the casing string, ECP's, and sliding sleeve openable ports within each of the eight zones. A "straddle tool" (not shown) was used to open and close the port collars in the individual zones. *Id.*

The test included 24-hour pressure build-up in each of the seven isolated zones along a 2,221-foot length of the horizontal well bore, and for each zone, data collection relating to various characteristics of the well including "average reservoir pressure values, skin values, and average permeability values for the various zones with the different stimulation jobs." *Id.* at 2. For each zone, different "frac jobs" were undertaken to stimulate the Devonian shale formation using different pressurized fluids, e.g. nitrogen, liquid CO₂, and nitrogen-foam with proppants. *Id.* at 3. Yost concludes that "[a]s a result of the different frac jobs in the various zones, the production was enhanced in all zones. This improvement in production is

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reflected in the increase in flow rates and a decrease in skin factor values.”

Id. at 5.

Thomson

Thomson teaches a Multi Stage Acid Frac Tool (“MSAF tool”) having a sliding sleeve and threaded ball seat, with “the smallest ball seat in the lowest sleeve and the largest ball seat in the highest sleeve.” Ex. 1003, 21.

As explained by Thomson, the MSAF tool permits that stimulation of 10 separate zones is accomplished in 12-18 hours by a unique procedure that lubricates varying sized low-specific gravity balls into the tubing and then pumps them to a mating seat in the appropriate MSAF, thus sealing off the stimulated zone and allowing stimulation of the next zone which is made accessible by opening the sleeve.

Id. Thomson’s Figure 5, below, depicts the MSAF tool in cross-section.

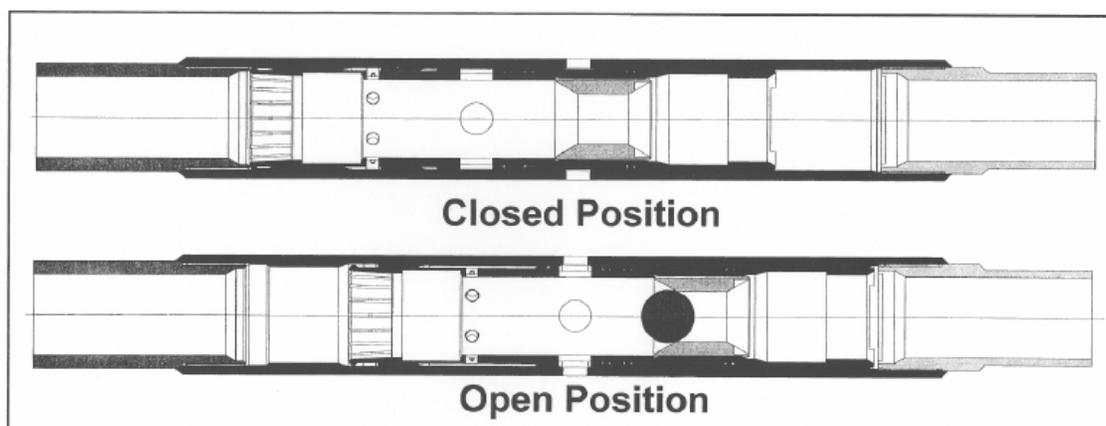


Figure 5
MSAF Tool in the Closed and Open Positions

Thomson’s Figure 5, reproduced above, depicts in the upper illustration labeled “Closed Position,” the MSAF tool having a sliding sleeve covering fluid ports in the closed position, and in the lower illustration,

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labeled “Open Position,” the sliding sleeve having been motivated by a ball into an open position uncovering the fluid ports.

Ellsworth

Ellsworth discloses that “[m]ore recently, solid body packers (SBP’s) (see Figure 4) have been used to establish open hole isolation.” Ex. 1004, 3. Ellsworth’s Figure 4 is reproduced below.

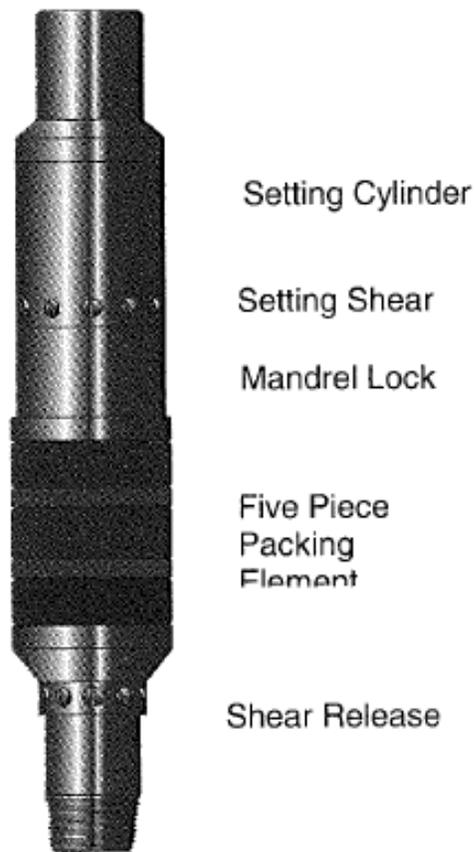


Figure 4 - The solid body packer is hydraulic set instead of inflatable (Guiberson / Halliburton Wizard II packer shown)

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Figure 4, above, shows a solid body packer, including a setting cylinder, a setting shear, a mandrel lock, a five piece packing element, and a shear release. *Id.*, Fig. 4. Ellsworth teaches that a solid body packer provides a hydraulically actuated mechanical packing element. *Id.* at 3. Ellsworth explains that “[t]he objective of using this type of tool is to provide a long-term solution to open hole isolation without the aid of cemented liners.” *Id.*

2. Differences Between the Prior Art and the Claimed Invention

Claims 1, 3–7, 9–10, 12, and 16 over Yost, Thomson, and Ellsworth

Claim 1 is independent and claims 3–7, 9–10, 12 and 16 depend directly from claim 1. Patent Owner focuses its arguments on certain limitations of claim 1 in relation to the applied prior art, and does not argue the dependent claims independently. *See* PO Resp. 45–66.

Patent Owner’s main points of emphasis with respect to the claimed invention and the prior art begins with the argument that Yost does not disclose SBP’s, ball-actuated sleeves, or the fracturing limitations recited in claim 1. *Id.* at 55.

Regarding Patent Owner’s assertion that Yost does not disclose “pumping fracturing fluid . . . to fracture the hydrocarbon formation” as recited in claim 1, we disagree. Patent Owner’s position is that “the Department of Energy ultimately concluded that there was no evidence that it had actually fractured the formation.” PO Resp. 55. Patent Owner relies on a passage from a different DOE report than Yost, (Ex. 2076) but relating apparently to the same stimulation test as disclosed in Yost. The passage

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upon which Patent Owner bases this argument is shown below in italics, in the context of the complete sentence, and reads as follows:

When high-pressure fluid was pumped down the tubing and annulus of the well, numerous natural fractures were enlarged. *Actual breakdown of the shale may not have occurred*, but fluid leak-off and subsequent expansion of the existing fracture system took place.

Ex. 2076, 2. This argument assumes that the verb “to fracture” means that shale breakdown must occur, or in other words, that “new” fractures as opposed to expansion or opening of natural fractures, must be induced in the formation. *See* PO Resp. 55 (“Yost indicates that one of the goals of the experiments was to induce new fractures.”). Patent Owner has pointed to no evidence that the verb “to fracture” would have been understood by a person of ordinary skill in the art as limited to either shale breakdown, or new fractures. Indeed, Patent Owner’s declarant, Mr. McGowan, conceded during his deposition that opening a natural fracture would infringe claim 1:

Q. Now, if I were to use the system that is described in Claim 1 of the ’774 patent and I were to pump fracturing fluid as is described in that claim and all I did was propagate or, sorry, open a natural fracture, would I, therefore, not infringe Claim 1 of the ’774 patent?

A. No, I think you probably would be infringing because you're -- I think that would still be considered a -- a frac.

Ex. 1038, 91:24–92:5.

We agree on one hand that there are certain differences, for example Yost does not disclose SBP’s or ball-actuated sleeves. As discussed above, Yost uses inflatable packers and “a combination straddle tool was designed to facilitate the opening and closing of port collars.” Ex. 1002, 2. On the

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other hand, we are persuaded by the evidence of record that Yost discloses, inter alia, the limitations of “running a tubing string into an open hole,” and “pumping a fracturing fluid . . . to fracture the hydrocarbon formation” as specifically recited in claim 1.

Where Yost discloses a combination straddle tool for opening the port collars, Petitioner relies upon the teachings in Thomson for a multi-stage fracturing tool including a plurality of sliding sleeves that are each activated by a plurality of appropriately increasing diameter fluid conveyed balls. *See* Pet. 12–14. Also, Petitioner relies upon Ellsworth for teaching use of solid body packer as a known alternative to inflatable packers. *Id.* at 9–12.

Patent Owner argues that each of Yost, Thomson, and Ellsworth are missing certain limitations recited in claim 1. PO Resp. 56–57. For example, Patent Owner argues that Ellsworth does not disclose “the use of ball-activated sleeves that are only opened when a ball is dropped downhole and forced against a ball seat with fluid pressure.” *Id.* at 57. To the extent Patent Owner’s contention is true, Petitioner relies on Thomson, for ball-activated sliding sleeves. These arguments by Patent Owner are ineffective because they attack the references in isolation, whereas Petitioner’s combination is predicated on a combination of the teachings of the three references. *See In re Merck & Co. Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references”).

Having reviewed each of the references and the associated evidence provided by the parties pertaining to the respective disclosure of each reference, we determine that although Yost, Thomson, and Ellsworth do not

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individually disclose all the limitations of claim 1, each of the limitations recited in claim 1 and in dependent claims 2–11, 13–22, and 39–42 is disclosed and taught by one at least one of Yost, Thomson, and Ellsworth.

3. Level of Ordinary Skill in the Art

“Section 103(a) forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 405 (2007).

Petitioner asserts that a person of ordinary skill in the art as of November 19, 2001

would have had at least a Bachelor of Science degree in mechanical or petroleum engineering or a similar technical discipline, such as metallurgy or material science and engineering and at least 3 years of experience with oil or gas well drilling and completion operations or in technical support of such operations.

Pet. 14–15 (citing Ex. 1007 ¶ 38). In addition, Petitioner relies upon its Declarant, Dr. Rao, to establish also that a person of ordinary skill in the art was aware that fracturing could be accomplished in both horizontal open hole and cased wells, with either inflatable or solid body packers being used for zonal isolation. *Id.* at 15. Dr. Rao testifies that “by the late 1990s, before the purported invention of the subject matter of the ’774 Patent, it was well understood that fracturing in horizontal open hole or cased wells can be successfully performed with both zonal isolation and some form of sleeve or port for injection into the isolated zones.” Ex. 1007 ¶ 55.

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Referring to the prior art, Dr. Rao explains further that “[a] selection of tools was available for performing zonal isolation including inflatable and solid body packers, . . . and ball-drop actuated sliding sleeves like the MSAF tool of Thomson.” *Id.* ¶ 56.

Patent Owner does not expressly disagree with Petitioner’s asserted level of ordinary skill in the art. Nor does Patent Owner dispute that a person of ordinary skill in the art would have been aware of different completion techniques, such as open hole and cased well completions. *See* PO Resp. 7–11. Patent Owner, however, makes the argument that, “[p]reparing a well bore for oil or gas production can be significantly more complicated than simply drilling a hole in the ground.” *Id.* at 8. Patent Owner contends specifically that a person of ordinary skill in the art would have *only* considered cemented casing completion for a well where multi-stage hydraulic fracturing, such as that disclosed in Thomson, to stimulate oil and gas production was to be used. *Id.* at 11. Patent Owner relies upon its Declarant, Mr. McGowen, to support its position that cemented casing, and the use of “plug and perf” fracturing was the conventional way to create efficient and productive multi-stage fracture horizontal wells. *Id.* at 12–43 (citing Ex. 2051, 14, 22–23, 40; Ex. 2016, 30:6–16). Mr. McGowen testifies that

[a]s of 2001, the industry accepted method for constructing a hydraulically fractured horizontal well consisted of drilling a horizontal borehole, running casing into that horizontal borehole, cementing the casing in place, perforating a section of the horizontal borehole that the operator desired to hydraulically fracture, hydraulically fracturing that perforated interval, and then repeating the plug/perforate/fracture cycle for each section

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that the operator desired to hydraulically fracture (the “Plug and Perf” method).

Ex. 2051, 22.

Patent Owner’s position is that, based on conventional wisdom, a person of ordinary skill in the art would not have contemplated using the known tools and multi-stage fracturing techniques in an open hole at least because “cemented casing is necessary to avoid the formation of these complex fracture geometries,” and because “[t]he safest and most likely path for the POSITA is to avoid considering ideas that deviate from industry norms.” PO Resp. 15–16 (citing Ex. 2051 at 18 (“where Patent Owner’s Declarant, Mr. McGowen states that Dr. Daneshy, considered in his testimony merely ‘that a POSITA would approach tool design from a purely academic point of view, without considering the magnitude of the risks involved when applying a new technology.’”))).

Petitioner responds by asserting that this evidence of conventional use of plug-and-perf “merely show[s] that some people preferred cemented casing.” Pet. Reply. 21. Petitioner contends that other prior art references, in addition to Yost, expressly describe that horizontal open-hole completions were known and had been done prior to the filing of the ’774 patent. Petitioner alleges that technical papers by McClellan (Ex. 1042) and Kim & Abass (Ex. 1043) describe successful horizontal open-hole completions prior to the effective filing date of the ’774 patent. *Id.* at 22.

After reviewing the evidence, we give some credit to both Declarants’ testimony in this proceeding. For instance, we determine that one of ordinary skill in the art would have known that the plug and perf method using a cemented casing was the generally accepted method in the oil and

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gas industry for completing a hydraulically fractured horizontal well. *See* Ex. 2051, 22, (Mr. McGowen testified that “[a]s of 2001, Plug and Perf was the industry standard because it had been economically successful, rigorously tested, and widely accepted amongst industry experts.”). Various papers cited by Patent Owner lend credence to the assertion that in the industry cemented casings were commonly used and “considered a prerequisite to ensure adequate zonal isolation for multiple fracture treatments in horizontal wells.” Ex. 2079, 1, *see also* Ex. 2078, 2 (“Austin et al. emphasized the importance of casing and cementing the horizontal section to allow for fracture initiation points to place multiple fractures along the horizontal well.”). We also give certain credit, as well, to Dr. Rao who testifies that a person of ordinary skill in the art knew that wells could be either cased, i.e., lined with tubing that is cemented in place, or uncased without such cemented tubing, and “could readily discern when it was advisable to use a cased hole tool in open hole and when it was not.” Ex. 1007 ¶¶ 56, 176, 180–181 (citing Ex. Ex. 1001, 1:28–4; Ex. 1002; Ex. 1004).

We find that such knowledge is not mutually exclusive, for example both parties’ Declarants provide reasoning and exemplary prior art references detailing why one of ordinary skill in the art might consider a cased well and an uncased well in different circumstances. *Compare* Ex. 1007 ¶ 42, (Dr. Rao discussing Yost’s multi-stage hydraulic fracturing in horizontal open-hole completion to “avoid the problems of formation damage associated with cementing.”) *with* Ex. 2051, 22–23 (Mr. McGowen explains that the problem of “multiple complex fractures being initiated near the well bore, could be better controlled through the precise placement of

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perforations, which requires cementing, perforating and the Plug and Perf method.”). Consistent with our finding, Mr. McGowen testified during his deposition that open hole completions would have been an option:

Q. So going without cemented casing would have been an option to consider[?]

A. It would have been an option to consider. But it’s something that had been -- in the early days of horizontal, there was hydraulic fracturing done in open holes and that was a more primitive completion system where they had no control over where the frac fluids were going, and then the industry progressed and became more sophisticated and developed methods to try to control where the fracture initiated.

Ex. 1034, 75:25–76:9.

Therefore, in addition to the education and experience of one ordinary skill in the art as discussed above, upon which the parties essentially agree, we determine that a person of ordinary skill in the art would have known that it was conventional to cement and line a well bore with a cemented casing for a multi-stage fracing completion. *See* Ex. 1036, 48 (“Options considered for isolating the individual zones included conventional cementing of the casing with perforations to access the individual zones.”). A person of ordinary skill in the art also would have known that there existed circumstances in which open hole multi-stage fracing might also be successful. *See* Ex. 1002, 1, 4–5 (Yost describing successful production increase from using multistage fracturing to achieve “zone isolation” in an “open hole” so as “to avoid the problems of formation damage associated with cementing and to eliminate the need for tubing-conveyed perforating of numerous treatment intervals”); Ex. 1042, 3 (A publication by McClellan, in the April 1992 Journal of Canadian Petroleum Technology describes a

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comparison of cased and open hole well bores where “[t]he horizontal section for the first well Shell Midale horizontal C9-3-6-11Wd was completed in a conventional manner with a cemented and perforated liner. Openhole completions were used in the next two horizontal wells.”); *see also id.* (“McClellan summarized in the Abstract that there was “potential for selective acid stimulation of horizontal wells completed openhole, provided that good zonal isolation is maintained.”).

The level of knowledge attributed to one of skill in the art by Mr. McGowen, Dr. Rao, and the prior art illustrates, albeit emphasizing different aspects of such knowledge, certain problems encountered in well bore completion and how the industry addressed and overcame such problems prior to the filing of the ’774 patent. For instance, acknowledging both the desire to closely control where fractures form in a cased well bore with perforations in a cemented casing as described by Mr. McGowen, (Ex. 2051, 12–13), and alternatively, ensuring zonal isolation in open hole completions in Yost and McClellan, (Ex. 1042, Abstract) is consistent with the Federal Circuit’s admonition that the hypothetical person of ordinary skill in the art is attributed with knowledge “of all prior art in the field of the inventor’s endeavor and of prior art solutions for a common problem even if outside that field.” *In re Nilssen*, 851 F.2d 1401, 1403 (Fed. Cir. 1988).

What we do not attribute to one of ordinary skill in the art based on the testimonial and prior art evidence in this proceeding, is Patent Owner’s contention that one of ordinary skill in the art would have understood that multi-stage fracturing *required* cemented casing completion. *See* PO Resp. 15 (“Thus, a POSITA would also expect that cemented casing is necessary to avoid the formation of these complex fracture geometries.”). Patent

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Owner’s position appears to be odds, to some extent, with their own explanation of “bullheading.” *See id.* at 11 (“The simplest form of hydraulic fracturing for a horizontal wellbore is to pump fluid into an open hole section of the wellbore (a process known as “bullheading.”). Although in his declaration Mr. McGowen opined that “Plug and Perf was deemed necessary partly because of the type of hydraulic fracturing treatments being pumped and partly because of the then current theories about the behavior of hydraulic fractures,” nowhere does Patent Owner point us to persuasive evidence that plug and perf completions were the sole option one of skill in the art would have considered for successful well bore completions. Ex. 2051, 23, *see also id.* at 17 (Mr. McGowen states that “[t]he POSITA would consider many different well configurations, reservoir types, stimulation methods, downhole operations, and other factors.).

4. *Secondary Considerations of Non-Obviousness*

Patent Owner presents evidence of secondary considerations including arguing that the claimed invention has the required nexus with the commercial embodiment StackFRAC as well as with competitors’ allegedly infringing system, and that the claimed method proceeds contrary to accepted wisdom. PO Resp. 21–26, 41–43. Patent Owner asserts as well, copying by competitors, commercial success, and industry praise for its claimed invention. *Id.* at 31–40. This evidence of secondary considerations of non-obviousness, when present, must always be considered en route to a determination of obviousness. *See Cyclobenzaprine*, 676 F.3d at 1075–76.

(a) *Nexus*

Patent Owner’s evidence of nexus shows that the structural limitations in the claims read on the product sold, and that these features are not a

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subcomponent of, but rather the entirety of, the product sold. Ex. 2051 ¶¶ 7, 43, Exhibit A; *see also* Ex. 2056, 1 (describing “StackFRAC systems use RockSEAL hydraulically set mechanical packers to isolate zones together with ball-actuated hydraulically activated FracPORT sleeves”; Ex. 2057; Ex. 2017 (explaining that the “StackFRAC . . . system is designed to provide open hole fracturing”); *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317 (Fed. Cir. 2016) (“[T]here is a presumption of nexus . . . when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘is the invention disclosed and claimed.’”); *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988) (presumption does not apply if the claimed invention is merely a subcomponent of the product).

We agree with Petitioner that the claims, for example claim 1, is a method claim and that evidence of commensurate tools and hardware between StackFRAC and the claimed invention may not necessarily express each claimed method step. *See* Pet. Reply, 18. However, Patent Owner’s evidence of secondary considerations includes information and evidence that expresses the use of these tools and hardware in highly similar, if not the same, steps as claimed. For example, where claim 1 recites the step of “running a tubing string into an open hole and uncased non-vertical section of the well bore,” a Packers Plus advertisement (Ex. 2017, 1) describes “StackFRAC HD technology allows you to increase your production by running longer laterals with shorter stage lengths . . . open hole systems provide an excellent opportunity to complete two or more laterals off of one vertical well bore.” *Compare* Ex. 1001, 13:64–65 *with* Ex. 2017, 1. The Packers Plus advertisement goes on to describe that the RockSEAL II solid-

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body packer “has a specially designed elastomer with the largest possible cross section to provide excellent expansion ratios for setting in oversized holes.” Ex. 2017, 3. This description is consistent with “the first solid body packer operable to seal about the tubing string and against a well bore wall in the open hole” as recited in claim 1. Ex. 1001, 14:25–27. We also give credit to Mr. McGowen’s testimony including the claim charts in Exhibit A to his declaration, detailing the comparison of the claimed invention and Packers Plus’s StackFRAC product and system. Ex. 2051, Ex. A.

In conclusion, Patent Owner’s evidence regarding nexus indicates that there is a strong correlation between any evidence in this case highlighting the merits of Packers Plus’s StackFRAC system and the merits of the claimed invention. *See, e.g.*, Ex. 2004 (“StackFRAC, the company’s prize product and primary innovation, is an open hole ball drop completion system that’s widely credited with unlocking old resource plays that were thought to be too expensive or too technically challenging to tap.”). In other words, we will consider evidence of the success and praise of the StackFrac system as direct evidence of the success and praise of the claimed invention. *See Ashland Oil, Inc. v. Delta Resins & Refractories*, 776 F.2d 281, 306 (Fed. Cir. 1985) (holding that the weight attributed to the secondary evidence is proportional to its nexus to the merits of the invention, implying that a weak nexus requires some discount factor to the evidence, but a strong nexus does not). We now turn to the evidence alleging commercial success and praise.

(b) Commercial Success

Packers Plus’s Chief Financial Officer, J.J. Girardi, states in his declaration that “Packers Plus has sold tools for or performed fracture treatments for tens of thousands of StackFRAC stages in the United States.

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That work accounts for the vast majority of Packers Plus’ overall revenue and profits.” Exs. 2048, 1; 2049. Mr. Girardi states further that Packers Plus is “generating ██████████ in annual U.S. revenue,” and that “[t]he StackFRAC system has been critical to that success.” *Id.* We note that Patent Owner does not specifically define the market, asserting that “there is no requirement that a patentee define the market share of a product to demonstrate commercial success. PO Resp. 37, n. 5. Patent Owner does indicate that the relevant market, as of 2011, can be understood from the following Figure 1, in a third party research and survey report by Qittitut Consulting, LLC. Ex. 2010.

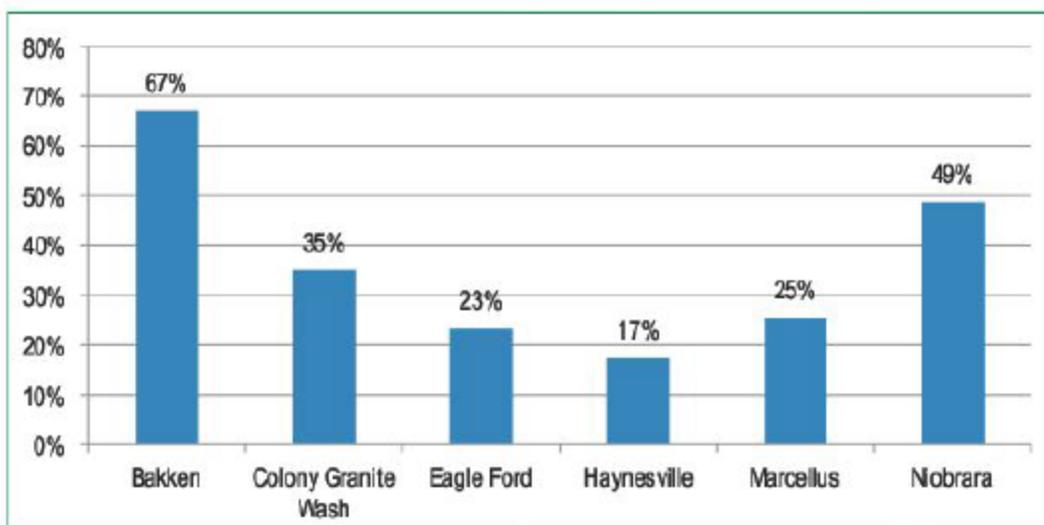


Figure 1. The OHMS technique for frac treatments is used in the Bakken play more than in other plays.

Ex. 2010, 4, Fig 1. Figure 1 reproduced above is from a report titled: Sleeves vs. Shots – The Debate Rages, by Qittitut Consulting, LLC, and shows a graph illustrating the percentage of open hole multi-stage

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(“OHMS”) well completions as compared to plug and perf completions in different formations or “plays.”

Patent Owner argues that this graph is indicative of commercial success because OHMS “has overtaken competing fracturing methods such as plug and perf in the Bakken formation and its market share has grown in other formations as well.” PO Resp. 39. The first problem with this argument is that the graph does not show data in any time domain, so we are not persuaded that this is evidence of any particular annual market growth of OHMS. Second, it is not clear that these “plays” are the entire market for oil and gas well completions or what part of the overall market they represent. *See* Pet. Reply, 17 (With respect to this play data, Petitioner argues that “PO cherry-picked six oil fields to create an illusion of market context.”). Further, Patent Owner does not point to any information or evidence that StackFRAC is the only method to perform OHMS, or discloses what part of these OHMS percentages for each play are due to Packers Plus’s StackFRAC system or systems that allegedly infringe, such as Weatherford’s ZoneSelect, or Baker Hughes Iso-Frac and FracPoint system.⁵

Patent Owner argues also that commercial success is shown by essentially the overall U.S. revenue generated by its StackFRAC system and allegedly infringing systems such as Weatherford’s ZoneSelect and Baker Hughes’s FracPoint systems. PO Resp. 38–39. For purposes of our analysis, we assume that Weatherford’s and Baker Hughes’s OHMS systems

⁵ Patent Owner explains that both Iso-Frac and FracPoint are names used by Baker Hughes at different times to refer to the Baker Hughes’s horizontal open hole ball-drop well completion system.

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are infringing systems; we list below the sales and revenue figures for each company, as provided by Patent Owner:

- a) Packers Plus – [REDACTED] annually (Exs. 2048, 2049);
- b) ZoneSelect by Weatherford – 12% of fracture system sales (Ex. 2074, 2);
- c) FracPoint by Baker Hughes – \$1 billion from 2008 and 2015 (Ex. 2051, 42; Ex. 2081, 25–27; Ex. 2084, 25–27).⁶

This evidence fails to establish market share for several reasons. Assuming that the above-noted devices all have nexus to the claimed invention, first, the evidence of revenue is not even actual sales data of any of the above-noted products. We have overall business revenue from Packers Plus and an uncorroborated estimate of FracPoint revenue. *See* Exs. 2048, 2049, 2081, 2084. We have no financial information relating to Weatherford’s ZoneSelect. Packers Plus’s CFO, Mr. Juan Jose Pena Giraldi, testifies that Packers Plus’s annual revenue is [REDACTED], but fails to state what part of that annual revenue is due to StackFRAC. *See* Ex. 2048 (Mr. Giraldi testifies only that StackFRAC “accounts for the vast majority of Packers Plus’ overall revenue and profits.”); Ex. 2049. With respect to Baker Hughes, Patent Owner’s declarant, Mr. McGowen, explains that his estimate of FracPoint revenue is “based on [] marketing data, and other information I have reviewed related to Baker Hughes sales of 774 Patent infringing technology.” Ex. 2051, 42; *see also* Ex. 2081, 22–24 (Mr. McGowen revised his estimate “[a]fter reviewing information found on Baker-Hughes

⁶ Patent Owners declarant, Mr. McGowen concedes that his estimate of Baker Hughes’s revenue from its FracPoint system is “a rough estimate.” Ex. 2081, 24; Ex. 2084, 24.

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publically available website”); Ex. 2084, 22–24. From this information what we can reasonably understand is that there is a market for OHMS tools and systems, and sales of goods, and perhaps services, arguably with nexus to the claimed invention, accounting for possibly hundreds of millions of dollars annually. Without a more credible and corroborated basis for the financial figures asserted by Mr. Giraldi and Mr. McGowen, we give little to no weight to these revenue estimates, although the evidence does appear to corroborate that there are certain sales and revenue to the companies in this market. The fact that there are sales however, does not define the market, nor tell us what portion of the market these sales account for, nor evidence any growth in market share. If simply good sales and revenue figures were enough to show success, then virtually every product or service which generates revenue would be considered successful.

To an extent, we find some objective evidence in an industry paper for the Society of Petroleum Engineers prepared by Weatherford, titled: Single-Size-Ball Interventionless Multi-Stage Stimulation System Improves Stimulated Reservoir Volume and Eliminates Milling Requirements: Case Studies, (“Weatherford’s paper” Ex. 2074), which provides some insight into the potential relative market of completion and fracture systems in unconventional formations. *See* Ex. 2074, 1 (“There is a lot of debate about how best to complete and fracture unconventional formations regarding the effectiveness and efficiency differences between frac sleeve and P-n-P methods.”). Figure 1 from Weatherford’s paper illustrates certain completion techniques used by Weatherford.

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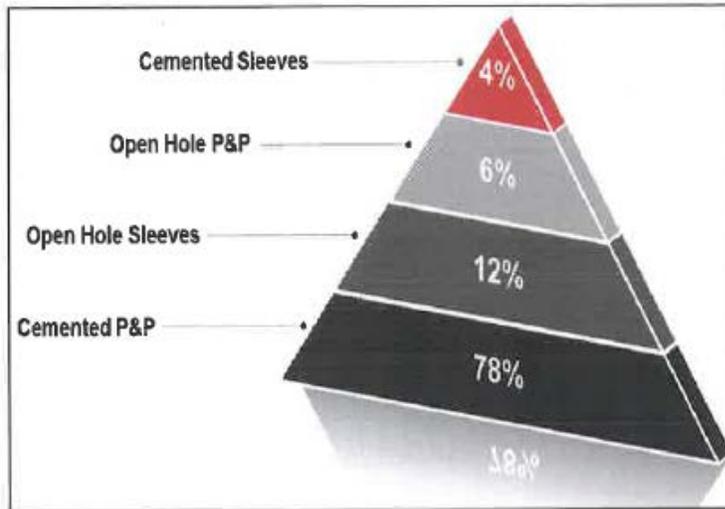


Figure 1—Percentages for different frac methods at Weatherford.

Weatherford’s paper at Figure 1, reproduced above, indicates that OHMS accounts for 12% of Weatherford’s frac completions and states that these distributions “reflect closely the overall distribution throughout the industry.” *Id.* at 2. Even if Weatherford’s Figure 1 is representative of the appropriate market, the problem remains that we have scant, if any, evidence of growth of OHMS and increase in market share, or displacement of other methods, in this market due to StackFRAC or any of the alleged infringing tools and systems, nor is it clear at all that StackFRAC, ZoneSelect, and FracPoint are the only tools and systems available in this 12% portion of the frac methods market.

We appreciate certain precedent has found commercial success absent specific evidence of market share. *See Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1054–56 (Fed. Cir. 2016) (en banc), cert. denied, 138 S. Ct. 420; *see also J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1572 (Fed. Cir. 1997). In *Apple*, for example, Apple provided highly specific evidence of commercial success apart from simply revenue, and the

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Federal Circuit noted that “[c]ritically, Apple presented survey evidence that customers would be less likely to purchase a portable device without the slide to unlock feature and would pay less for products without it, thus permitting the jury to conclude that this feature was a key driver in the ultimate commercial success of the products.” *Apple*, 839 F.3d at 1055. In *JT Eaton*, the Federal Circuit noted the volume of sales that the district court relied on to show commercial success, stating that “we agree with the district court in these respects and affirm its decision that the sales evidence in this case shows success.” *J.T. Eaton*, 106 F.3d at 1572. In this proceeding, Patent Owner has not provided evidence even of its own sales revenue from StackFRAC. *See* Ex. 2048 (Noting overall company revenue figure, Mr. Giraldi states that StackFRAC “accounts for the vast majority of Packers Plus’ overall revenue and profits.”); Ex. 2049. Our analysis of the commercial success evidence presented by Patent Owner is more consistent with Petitioner’s argument that “it does not provide competent evidence of market share, and instead relies on vague numbers of products sold.” Pet. Reply 17 (citing *In re Applied Materials, Inc.*, 692 F. 3d 1289, 1300 (Fed. Cir. 2012)).

We are not persuaded that Patent Owner has shown commercial success. Despite a showing of nexus between the claimed invention and Packers Plus’s StackFRAC system, Patent Owner’s evidence of commercial success is lacking in detail that links such ambiguous revenue and sales to any significant market growth in OHMS due to the merits of the claimed invention. Accordingly, this factor does not weigh towards a finding of non-obviousness.

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(c) Industry Praise

Asserting that the StackFRAC system as exemplified in claim 1 of the '774 patent, accounts for “the vast majority of Packers Plus’ ” [REDACTED] annual U.S. revenue, Patent Owner argues that a variety of media sources, technical journals, and industry analysts have praised the StackFRAC system. PO Resp. 27–31 (citing Exs. 2004–2008, 2013, 2020, 2045–2049, 2054, 2061). Patent Owner argues that the praise and notoriety is for the StackFRAC system specifically, “as embodied in claim 1, i.e., the overall combination of claimed elements.” *Id.* at 27.

Patent Owner argues, for example, that a confidential industry report [REDACTED] [REDACTED] and a 2013 technical paper by BP America “identified a Packers Plus article as describing ‘the first commercial OHMS [Open Hole Multi-Stage] systems [that] were developed and deployed in 2001.’” *Id.* at 30 (citing Exs. 2013, 2047). Patent Owner argues further that Schlumberger, apparently the largest oil and gas service company in the world, negotiated for and credited Packers Plus’s technologies as facilitating the development of Schlumberger’s StageFRAC multistage fracturing service for horizontal wells. *Id.* at 30–31 (citing Ex. 2054 (Mark Corrigan, President of Schlumberger’s Well Services division stated, “Packers Plus has established an industry leading reputation with their systems, which when combined with our services, offers a powerful solution.”)). Patent Owner contends that “[t]his high praise from a major competitor, and its desire to obtain rights to the technology is highly compelling evidence of non-obviousness.” *Id.* at 31.

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Petitioner argues that Patent Owner’s evidence “is flawed because the praise is not ‘professional’ (i.e., from experts or industry players) and there is no nexus to the claims.” Pet. Reply 23. We agree that certain evidence is attributable to entities which are not experts or companies in the oil and gas industry, such as the Financial Post and Ernst and Young, for example. See Exs. 2066, 2061 (citing *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1352 (Fed. Cir. 2010)). We find Petitioner’s arguments, however, unpersuasive. First, as discussed above, much of the recognition and praise evidence *is* attributable to competitors in the oil and gas industry such as Schlumberger and Baker Hughes, as well as oil and gas industry reporting such as Oil Patch Report. See Ex. 2008 (“After 10 years of marketing their innovative StackFRAC system, Packers Plus has become the darling of the oil and gas sector, not just in North America, but worldwide.”). Second, we do not find Petitioner’s reliance on *Power-One* to be entirely valid. In *Power-One*, the Federal Circuit found that evidence of industry praise “demonstrate[s] the unobviousness of the invention disclosed in the ’125 patent” and that “praise in the industry for a patented invention, and specifically praise from a competitor tends to ‘indicat[e] that the invention was not obvious.’” *Power-One, Inc.*, 599 F.3d at 1352. *Power-One* indicates that it may be suitable to credit evidence of praise and recognition from Packers Plus’s competitors, but we are not persuaded that this case stands for the proposition that other evidence, such as national media recognition of inventor, Dan Themig, as Ernst & Young’s entrepreneur of the year, which also notes his development of Packers Plus’s StackFRAC product, is somehow flawed or irrelevant, or that somehow all the media evidence provided by Patent Owner in this regard should be discounted.

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Industry praise for an invention may provide evidence of nonobviousness where the industry praise is linked to the claimed invention. *See Geo. M. Martin Co. v. Alliance Mach. Sys. Intern. LLC*, 618 F.3d 1294, 1305 (Fed. Cir. 2010); *Asyst Tech’n, Inc.*, 544 F.3d at 1316. Patent Owner has supplied credible evidence that its StackFRAC system was praised and recognized in the oil and gas industry as an innovative product. *See* Ex. 2004 (Calling StackFRAC an “innovation,” Alberta Oil Magazine stated that “StackFRAC, the company’s prize product and primary innovation, is an open hole ball drop completion system that’s widely credited with unlocking old resource plays that were thought to be too expensive or too technically challenging to tap.”). Giving weight also to industry publications that highlight the invention and specific technical aspects and elements of StackFRAC corresponding to the claims in the ’774 patent, we determine that Patent Owner’s evidence of value, industry praise and recognition of the StackFRAC system is linked to the claims of the ’744 patent and entitled to some weight.

(d) Copying

We turn to Patent Owner’s allegations of copying. PO Resp. 31–36. Patent Owner offers two technical documents, one document is labeled “Packers Plus” and details the well completion tooling for what is apparently the StackFRAC tooling, as it is intended for open hole horizontal fracture well completion. Ex. 2053. The other is labeled “Iso-Frac System,” apparently the name for Baker Hughes’s competing horizontal open hole well completion system. Ex. 2052, 13. Patent Owner contends that Baker Hughes’s simply “replaced the Packers Plus logo and slogan with the Baker Hughes internal name for their ‘equivalent’ system.” PO Resp. 32.

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Patent Owner argues further that Baker Hughes’s FracPoint system employs the same components as used in Packers Plus’s StackFRAC system and points out that Baker Hughes’s own expert, Mr. Daneshy confirmed that both are an “open-hole ball-drop” system. *Id.* at 34–35 (citing Exs. 2003; 2016, 94:2–96:5; 2017; 2018; 2019; 2058; 2059). Petitioner argues mainly that the documents are hearsay, *see* Pet. Reply 23–24; they are not, for the reasons discussed previously. Petitioner contends also that Baker Hughes’s document in this case was only part of an offer for sale, and at best, shows that Baker Hughes’ Iso-Frac system was “equivalent” to Packers Plus’s competing system, not that one was copied from the other. *Id.* at 24. We find this attorney argument unpersuasive and uncorroborated by any factual evidence. From our review of the document, the most reasonable inference to be drawn is that the tools shown in the engineering drawing itself are intended to be understood as those of Baker Hughes’ Iso-Frac System, as distinctly labeled at the top of the document. *See* Ex. 2052, 13.

Comparing, in particular, the technical drawings shown by Exhibits 2052 and 2053, and in conjunction with Petitioner’s inability or reluctance to explain how the Iso-Frac drawing in Exhibit 2052 is different from the StackFRAC drawing in Exhibit 2053 creates an inference that Baker Hughes copied to some degree Packers Plus’s StackFRAC system and brought to market a similar and competing product—Iso-Frac. *Compare* Ex. 2052, 13, *with* Ex. 2053, 1. Patent Owner has provided certain evidence of some degree of copying, at least by Baker Hughes, and therefore we determine that such copying weighs somewhat in favor of nonobviousness.

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(e) Long-Felt but Unsolved Need

Patent Owner argues further that the length of time by which Yost and Thomson predate the filing date of the claimed invention, namely by 12 and 5 years, respectively, “is compelling evidence that the claimed invention is not obvious.” PO Resp. 43–44 (citing *Leo Pharm. Prod., Ltd. v. Rea*, 726 F.3d 1346, 1359 (Fed. Cir. 2013)). In other words, Patent Owner is arguing that knowledge of Yost’s open hole completion and testing procedures and Thomson’s MSAF tool (ball and sliding sleeve) for a period of 12 and 5 years, respectively, prior to their combination in the system described and claimed in the ’774 patent, is evidence of non-obviousness. *Id.* at 44. Several facts weigh against attributing much, if any, weight to this argument. First, the time periods by which the references in *Leo* predated the patented invention were 22 and 14 years, essentially double the time between Yost, Thomson and the ’774 patent, and occurred in the pharmaceutical compositions and medical field. *See id.* Second, as Patent Owner itself alleges, well drilling is a fairly conservative industry, and slow to adopt changes. *Id.* at 16 (citing Ex. 2092, 2). Third, in *Leo*, the long time period was asserted in conjunction with evidence that “there was a long felt but unsolved need for a combined treatment of vitamin D and corticosteroid” to treat psoriasis. *See Leo*, 726 F.3d at 1359. (“The record also shows evidence of long felt but unsolved need, i.e., the need for a single formulation to treat psoriasis.”). In this case, Patent Owner fails to provide sufficient evidence of a long-felt but unsolved need such that the intervening time between the prior art and the combination claimed in the ’774 patent is probative of non-obviousness.

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*(f) The Invention is Contrary to Accepted Wisdom
and Produced Unexpected Results*

Patent Owner argues, as it does with respect to the level of ordinary skill, that a POSITA would have known that the manner in which to achieve the most efficient and profitable horizontal fracturing well completions was by casing and cementing the well bore and using the plug and perf method to achieve productive fracturing. *See* PO Resp. 22 (pointing to a Halliburton paper published in 1988 by the Society of Petroleum Engineers (Ex. 2098, 1) and asserting that “[c]asing and cementing the horizontal section allows fracture initiation points to be controlled in placing multiple fractures.”). For example, in the Halliburton paper, it was described that “[t]o be effectively fracture stimulated, a horizontally drilled well must be cased and cemented through the horizontal producing section of the well.” Ex. 2098, 1. Patent Owner relies on multiple references that expressly state that cemented casing, and the plug and perf technique was conventional and a successful method for multi-stage fracture stimulation of a well. *See* PO Resp. 21–26 (citing Exs. 2014, 2078–2079, 2098–2099).

Petitioner contends that references such as the Halliburton paper merely show that cemented casing was preferred, and points, again, to its primary reference, Yost, to show that open hole completions had been successful, and were also known to those of ordinary skill in the art. Pet. Reply 21–22. Petitioner contends that multi-stage open hole completions might not have been the most prevalent method, but that this technique was known to those of ordinary skill in well bore fracturing, as illustrated by a paper authored by McLellan. *Id.* at 22 (citing Ex. 1042, 3).

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We determined, above, that a person of ordinary skill in the art would have known that it was conventional to cement and line a well bore with a cemented casing for a multi-stage fracing completion, and that person of ordinary skill in the art would also have known that there existed circumstances in which open hole multi-stage fracing would also be successful. *See* Section IV.A.3. The level of ordinary skill speaks initially to the question of whether it was contrary to accepted wisdom to perform a multi-stage open hole completion. Although cemented casings were, and still appear to be the most utilized method of performing multi-stage fracture completions in the industry, the evidence nonetheless shows that open hole multi-stage completions were known and preferred under certain circumstances. *See* Ex. 1043, 15 (A 1991 Halliburton paper by C.M. Kim and H.H. Abass (“Kim & Abass paper”) discussing fracture initiation in horizontal well bores and stating that “[a]n openhole completion would be preferred if the formation rock is competent enough to maintain the well bore in stable condition for the life of the well.”). Thus, we are persuaded that using such open hole methods was not contrary to the wisdom and skill of an ordinary artisan in the field of oil and gas well completions.

We are also not persuaded by Patent Owner’s evidence of unexpected or surprising results. Arguing that open hole multi-stage completions unexpectedly outperformed cemented and cased wells, Patent Owner points to a paper titled Comparative Study of Cemented Versus Uncemented Multi-Stage Fractured Wells in the Barnett Shale (“The Barnett Shale paper”) published in 2010 by the Society of Petroleum Engineers. PO Resp. 24 (citing Ex. 2015, 1). The Barnett Shale paper explains that OHMS completions in the Barnett shale formation in Texas, apparently

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outperformed cemented liner completions based on cost savings, improved fracture stimulation, and well production. Ex. 2015, 3. The conclusion reached by the authors was that “it is clear that beyond the production benefits, the simplified operations intrinsic to the OHMS method also result in numerous time and cost savings.” Ex. 2015, 5. This evidence shows a benefit of OHMS in a particular region, i.e., the Barnett shale, but does not necessarily show that such results were unexpected or surprising. One of ordinary skill in the art would have known, from the Kim & Abass paper that where the formation can support open hole completions, such open hole completions are preferred. Ex. 1043, 15. Overall, the evidence that using OHMS is contrary to accepted wisdom and provided beneficial results is balanced by the level of skill in the art and the knowledge that under certain circumstances OHMS was an option and even preferred method of well completion. We determine this evidence to be a neutral factor in our overall determination regarding objective indicia of non-obviousness.

5. Whether the Prior Art Could Have Been Combined and/or Modified to Achieve the Claimed Invention

The Supreme Court instructs an expansive and flexible approach in determining whether a patented invention was obvious at the time it was made. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 415 (2007). The existence of a reason for a person of ordinary skill in the art to modify a prior art reference is a question of fact. *See In re Constr. Equip. Co.*, 665 F.3d 1254, 1255 (Fed. Cir. 2011). In an obviousness analysis, some kind of reason must be shown as to why a person of ordinary skill would have thought of combining or modifying the prior art to achieve the patented invention. *See Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1374

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(Fed. Cir. 2008). A reason to combine or modify the prior art may be found explicitly or implicitly in market forces; design incentives; the “‘interrelated teachings of multiple patents’”; “‘any need or problem known in the field of endeavor at the time of invention and addressed by the patent’”; and the background knowledge, creativity, and common sense of the person of ordinary skill. *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1328–29 (Fed. Cir. 2009) (quoting *KSR*, 550 U.S. at 418–21).

According to Petitioner, Yost discloses all the steps and elements of claim 1 except for the packers being solid body type packers and the sliding sleeves being actuated by a “fluid conveyed sealing device” such as a ball. Pet. 46. For example, and consistent with our review of the scope and content of the prior art as discussed above, Petitioner asserts that “Yost describes multi-stage fracturing of horizontal open hole wells using packers for zonal isolation and ported sliding sleeves for injecting fracturing fluids.” Pet. 7–8. Petitioner then contends that Thomson’s MSAF tool teaches a known alternative to Yost’s sliding sleeve collars and that one of ordinary skill in art would have known to substitute the MSAF tool “to eliminate through-tubing tools and to save time” in either a cased or uncased hole. *Id.* at 32–35 (citing Ex. 1007 ¶ 81–92). Petitioner argues that using Thomson’s MSAF fluid-conveyed ball activated sliding sleeve system in an open uncased hole was a straightforward task and “was known to yield predictable results as both Rapid’s own experts/inventor (see Section VI.C) and Dr. Rao have opined.” *Id.* at 27–28 (citing Ex. 1007 ¶¶ 68–72), *see also id.* at 17, (citing Ex. 1008, 498:12–500:1). Further, Petitioner asserts that both Thomson and Ellsworth describe the use of solid body packers as a known alternative to inflatable packers. *Id.* at 27 (citing Ex. 1007 at ¶¶ 67–72).

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Patent Owner makes several arguments contending that a person of ordinary skill in the art would not have combined Yost, Ellsworth and Thomson. PO Resp. 58–61. Patent Owner argues specifically that Petitioner has failed to show a motivation to combine Yost and Thomson, that Yost and other DOE experiments teach away from open hole completions, and that Yost fails to show that there was any reasonable expectation of success. *Id.*

Motivation and Teaching Away

Patent Owner argues first with respect to motivation and teaching away, that Yost was not a commercially viable enterprise, but simply a DOE experiment “[a]nd those experiments would lead a POSITA to believe that attempting to fracture through multiple open hole segments will fail to create fractures as planned, and may even fail to create any fractures at all.” *Id.* at 58. Besides Yost, Patent Owner’s argument cites as support for this contention a different DOE sponsored test, Ex. 2077 (“Yost II”, i.e. also authored by Yost), that evaluated “site selection, air directional drilling, stimulations, and economic evaluation for a 72° slant well drilled in the Devonian shale, Roane County West Virginia.” Ex. 2077, Abst. Patent Owner contends that these experiments in Yost II, despite showing a boost in production, led to an apparent conclusion by the DOE, that the multi-stage slant drilling technique in the Devonian Shale was not commercially viable. PO Resp. 59.

We are not persuaded that either Yost reference can be extended so far as to support a lack of motivation or a teaching away. The gist of Patent Owner’s position is that the initial Yost reference, as cited by Petitioner, does not show sufficient economic benefits, e.g. increasing profitability of a

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well, such that one of ordinary skill in the art would have used open hole completions for multi-stage fracking in a commercial application. *See id.* at 49–50 (citing Ex. 2100, 211). We disagree. Reading Yost through the lens of one of ordinary skill in the art, it is clear that while cemented casings were more typical, open hole completions were an option that was known to those of ordinary skill in the art. *See* Section IV.A.3. Indeed, Yost details an open hole completion of a horizontal well including seven zones, and states that compared to cemented casings “[a]n alternative approach is zone isolation accomplished by the installation of external casing packers and port collars as an integral part of a casing string in the horizontal section.” Ex. 1002, 1. Yost recognizes that the benefit of using alternating packers and port collars to achieve zonal isolation in an “open hole” wellbore is “to avoid the problems of formation damage associated with cementing and to eliminate the need for tubing-conveyed perforating of numerous treatment intervals.” Ex. 1002, 1. A reasonable reading of Yost clearly discloses specific considerations of open hole completion for a multi-stage fracture operation, and expressly notes the success of such completions in the following conclusions:

1. This 2000 foot horizontal well in fractured Devonian shale has successfully demonstrated numerous folds of increase in production as compared to vertical wells in a pressure-depleted producing field.
2. Productivity improvements were successfully evaluated by actual flow rates, build-up analysis, and kin factor calculations.
3. This project represents the most extensively documented zone-to-zone production and stimulation testing of a long horizontal well in a naturally-fractured gas reservoir.

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4. Both long horizontal drilling and multiple stimulations are required to achieve high folds of increase in production.

Ex. 1002, 5.

Patent Owner makes much of the fact that Yost is an experiment, and not a commercial implementation of open hole multi-stage fracture completion. *See* PO Resp. 58 (“Yost describes scientific experiments, not the results of a commercially viable fracturing operation.”). Yet Patent Owner has not pointed to any case law or precedent that stands for the proposition that distinguishing prior art as a test, or experiment, as compared to a commercial embodiment, has any particular relevance with respect to a finding of obviousness. We moreover agree with Petitioner’s argument that there is no necessity that prior art disclose a commercial system as opposed to a non-commercial system. *Galderma Labs., L.P. v. Tolmar Inc.*, 737 F.3d 731, 737 (Fed. Cir. 2013) (“Nothing in the statute or our case law required Tolmar to prove obviousness by starting with a prior art commercial embodiment and then providing motivation to alter that commercial embodiment.”).

The Federal Circuit has been clear about what facts constitute a teaching away noting that “[t]he prior art’s mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed.” *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). We are persuaded by the evidence in this proceeding that Yost provides motivations to consider and use open hole completions and does not discredit or overtly discourage one of ordinary skill in the art from

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considering the technique of open hole, multi-stage fracture well bore completion.

Reasonable Expectation of Success

Also, we are also not persuaded that Yost II, as argued by Patent Owner, demonstrates any lack of a reasonable expectation of success based on these experiments. PO Resp. 59. What Yost II expressly concluded was that a slant well (which, different from Yost, was a plug and perf completion, not an open hole) was essentially a wash economically because

the three-fold increase in production will simply offset the 2.7 fold increase in cost and until the cost of slant well directional drilling technology using air can be reduced to less than twice the cost of vertical wells, improved economic advantage cannot be realized.

Ex. 2077, 50. Patent Owner’s argument that this conclusion somehow shows no expectation of success is not effective, in part because it does not explain persuasively how the cemented cased well and plug and perf methods and results described in Yost II, relate to the open hole test and disclosure in Yost. Also, Patent Owner does not explain, nor point to any persuasive evidence, that the DOE considered Yost II’s “marginal benefits” as driving any conclusion that Yost’s techniques were not commercially viable. PO Resp. 59. Further, Mr. McGowen admitted during his deposition that Yost II did not indicate that the DOE experiments were not commercially viable. Ex. 1038, 109:1–4. Patent Owner appears to ascribe to the DOE, as promulgating a standard for success where “a new system must demonstrate superior or at least comparable benefits to known alternatives.” PO Resp. 59. (citing Ex. 1007, 50). We find no literal support for this allegation in Yost II, and thus lend no weight to Patent Owner’s

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argument in this regard. *See Meitzner v. Mindick*, 549 F.2d 775, 782 (CCPA 1977) (“Argument of counsel cannot take the place of evidence lacking in the record.”). Moreover, Patent Owner’s argument that a well bore completion technique must have some proven level of profitability seems to require almost an “absolute predictability,” which is “an incorrect legal standard for obviousness.” *Soft Gel Techs. v. Jarrow Formulas, Inc.*, 864 F.3d 1334, 1341 (Fed. Cir. 2017) (citing *Noelle v. Lederman*, 355 F.3d 1343, 1352 (Fed. Cir. 2004)); *see also Hoffman-La Roche Inc. v. Apotex, Inc.*, 748 F.3d 1326, 1331 (Fed. Cir. 2014) (“Conclusive proof of efficacy is not necessary to show obviousness. All that is required is a reasonable expectation of success.”).

We find Dr. Rao’s rebuttal testimony persuasive on these points and give weight to Dr. Rao’s testimony that one of ordinary skill in the art, in 2001, understood that “certain formations, such as the very consolidated shale formations of the Bakken, lent themselves to being completed as open holes.” Ex. 1035 ¶ 7. Dr. Rao testifies that “[a] person of ordinary skill in the art in the 1990s understood that open hole, multistage fracturing was a viable option in appropriate, competent boreholes and formations,” and buttresses his testimony by reference to C.M. Kim & H.H. Abass, “Hydraulic Fracture Initiation From Horizontal Well bores: Laboratory Experiments,” *Rock Mechanics As A Multidisciplinary Science* (1991) (“Kim & Abass”). *Id.* at ¶ 7–8. Discussing experimental results of fracture initiation in horizontal well bores, Kim & Abass wrote, “[i]t appears that the type of well bore completion is not a critical factor. However, an openhole completion would be preferred if the formation rock is competent enough to

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maintain the well bore in stable condition during the life of the well.” Ex. 1043, 15.

In view of Dr. Rao’s testimony and the teachings and evidence from the prior art including Yost, Yost II, Kim & Abass, McClellan, we are persuaded that although certain evidence may show that cemented and perforated cased well bore completions were “conventional,” this would not have posed an insurmountable problem, discouraged or failed to show a reasonable expectation of success to a person of ordinary skill in the art seeking to combine the teachings of open hole completion in Yost with Ellsworth and Thomson. *See In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1382 (Fed. Cir. 2007) (“we do not ignore the modifications that one skilled in the art would make to a device borrowed from the prior art”).

Petitioner’s evidence and reasoning for combining and modifying Yost with Thomson and Ellsworth is straightforward— it is to substitute Thomson’s MSAF tools (ball-actuated sliding sleeves) for Yost’s ported collar sliding sleeves to permit fracture in a single trip and eliminate through tubing intervention. Pet. 27–28 (citing Ex. 1007 ¶ 68). Also, Petitioner argues that a person of ordinary skill in the art would look to Ellsworth’s teaching that solid body packers “were a known alternative to inflatable packers for zonal isolation and stimulation in horizontal open hole wells.” *See id.*, *see also* Ex. 1007 ¶ 69 (“Ellsworth teaches that solid body packers provide effective, long term isolation in open hole wells without the need of cemented liners.”). Further, Petitioner’s declarant Dr. Rao testifies persuasively based on these evidentiary underpinnings that “the successful use of Thomson’s MSAF tools and Ellsworth’s and Thomson’s solid body

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packers in horizontal open hole was entirely predictable and would have been expected by one of ordinary skill in the art in 2001. Ex. 1007 ¶ 72.

6. Application of the Graham Factors Analysis

We have considered all the evidence of obviousness and nonobviousness, well-presented by the parties in this proceeding, within the required framework of the *Graham* factors. We finally determine, having considered the evidence from each of the four factual premises, that the preponderance of the evidence shows that the challenged claims are obvious in view of Yost, Thomson, and Ellsworth. *See Apple*, 839 F.3d at 1048 (“A determination of whether a patent claim is invalid as obvious under § 103 requires consideration of all four Graham factors, and it is error to reach a conclusion of obviousness until all those factors are considered.”), *see also Leo Pharm.*, 726 F.3d at 1357–58 (“Whether before the Board or a court, this court has emphasized that consideration of the objective indicia is part of the whole obviousness analysis, not just an afterthought.”).

After determining initially the scope and content of the prior art, including Yost, Thomson and Ellsworth, we are persuaded that although Yost, Thomson, and Ellsworth do not individually disclose all the limitations of claim 1, each of the limitations recited in claim 1 and in dependent claims 3–7, 9–10, 12 and 16 is disclosed and taught by one of Yost, Thomson, and Ellsworth. We find evidence that one of ordinary skill in the art would have known about both multi-stage open hole completions as well as cemented casing completions, and while cemented casings appear, arguably, to be conventional, we are not persuaded that one of ordinary skill in the art would have understood that horizontal well bore multi-stage fracturing *required* cemented casing completion. Petitioner also provided persuasive reasons

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and evidentiary underpinnings explaining why one of ordinary skill in the art would have been motivated to combine Yost, Thomson, and Ellsworth in an OHMS completion for a non-vertical well bore, and that doing so was well within the knowledge and skill of a person of ordinary skill in the art.

We also considered the objective indicia of non-obviousness presented by Patent Owner and find evidence that the claims were embodied in the commercial embodiment of the claimed invention, i.e. StackFRAC, thus establishing the required nexus. We find also that there was evidence of industry praise for StackFRAC, because the system was apparently the first to use ball drop fracturing in open holes, as well as certain evidence of copying by competitors. We did not find, however, that there was strong evidence of commercial success and unexpected results, or that the claimed invention was contrary to the accepted wisdom of those of ordinary skill in the art. We are also not persuaded that the length of time between the asserted prior art references and the filing of the '774 patent was sufficient evidence to establish a long felt but unsolved need.

That fact that there was certain industry praise for StackFRAC and acknowledgment that the system was a viable commercial well completion technique by way of certain evidence of competitor copying is not, however, strengthened by the dearth of evidence of commercial success. So in part, we find a modicum of evidence supporting certain aspects of a secondary consideration analysis. Obviousness is, however, more so evinced by the elements of the claims being readily discussed and applied in a variety of oil and gas industry prior art, including OHMS completions, and the level and knowledge of one of ordinary skill in the art understanding that different completion techniques existed, including open hole multi-stage completion.

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Also, we are apprised of persuasive evidence that motivations to complete open hole wells existed and that combining the tools and techniques disclosed in the prior art was not difficult and was within the level of ordinary skill in the art.

As a whole, the evidence of praise and copying is not sufficiently probative of nonobviousness to accord significant weight to secondary considerations in the overall Graham factors analysis. *C.f. Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). (“[E]vidence of secondary considerations may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not.”). Weighing the evidence of obviousness against the evidence of nonobviousness, we determine that evidence of obviousness is the most convincing evidence in the record.

Petitioner has shown by a preponderance of the evidence that the subject matter of any of claim 1 is unpatentable in view of Yost, Thomson, and Ellsworth.

For all other limitations and analysis, we are persuaded that Petitioner has met its burden of showing, by a preponderance of the evidence that claims 3–7, 9–10, 12 and 16 are obvious over Yost, Thomson, and Ellsworth, for the reasons set forth in the Petition.

B. Claims 1, 3–7, 9–10, 12 and 16 — Alleged obviousness over Thomson, and Ellsworth

The difference from the prior ground is that instead of Yost as the primary reference to show that multi-stage open hole completions were known by those of skill in the art, now, Petitioner relies on alleged prior

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admissions by Patent Owner’s current COO, Kevin Trahan, that use of cased hole completion tools in open hole completions was well known and even “common place” in the industry. Pet. 55 (citing Ex. 1012 ¶¶ 10–11). In his expert report in a separate case, *Halliburton Energy Services, Inc. and Halliurton Group Canada v. Packers Plus Energy Services, Inc., et al.*, Case Nol CV-44,964 238th Judicial District Court of Midland Count, Texas, involving trade secret issues, Mr. Trahan stated that

[c]ased hole tools, including packers, have been used in open hole applications for many years. In my opinion use of a tool with Rockseal type features in open hole does not pass the patentability standard of novelty or nonobviousness. The open hole application of tools that were originally designed for cased hole has been common place in the industry since I began working in the industry in 1992. There is nothing novel or nonobvious about such an application.

Pet. 19 (citing Ex. 1012 ¶¶ 10–11). In the same case, in his supplemental expert report responding to plaintiff’s expert, Mr. Trahan stated further:

Mr. Berryman has expended significant effort in attempting to show that tools that were initially designed for cased hole would not be applicable for use in open hole. This point could be construed as intentionally misleading.

Ex. 1013, 4. Further along in his supplemental expert report, Mr. Trahan explained that “my intention is to convey the fact that downhole tools which were initially designed for cased hole can be, and have been, utilized in open hole. I have personal experience of such installations and look forward to testifying as such at trial.” *Id.* at 6.

Patent Owner does not dispute that cased hole tools can be used in open holes. PO Resp. 17. Patent Owner argues, however, that Mr. Trahan’s alleged admissions, “do not support a finding that it would have been

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obvious to use solid body packers for the specific purpose of multi-stage open hole fracturing.” *Id.* at 18. Petitioner’s second ground, does not however, rely on Mr. Trahan’s testimony for teaching use of solid body packers in multi-stage open hole fracturing. Petitioner relies on the teachings in Ellsworth showing successful use of using solid body packers in a multi-stage zonal isolation of a horizontal open hole well bore, in combination with Thomson’s disclosure of multi-stage fracturing completions in a cased well bore. Pet. 2–3, 56 (Petitioner argues that “Ellsworth confirmed that SBPs, like those used in Thomson’s cased hole, worked in open hole wells for stimulation.”). That the combination of Ellsworth and Thomson would have been possible and a straightforward task for a person of ordinary skill in the art is further established by Petitioner’s use of Mr. Trahan’s prior admissions showing persuasively that it was within the realm of experience and skill in the art to use completion tools for cased holes, such as solid body packers, in open hole fracturing applications. Ex. 1012 ¶¶ 10–11. Mr. Trahan’s admissions are reasonably understood to confirm Dr. Rao’s testimony that “persons of ordinary skill in the art readily understood the considerations of using a cased hole tool in an open hole well and could readily discern when it was advisable to use a cased hole tool in open hole and when it was not.” Ex. 1007 ¶ 56.

Patent Owner’s argues further that “[n]either Thomson nor Ellsworth teaches pumping fracturing fluid through open hole annular segments.” PO Resp. 62. We appreciate that Ellsworth does not discuss fracturing. *Id.* But again, this argument attacks Ellsworth individually, and fails to account for Petitioner’s reliance on the teachings of Thomson and Ellsworth as a whole and in view of the level of one of ordinary skill in the art. Besides

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confirming the efficacy of cased hole tools utilized in open hole completions, we credit Dr. Rao’s testimony that one of ordinary skill in the art would have been motivated to use cased hole tools, such as ball-activated sliding sleeves and solid body packers, in an open hole completion “based on design incentives or market forces, such as eliminating the need to cement a liner in a well or reducing the time that it takes to fracture a well (as in Thomson).” Ex. 1007 ¶ 180.

After determining initially the scope and content of the prior art, including Thomson and Ellsworth viewed in light of Mr. Trahan’s admissions, we are persuaded that although Thomson, and Ellsworth do not individually disclose all the limitations of claim 1, each of the limitations recited in claim 1 and in dependent claims 3–7, 9–10, 12 and 16 is disclosed and taught by one of Thomson, and Ellsworth. As in the first ground, here we also find evidence that one of ordinary skill in the art would have known about both multi-stage open hole completions as well as cemented casing completions, and while cemented casings appear, arguably, to be conventional, we are not persuaded that one of ordinary skill in the art would have understood that horizontal well bore multi-stage fracturing *required* cemented casing completion.

Petitioner also provided persuasive reasons and evidentiary underpinnings explaining why one of ordinary skill in the art would have been motivated to combine Thomson, and Ellsworth in an OHMS completion for a non-vertical well bore, and that doing so was well within the knowledge and skill of a person of ordinary skill in the art. *See* Ex. 1007 ¶ 181 (Dr. Rao testifies that combining Thomson and Ellsworth “provide[s] for fracturing multiple stages in quick succession and avoid unnecessary

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fracture pumping equipment time and rental expense with solid body packers for open hole isolation to avoid the time and expense of casing the well.”).

Without reiterating it for this second ground, we also considered the objective indicia of non-obviousness presented by Patent Owner and find evidence that the claims were embodied in the commercial embodiment of the claimed invention, i.e. StackFRAC, thus establishing the required nexus. We find also that there was evidence of industry praise for StackFRAC, because the system was apparently the first to use ball drop fracturing in open holes, as well as certain evidence of copying by competitors. We did not find, however, that there was strong evidence of commercial success and unexpected results, or that the claimed invention was contrary to the accepted wisdom of those of ordinary skill in the art. We are also not persuaded that the length of time between the asserted prior art references and the filing of the '774 patent was sufficient evidence to establish a long felt but unsolved need.

That fact that there was certain industry praise for StackFRAC and acknowledgment that the system was a viable commercial well completion technique by way of certain evidence of competitor copying is not, however, strengthened by the dearth of evidence of commercial success. So in part, we find a modicum of evidence supporting certain aspects of a secondary consideration analysis. Obviousness is, however, more so evinced by the elements of the claims being readily discussed and applied in a variety of oil and gas industry prior art, including OHMS completions, and the level and knowledge of one of ordinary skill in the art understanding that different completion techniques existed, including the use of cemented casing tools in

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open hole multi-stage completions. Also, we are apprised of persuasive evidence that motivations to complete open hole wells existed and that combining the tools and techniques disclosed in the prior art was not difficult and was within the level of ordinary skill in the art.

As a whole, the evidence of praise and copying is not sufficiently probative of nonobviousness to accord significant weight to secondary considerations in the overall Graham factors analysis. *C.f. Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). (“[E]vidence of secondary considerations may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not.”). Weighing the evidence of obviousness against the evidence of nonobviousness, we determine that the evidence of obviousness is the most convincing evidence in the record.

We determine that Petitioner has shown by a preponderance of the evidence that the subject matter of claims 1, 3–7, 9–10, 12 and 16, are also unpatentable in view of Thomson and Ellsworth.

V. SUMMARY

For the foregoing reasons, we conclude that Petitioner has shown by a preponderance of the evidence that the subject matter of claims 1, 3–7, 9–10, 12 and 16 is unpatentable in view of Yost, Thomson and Ellsworth, and that the subject matter of claims 1, 3–7, 9–10, 12 and 16 is further unpatentable in view of Thomson and Ellsworth.

This is a final written decision of the Board under 35 U.S.C. § 318(a). Parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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VI. ORDERS

After due consideration of the record before us, it is:

ORDERED that claims 1, 3–7, 9–10, 12 and 16 have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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