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 IPR2016-01514
Patent 7,543,634

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 2016-01514, concerning U.S. Patent 7,543,634 ("the '634 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 claim 25 would have been obvious under 35 U.S.C. § 103 over Thomson, Ellsworth and Yost?

B. Whether the PTAB erred in giving insufficient weight to Patent Owner's secondary considerations of non-obviousness?

C. Whether the PTAB erred in concluding that Patent Owner did not demonstrate commercial success?

D. Whether the PTAB erred in concluding that Patent Owner did not demonstrate a long-felt but unsolved need?

E. 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?

F. 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 inveniton with a reasonable expectation of success?

G. 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.

Respectfully submitted,

Dated: April 20, 2018

/Gregory J. Gonsalves/

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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 20, 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 though 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

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Paper 65
Entered: April 3, 2018

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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v.

PACKERS PLUS ENERGY SERVICES, INC.,
Patent Owner.

Case IPR2016-01514
Patent 7,543,634 B2

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

POWELL, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
Inter Partes Review
37 C.F.R. § 42.108

I. INTRODUCTION

Packers Plus Energy Services Inc. ("Packers Plus") is the owner of the '634 patent. Weatherford International, LLC, Weatherford/Lamb, Inc., Weatherford US, LP, and Weatherford Artificial Lift Systems, LLC ("Petitioner") filed a Petition (Paper 1, "Pet.") challenging claim 25 of the '634 patent. Rapid Completions LLC, the exclusive licensee of the '634 patent, filed a Preliminary Response (Paper 18, "Prelim. Resp."). In view of those submissions, we instituted an *inter partes* review of claim 25 of the '634 patent. Paper 23 ("Institution Decision" or "Dec. on Inst."). Subsequent filings include a Patent Owner Response (Papers 32, 33[1], "PO Resp."), a Petitioner Reply (Paper 39, "Pet. Reply"), and a Patent Owner Surreply (Paper 55, "PO Surreply").

We have jurisdiction over this proceeding under 35 U.S.C. § 6(b). After considering the evidence and arguments of the parties, we determine that Petitioner has proven by a preponderance of the evidence that claim 25 of the '634 patent is unpatentable. *See* 35 U.S.C. § 316(e). We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a).

II. BACKGROUND

A. The '634 Patent

The '634 patent discloses an apparatus and method for fluid treatment of a wellbore. Ex. 1001, 1:19–22. The '634 patent discloses that many prior systems required inserting a tubing string into a bore hole "with the ports or perforations already open." *Id.* at 2:11–13. The '634 patent states that this

[1] Paper 32 is a private, unredacted version of the Patent Owner Response, and Paper 33 is a public, redacted version of the Patent Owner Response.

"can hinder the running operation and limit usefulness of the tubing string." *Id.* at 2:16–18. The '634 patent addresses this problem, disclosing that its "method and apparatus provide for the running in of a fluid treatment string, the fluid treatment string having ports substantially closed against the passage of fluid therethrough, but which are openable when desired to permit fluid flow into the wellbore." *Id.* at 2:27–31. Regarding applications for its system, the '634 patent discloses that "[t]he apparatus and methods of the present invention can be used in various borehole conditions including open holes, cased holes, vertical holes, horizontal holes, straight holes or deviated holes." *Id.* at 2:31–35.

The '634 patent shows details of a wellbore fluid treatment assembly in Figure 1b. *Id.* at 6:8–9. Figure 1b is reproduced below.

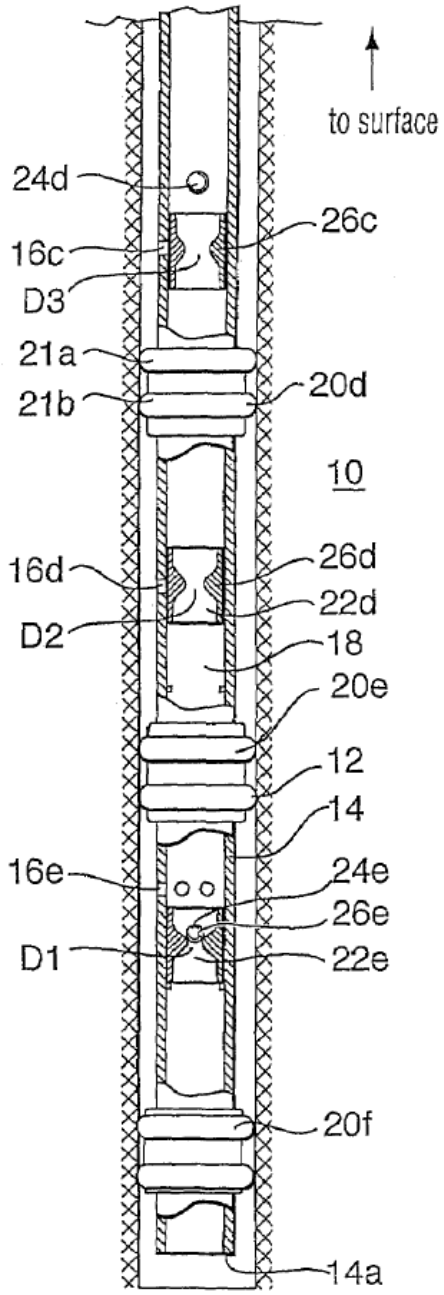


FIG. 1b

Figure 1b shows a wellbore fluid treatment assembly, including tubing string 14 disposed inside wellbore 12 of formation 10. *Id.* at 6:8–12.

Packers 20d, 20e, and 20f mount at different positions along the axis of tubing string 14. *See id.* at 6:17–19; Fig. 1b. The packers used are solid-body type packers having at least one extrudable packing element. *Id.* at 6:33–34. At ported intervals 16c, 16d, and 16e, ports 17 open through tubing string 14. *Id.* at 6:12–16. Ported interval 16c sits above packer 20d, ported interval 16d sits between packers 20d and 20e, and ported interval 16e sits between packers 20e and 20f. *See id.* at 6:17–19; Fig. 1b.

Sliding sleeves 26c, 26d, and 26e are positioned inside tubing string 14 to regulate opening of ports 17. *Id.* at 6:41–42. Sliding sleeves 26c, 26d, and 26e mount over ports 17 of ported intervals 16c, 16d, and 16e, respectively, to close the ports 17. *See id.* at 6:42:44. Each of sliding sleeves 26c, 26d, and 26e can be moved to a position away from the associated ports 17 to open them. *Id.* at 6:46–53. In one embodiment, a ball or plug may actuate a sliding sleeve from the closed state to an open state. Ball 24e can travel through tubing string 14 and seat in sleeve 22e. *Id.* at 6:65–7:17. For example, ball 24e can travel through tubing string 14 and seat in sliding sleeve 26e. *Id.* at 6:65–7:10. Subsequently, pressure applied inside tubing string 14 can move ball 24e and sliding sleeve 26e to open ports 17 of ported interval 16e, as shown in Figure 1b. *Id.* at 7:1–14. This allows fluid flow between the inside and the outside of tubing string 14 through ports 17. *Id.* at 7:14–17. Other balls can be used to move the other sliding sleeves in sequence, so as to allow sequential treatment of different zones within wellbore 12. *Id.* at 7:66–8:32. To facilitate sequential treatment, the ’634 patent discloses that

> Each of the plurality of sliding sleeves has a different diameter seat and therefore each accept different sized balls. In

> particular, the lower-most sliding sleeve 22e has the smallest diameter D1 seat and accepts the smallest sized ball 24e and each sleeve that is progressively closer to surface has a larger seat.

Id. at 7:18–23.

B. Related Matters

The ’634 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. Paper 3. Additionally, the ’634 patent is challenged in IPR2016-00597, where we instituted trial in August, 2016. The ’634 patent also is challenged in IPR2016-01505, where we instituted trial in February, 2017.

C. The Challenged Claim

Claim 25 depends from independent claim 20. Claims 20 and 25 are reproduced below.

> 20. A method for fluid treatment of a borehole, the method comprising:
>
> providing an apparatus for wellbore treatment including
>
> > a tubing string having a long axis, a first port opened through the wall of the tubing string,
> >
> > a second port opened through the wall of the tubing string,
> >
> > the second port offset from the first port along the long axis of the tubing string,
> >
> > a first packer operable to seal about the tubing string and mounted on the tubing string to act in a position offset from the first port along the long axis of the tubing string,
> >
> > a second packer operable to seal about the tubing string and mounted on the tubing string to act in a position between the first port and the second port along the long axis of the tubing string;

> a third packer operable to seal about the tubing string and mounted on the tubing string to act in a position offset from the second port along the long axis of the tubing string and on a side of the second port opposite the second packer,
>
> at least one of the first, second and third packer being a solid body packer and each of the first, second and third packers including at least two packing elements;
>
> a first sleeve positioned relative to the first port, the first sleeve being moveable relative to the first port between a closed port position and a position permitting fluid flow through the first port from the tubing string inner bore a second sleeve being moveable relative to the second port between a closed port position and a position permitting fluid flow through the second port from the tubing string inner bore; and
>
> a sleeve shifting means for moving the second sleeve from the closed port position to the position permitting fluid flow, the means for moving the second sleeve selected to create a seal in the tubing string against fluid flow past the second sleeve through the tubing string inner bore and;
>
> running the tubing string into a wellbore in a desired position for treating the wellbore;
>
> setting the packers;
>
> conveying the means for moving the second sleeve to move the second sleeve and increasing fluid pressure to force wellbore treatment fluid out through the second port.

Ex. 1001, 15:33–16:21 (line breaks added).

> 25. The method of claim 20 wherein when in a desired position the apparatus is adjacent an open hole section of the wellbore and the packers are set to seal the annulus between the apparatus and the wellbore wall.

Id. at 16:41–44.

D. The Pending Ground

Claim 25 of the '634 patent is challenged as allegedly unpatentable under 35 U.S.C. § 103 based on the following pending ground (Dec. on Inst. 26–27):

Ground	References	Challenged Claim
§ 103	Thomson,[2] Ellsworth,[3] and Yost[4]	25

As further support, Petitioner proffers the Declaration of Vikram Rao, Ph.D. (Exs. 1007, 1035). Patent Owner proffers Declarations of Harold E. McGowen III, PE. (Exs. 2051, 2081, 2084).

[2] 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 (Society for Petroleum Engineering) 37482 (1997) (Ex. 1003).
[3] B. Ellsworth et al., *Production Control of Horizontal Wells in a Carbonate Reef Structure*, 1999 Canadian Institute of Mining, Metallurgy, and Petroleum Horizontal Well Conference (1999) (Ex. 1004).
[4] 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) (Ex. 1002).

III. MOTIONS TO EXCLUDE

The parties have each filed a motion to exclude certain evidence, along with subsequent papers disputing the merits of those motions. Papers 44, 46, 48, 50, 52, and 53.

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

1. *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[5] ("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."). 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[6], *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.

2. *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.*

[5] We cite to the original pagination of Exhibit 2051, not to the pagination added at the very bottom of each page.
[6] We cite to the original pagination of Exhibit 2081, not to the pagination at the very bottom of each page.

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 23 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 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 '634 patent. *Id.* at 8. (Petitioner alleges that "[n]ot one of these exhibits mentions the long

list of steps recited in claim 25 of the '634 Patent, which requires a series of steps performed in an 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 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 '634 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 '634 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 '634 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.

3. *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 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. PO Resp. 23. 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 '634 patent. *See* Ex. 2016, 8:21–25. Petitioner had the opportunity also in this proceeding to depose Mr. Dsnshy 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 slideshows 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 drawing, with Exhibit 2053 allegedly having an altered product label, crediting the Packers Plus's technical drawing to Baker Hughes Iso-Frac system. PO Resp. 31–34. 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. 35–36. 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's Reply to Its Motion to Exclude 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. Claim Construction

Petitioner proposes constructions for certain claim terms. Pet. 26–27. Patent Owner addresses the meaning of the claim language "solid body

packer." PO Resp. 3–5. For purposes of this decision, we need not construe explicitly any claim language to determine that Petitioner has demonstrated obviousness of claim 25 by a preponderance of the evidence. *See* 35 U.S.C. § 314(a); *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.").

B. Alleged Obviousness of Claim 25 over Thomson, Ellsworth, and Yost

Petitioner asserts, citing record evidence, that Thomson anticipates claim 20, from which claim 25 depends. Pet. 27–45. With respect to the claim 20 recitations regarding packers, Petitioner asserts that Ellsworth also teaches these recitations. *Id.* at 36–38. Petitioner further asserts that if Thomson did not teach solid body packers, "it would have been obvious to substitute the solid body packers of Ellsworth for the retrievable packers of Thomson in order to use the Thomson system in open hole wells to avoid the need to case and cement the horizontal section of the wellbore." *Id.* at 46–47. Regarding claim 25, Petitioner asserts that "it would have been obvious . . . to use Thomson's system in multistage fracturing or any other fluid treatment in an open hole well." *Id.* at 27.

Patent Owner argues that claim 25 would not have been obvious for a number of reasons related to the factors identified in *Graham v. John Deere Co.*, 383 U.S. 1, 148 (1966). Those factors include (1) the scope and content of the prior art, (2) differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) secondary considerations, i.e., objective indicia of non-obviousness. We turn now to detailed discussions

of these factors, followed by our conclusions regarding whether claim 25 would have been obvious.

1. Scope and Content of the Prior Art

a. Thomson

Thomson discloses a "completion design that allows multiple acid fracs to be performed in horizontal subsea chalk-formation wells with a single trip into the wellbore." Ex. 1003, 1. "The key element" of Thomson's system "is a multi-stage acid frac tool (MSAF) that is similar to a sliding sleeve circulating device and is run in the closed position." *Id.* Thomson's Figure 5, below, depicts the MSAF tool in cross-section.

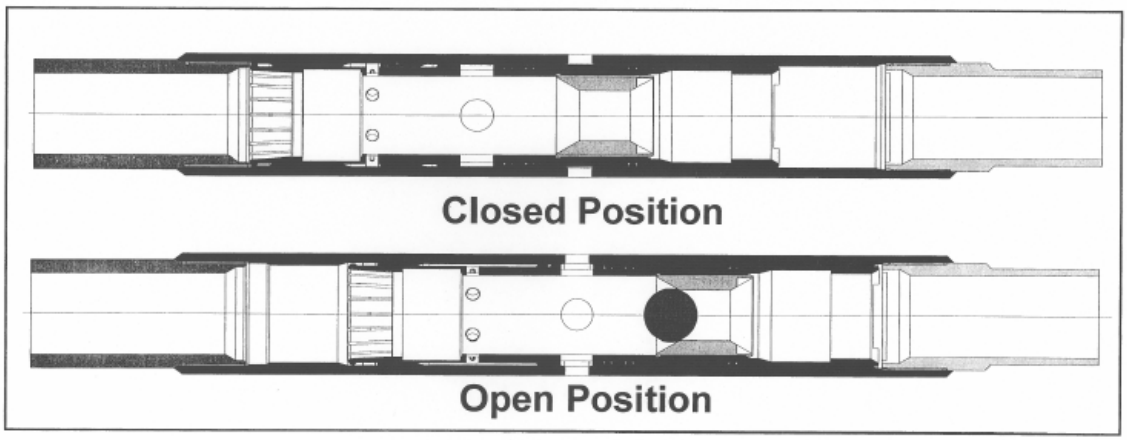


Figure 5
MSAF Tool in the Closed and Open Positions

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, labeled "Open Position," the sliding sleeve having been motivated by a ball into an open position uncovering the fluid ports. *Id.* at 2, 12.

Thomson discloses that hydraulic-set retrievable packers may be positioned on each side of an MSAF tool. *Id.* at 1. Thomson shows an MSAF tool disposed between two packers in Figure 3, which is reproduced below.

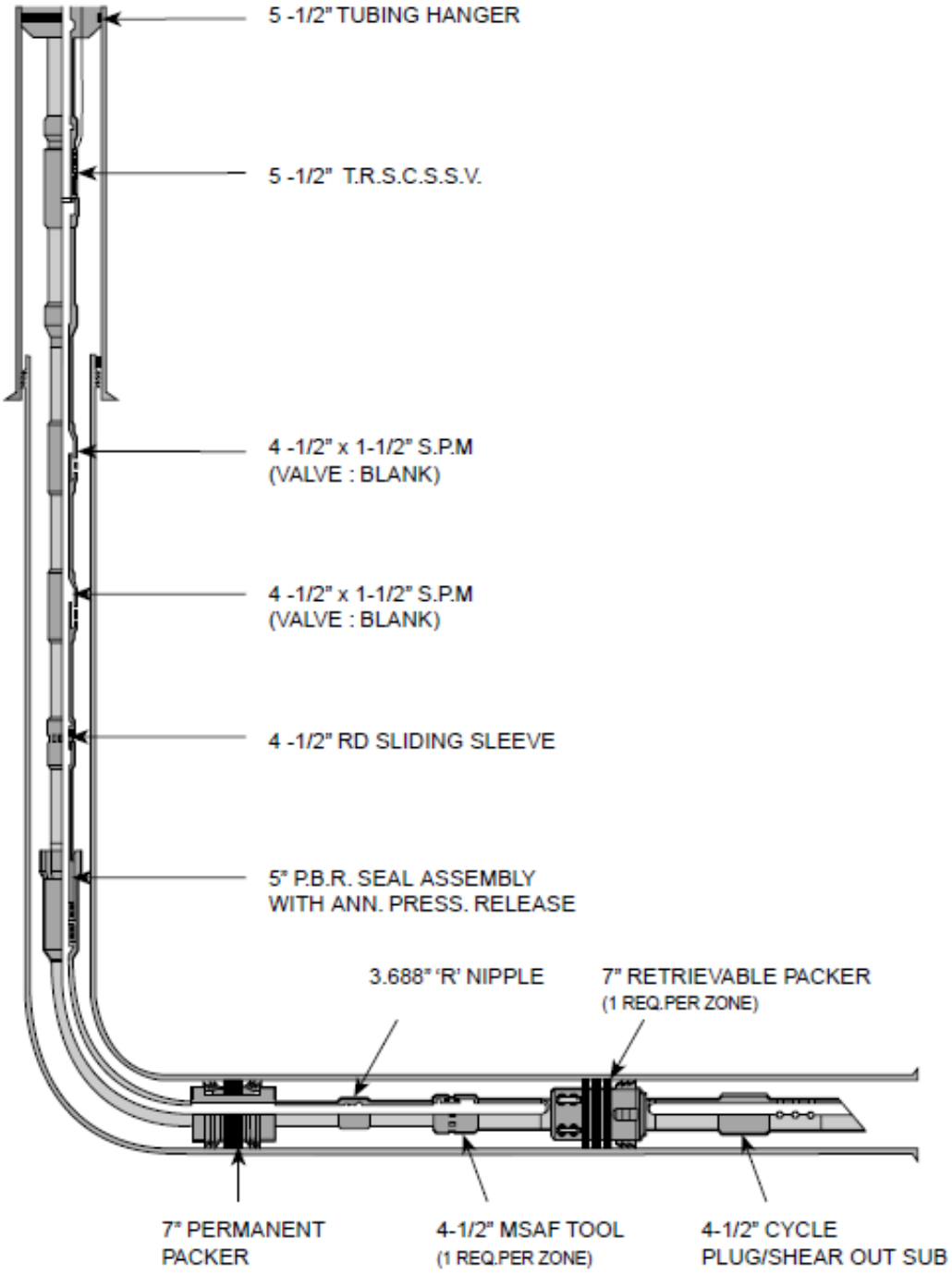
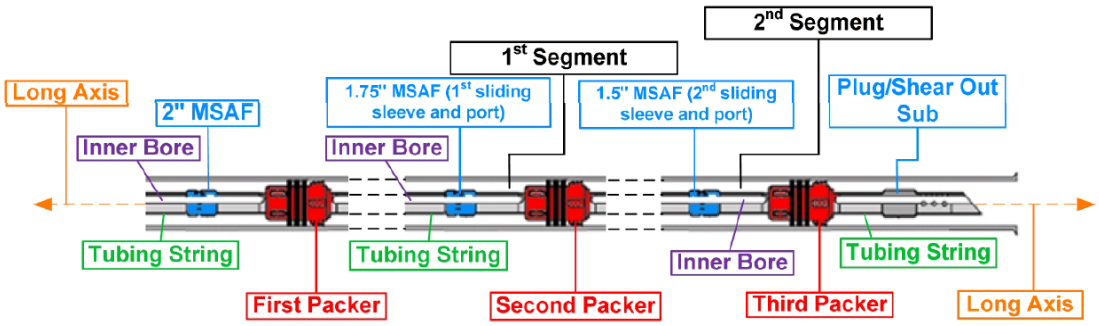


Fig. 3 — Schematic of a Typical Joanne Completion

Thomson's Figure 3 shows "a schematic of a typical Joanne completion." *Id.* at 2. Figure 3 shows one MSAF tool disposed between two packers. *Id.* at 2, Fig. 3. Thomson discloses that more MSAF tools can be used, stating that "[u]p to 9 MSAF tools can be run in the completion with isolation of each zone being achieved by hydraulic-set retrievable packers that are positioned on each side of an MSAF tool." *Id.* at 1. To illustrate an example of Thomson's disclosure of using multiple MSAF tools, each isolated in a zone by adjacent hydraulic-set retrievable packers, Petitioner provides the following modified, annotated version of Thomson's Figure 3. Pet. 9.



Petitioner's modified, annotated version of Figure 3 shows three MSAF tools and three packers mounted in alternating positions along a tubing string. *Id.* Based on table 1 of Thomson, the annotated, modified Figure 3 identifies the first (leftmost) MSAF tool as having a 2" dimension, the next MSAF tool as having a 1.75" dimension, and the next MSAF tool as having a 1.5" dimension. *Id.* at 9, n.2. This also comports with Thomson's disclosure that "[e]ach sleeve contains a threaded ball seat with the smallest ball seat in the lowest sleeve and the largest ball seat in the highest sleeve." *Id.* at 1. Thomson discloses that:

> With this system, 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 the open sleeve.

Id. Based on the foregoing disclosures, we find that Thomson teaches multistage fracturing of a wellbore.

b. 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.

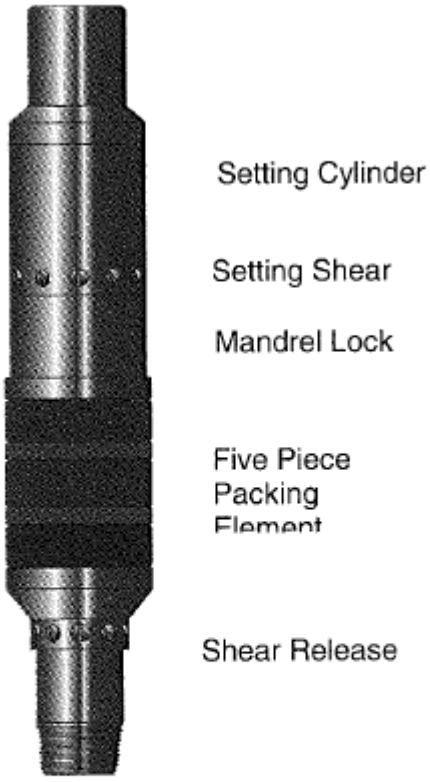


Figure 4 - The solid body packer is hydraulic set instead of inflatable (Guiberson / Halliburton Wizard II packer shown)

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 sheer 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.*

c. Yost

Yost discloses a U.S. Department of Energy sponsored stimulation test ("stimulation test") of a horizontal wellbore 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, wellbore. *Id.* The casing string included eight external 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.

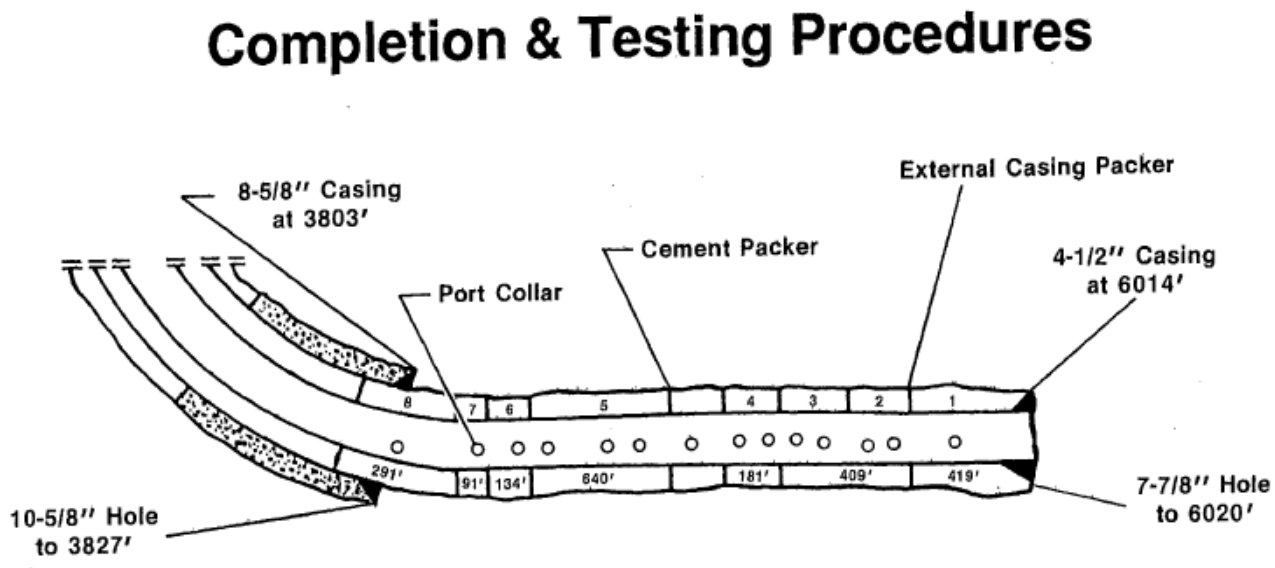


Fig. 2—Schematic diagram of completion configuration.

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 wellbore, 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 reflected in the increase in flow rates and a decrease in skin factor values." *Id.* at 5. Based on the foregoing, we find that Yost teaches open-hole multistage fracturing of a wellbore.

2. *Differences Between the Prior Art and the Claimed Invention*

As noted above, Petitioner asserts that Thomson anticipates claim 20. Pet. 28–45. Patent Owner does not assert Thomson fails to disclose any limitation of claim 20. For the reasons expressed by Petitioner, we are persuaded that Thomson discloses each of the limitations of claim 20, arranged and operating in the manner disclosed in claim 20. *See* Pet. 28–45. Consequently, the only difference between Thomson and claim 25 appears in the claim limitation "wherein when in a desired position the apparatus is adjacent an open hole section of the wellbore and the packers are set to seal the annulus between the apparatus and the wellbore wall." Ex. 1001, 16:41–44. In other words, although Thomson teaches using its apparatus to perform multistage fracturing in a wellbore (*see* Section IV.B.1.a, *supra*), it does not teach doing so in an open-hole wellbore.

Compared to the claimed invention, Yost uses a different apparatus to perform treatment of an open-hole wellbore. For example, Yost discloses using "external casing packers" (Ex. 1002, 2), in contrast to the claim

limitation of "at least one of the first, second and third packer being a solid body packer and each of the first, second and third packers including at least two packing elements" (Ex. 1001, 16:2–5). Additionally, it appears that Yost's sliding sleeve ported collars (Ex. 1002, 2) may differ from the claimed "sleeve[s]" and "sleeve shifting means" (Ex. 1001, 14:13–25). In other words, whereas Thomson uses the tools recited in the claims but in a cased-hole wellbore, Yost teaches treating an open hole wellbore using different tools than the claimed invention. Thus, Yost differs from the claimed invention in that it does not use an apparatus like the one disclosed in Thomson to perform the open-hole well treatment that Yost describes.

Patent Owner indicates that Ellsworth differs from the claimed invention in that Ellsworth does not teach using "ball-activated sleeves that are only opened when a ball is dropped downhole and forced against a ball seat with fluid pressure." PO Resp. 59. Without disputing this assertion, Petitioner asserts "it is irrelevant as . . . Ellsworth is relied upon to show that [solid body packers] were an obvious alternative to Yost's inflatable packers and to show modifying Thomson's system to provide zonal isolation in an open-hole wellbore was obvious." Pet. Reply 16. We agree with Petitioner that the distinction Patent Owner draws between Ellsworth and the claimed invention has very little relevance, in light of the disclosures of Thomson and Yost, as well as Petitioner's assertions of obviousness.[7]

[7] To the extent Patent Owner suggests that Ellsworth teaches away from the claimed invention, we disagree. Patent Owner's assertion that Ellsworth teaches an approach that differs from the claimed invention does not provide a basis for determining that Ellsworth would in any way discourage a person of ordinary skill in the art from practicing the claimed invention.

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 individually disclose all the limitations of claim 25, each of the limitations of claim 25 is disclosed and taught by 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. 15 (citing Ex. 1007 ¶¶ 38–39). 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 15–16. Dr. Rao testifies that "by the late 1990s, before the purported invention of the subject matter of the '634 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 ¶ 56. 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.*

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 wellbore 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 when planning to use multi-stage hydraulic fracturing, such as that disclosed in Thomson, to stimulate oil and gas production. *Id.* at 11–15. 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 12–27 (citing Ex. 2051 ¶¶ 14, 22–25, 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 that the operator desired to hydraulically fracture (the "Plug and Perf" method).

Ex. 2051, 26.

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). Patent Owner argues, further, that it would not have been obvious to combine the known technologies in the manner suggested by Petitioner because "then you don't have the guarantee that you're going to get a fracture in each stage." Tr. 29:20–24.

Petitioner argues that Patent Owner's evidence of conventional use of Plug and Perf "merely show[s] that some people preferred cemented casing." Pet. Reply. 22. 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 '634 patent. Petitioner alleges that technical papers by McClellen (Ex. 1042) and Kim and Abass (Ex. 1043) describe successful horizontal open hole completions prior to the effective filing date of the '634 patent. Pet. Reply 22–23.

After reviewing the evidence, we give some credit to the testimony of both parties' Declarants this proceeding. For instance, we determine that

one of ordinary skill in the art would have known that Plug and Perf using a cemented casing was a conventionally accepted method in the oil and 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 characterized by some as "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 "Yost specifically describes multi-stage open hole fracturing of horizontal wells using packers for zonal isolation" (Ex. 1007 ¶ 43), and that those of ordinary skill in the art understood that such multi-stage open hole fracturing could be performed successfully (*id.* at ¶¶ 44–56). We also credit Dr. Rao's testimony that those of ordinary skill in the art "could readily discern when it was advisable to use a cased hole tool in open hole and when it was not." *Id.* at ¶ 57.

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 ¶ 43, (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 wellbore, could be better controlled through the precise placement of perforations, which requires cementing, perforating and the Plug and Perf method."). Consistent with our finding, Mr. McGowen testified during his deposition that openhole 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 of 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 wellbore with a cemented casing for a multi-stage fracturing 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 fracturing might also be successful. *See* Ex. 1002, 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 ("The 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.* (noting "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 in different ways, certain problems encountered in wellbore completion and how the industry addressed and overcame such problems prior to the filing of the '634 patent. For instance, knowledge of conventional fracturing through perforations in cemented casing completions as described by Mr. McGowen, and fracturing in open hole completions in Yost and McClellan, 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 [person of ordinary skill in the art] would also expect that

cemented casing is necessary to avoid the formation of these complex fracture geometries."). This position appears as mostly unsupported attorney argument. 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 cased hole Plug and Perf completions were the sole option one of skill in the art would have considered for successful wellbore 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.").

Additionally, Petitioner provides persuasive evidence that, consistent with Ellsworth's disclosure, a person of ordinary skill in the art knew that cased hole tools, such as solid body packers, could be used successfully in open holes. Petitioner relies on alleged prior 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. 19–20 (citing Ex. 1012 ¶¶ 10–11). In his expert report in a separate case, *Halliburton Energy Services, Inc. and Halliburton Group Canada v. Packers Plus Energy Services, Inc., et al.*, Case No. 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.

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. 18. Patent Owner argues, however, that Mr. Trahan's alleged admissions, "do not support a finding that it would have been obvious to use solid body packers for the specific purpose of multi-stage open hole fracturing." 18. Petitioner 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 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. Pet. 2–3, 47–48. Petitioner argues that "Ellsworth confirmed that [SBPs], like those used in Thomson's cased hole, worked in open hole wells for stimulation." *Id.* at 47. 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 ¶ 57.

4. *Objective Indicia of Non-Obviousness*

Patent Owner presents evidence of objective indicia of non-obviousness, including proceeding contrary to accepted wisdom, nexus, copying, commercial success, and industry praise. Evidence of objective indicia of non-obviousness, when present, must always be considered en route to a determination of obviousness. *See In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1075–76 (Fed. Cir. 2012).

a. *Nexus*

Patent Owner's evidence of nexus shows that the structural limitations in the claims read on the apparatus sold by Packers Plus, and that these features are not a subcomponent of, but rather the entirety of the product sold. Ex. 2051, 7, 43, Exhibit A; *see also* Ex. 2056 (describing "StackFRAC systems use RockSEAL hydraulically set mechanical packers to isolate

zones together with ball-actuated hydraulically activated PracPORT 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 claim 25 is a method claim, and that some of the evidence simply of commensurate tools and hardware between StackFRAC and the claimed invention may not necessarily express each claimed method step. *See* Pet. Reply, 18–19. However, Patent Owner's evidence of objective indicia 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 20 recites "running the tubing string into a wellbore in a desired position for treating the wellbore," and claim 25 recites "when in a desired position the apparatus is adjacent an open hole section of the wellbore and the packers are set to seal the annulus between the apparatus and the wellbore wall," a Packers Plus advertisement (Ex. 2017, 1) states "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 wellbore." *Compare* Ex. 1001, 16:17–18, 16:41–44 *with* Ex. 2017, 1. The Packers Plus advertisement goes on to describe

that the RockSEAL II solid-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 packers are set to seal the annulus between the apparatus and the wellbore wall," as recited in claim 25. Ex. 1001, 16:43–44.

In conclusion, Patent Owner presents evidence for which there is a strong nexus between the asserted 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."). We will consider such 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). Petitioner does not persuade us that there is no nexus between Patent Owner's evidence and the claimed invention. *See* Pet. Reply 18–20. We now turn to the evidence alleging 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.

That work accounts for the vast majority of Packers Plus's overall revenue and profits." Exs. 2048, 2049. Mr. Girardi states further that Packers Plus is "generating [redacted] 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. 39, 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.

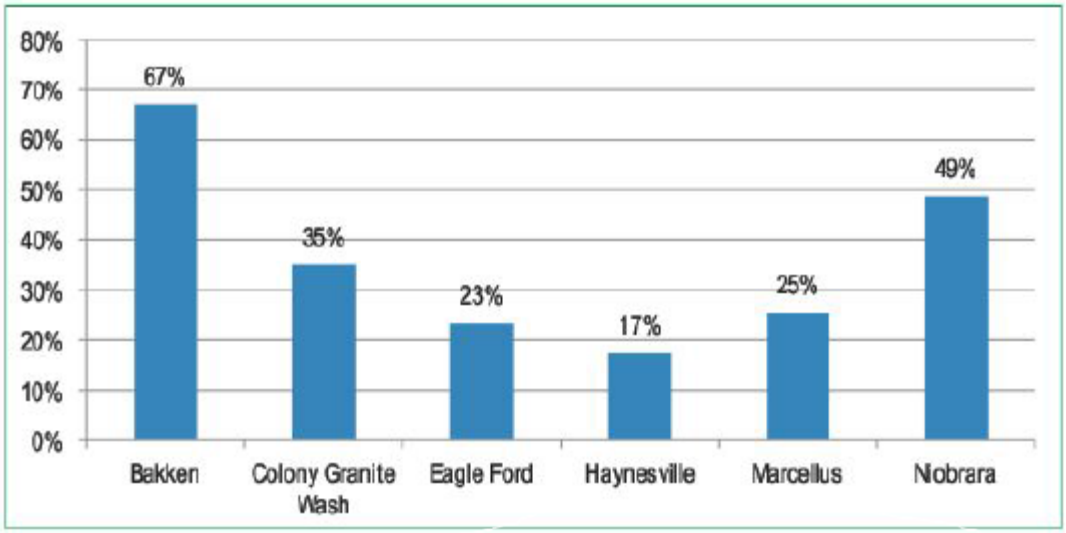


Figure 1. The OHMS technique for frac treatments is used in the Bakken play more than in other plays.

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 ("OHMS") well completions in different sites 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. 41. 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, 18 n.2 (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.[8]

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. 38–40. Listed below are sales and revenue figures for Packers Plus, Weatherford, and Baker Hughes:

a) Packers Plus – [redacted] annually (Exs. 2048, 2049);

[8] 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. PO Resp. 33.

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, 22–24).[9]

This evidence does not establish market share or commercial success of the claimed inventions for several reasons.

First, the foregoing evidence does not contain clear information about what portion of each company's sales infringe the claimed methods. For example, 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. Thus, the evidence of record does not show how much revenue Packers Plus generated from sales of the StackFRAC components.

Furthermore, the StackFRAC components, by themselves, do not embody the claimed invention, which relates to a method that includes "running the tubing string into a wellbore in a desired position for treating the wellbore," "wherein when in a desired position the apparatus is adjacent an open hole section of the wellbore and the packers are set to seal the annulus between the apparatus and the wellbore wall." Ex. 1001, 16:17–18, 16:41–44. Thus, only those StackFRAC systems that are actually installed in an open hole wellbore embody the claimed invention. And we do not have reliable information regarding what portion of StackFRAC systems are

[9] 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.

so installed. *See* Pet. Reply 18–20. Accordingly, we do not have reliable information regarding Packers Plus's revenues associated with the patented invention sufficient to support a finding of commercial success.

Regarding the alleged commercial success of Baker Hughes's FracPoint system, we have only an uncorroborated estimate of FracPoint revenue. *See* Exs. 2048; 2049; 2081, 25–27; 2084, 25–27. Furthermore, as with StackFRAC, the FracPoint components themselves cannot embody the claimed method invention. And we also lack reliable information regarding what portion of speculated Baker Hughes revenue is associated with installations that embody the patented invention. *See* Pet. Reply 18–20.

From the foregoing information, we can reasonably understand that there is a market for multistage fracturing tools and systems, and sales of goods, and perhaps services, with some portion arguably having nexus to the claimed invention, accounting for possibly hundreds of millions of dollars annually. 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.

To an extent, we find some objective evidence in an industry paper for the Society of Petroleum Engineers prepared by Weatherford ("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.

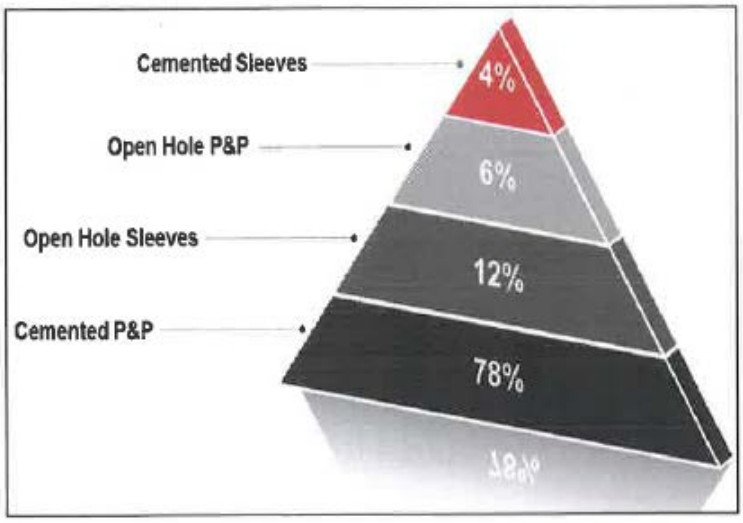


Figure 1—Percentages for different frac methods at Weatherford.

Weatherford's paper at Figure 1, reproduced above, indicates that OHMS accounts for 12% of Weatherford's fracturing completions. *Id.* at 2. Even if Weatherford's Figure 1 is representative of the market for open hole multi-stage fracturing, we still have no cogent evidence of how much of the overall market for open hole multistage fracturing (all companies performing fracturing completions) involves the use of tools consistent with those recited in the claims. Thus, the Weatherford paper's vague snapshot of fracturing distributions does not demonstrate commercial success of the claimed invention, particularly when Weatherford's paper notes that "[Plug and Perf] is still the number one stimulation technique being used in unconventional horizontal wells in North America and globally." Ex. 2074, 2. Indeed, the Weatherford paper indicates that Plug and Perf accounts for 78% of Weatherford's fracturing, vastly outstripping the 12% attributed to open hole with sleeves. *Id.* at Fig. 1.

We appreciate that 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 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 ("Packers Plus has grown . . . to . . . generating [redacted] in annual U.S. revenue. The StackFRAC system . . . 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 18 (citing *In re Applied Materials, Inc.*, 692 F. 3d 1289, 1300 (Fed. Cir. 2012).

The evidence does not show commercial success. Despite a showing of nexus between the claimed invention and some installations of 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 completions embodying the claimed invention. Accordingly, this factor does not weigh towards a finding of non-obviousness.

c. *Industry Praise*

Asserting that the StackFRAC system 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. 27–32 (citing Exs. 2004–2008, 2013, 2020, 2045–2049, 2051, 2054, 2061). Patent Owner argues that the praise and notoriety is for the StackFRAC system specifically, "as embodied in claim [25], i.e., the overall combination of claimed elements." *Id.* at 28.

Patent Owner argues, for example, that a confidential industry report [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 31 (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 32 (citing Ex. 2054 ("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.*

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 (citing *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1352 (Fed. Cir. 2010)). We agree that certain evidence is attributable to entities that are not experts or companies in the oil and gas industry, such as the Financial Post Magazine. *See* Ex. 2006. Petitioner's arguments, however, do not negate that Patent Owner's evidence shows some industry praise. 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 flawed or irrelevant, or that all the media evidence provided by Patent Owner in this regard should be discounted.

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., v. Emtrak, Inc.*, 544 F.3d 1310, 1316 (Fed. Cir. 2008). Patent Owner has supplied credible evidence that use of the StackFRAC system in open holes was praised and recognized in the oil and gas industry. For example, 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." Ex. 2004. Such evidence clearly supports Patent Owner's position.

Other evidence advanced by Patent Owner also provides some support for Patent Owner's assertion of industry praise, although less convincingly. An example of such evidence comes from the Canadian OilPatch Technology Guidebook (Ex. 2005), which "profiled Packers Plus and its StackFRAC technology." PO Resp. 28. This article describes Packers Plus as a "[m]ultistage fracking pioneer" that "revolutionized the completions

sector." Ex. 2005. This provides some support for Patent Owner's assertion of industry praise. At the same time, the article includes portions suggesting that the desirable feature of StackFRAC consists of facilitating the performance of a number of fracturing stages. *Id.* ("When we started you could do five fracs," he said. "Our StackFRAC brought that up to 20 and now we have technology that can do 60."). Given Petitioner's evidence that Thomson provides the same advantage of facilitating the performance of a number of fracturing stages, the persuasive value of Patent Owner's evidence industry praise is somewhat diminished. *See, e.g.*, Ex. 1035 ¶¶ 28–29.

Thus, the exhibits presented by Patent Owner provide some evidence of industry praise. Certain of the exhibits appear to provide praise specifically for the claimed invention as a whole, as asserted by Patent Owner. Others of the exhibits are less convincing for Patent Owner's position. Although the persuasive value of Patent Owner's evidence does not appear commensurate with the number of exhibits allegedly showing industry praise, we give some weight to industry publications that highlight the specific technical aspects and elements corresponding to the claims in the '634 patent.

d. *Copying*

We turn to Patent Owner's allegations of copying. PO Resp. 32–38. 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 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. 33.

Patent Owner argues further that Baker Hughes's FracPoint system employs the same components as used in Packers Plus's StackFRAC system. Petitioner argues mainly that the documents are hearsay. Pet. Reply 24. They are not, for the reasons discussed above in Section III.A.3. 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.* 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 those of the 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, we are persuaded that Patent Owner's evidence of copying, and 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 persuasive evidence of some degree of copying, at least by Baker Hughes, and therefore we determine that such copying, as a factor

tending towards non-obviousness, is accorded some weight. *See, e.g., Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (copying may be demonstrated by access to and substantial similarity to patented product).

e. *Time*

Patent Owner argues further that the length of time by which Thomson and Yost 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. 44–45 (citing *Leo Pharm. Prod., Ltd. v. Rea*, 726 F.3d 1346, 1359 (Fed. Cir. 2013). In other words, Patent Owner argues that knowledge of Thomson's multi-stage fracturing apparatus and Yost's open hole multi-stage fracturing procedure 5 and 12 years prior to their combination in the system described and claimed in the '634 patent is evidence of non-obviousness. *Id.* at 45–46. Multiple 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 14 and 22 years, essentially double the time between the '634 patent and Thomson and Yost. *See id.* Second, 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 Pharm.*, 726 F.3d at 1359 (Fed. Cir. 2013). ("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 any persuasive evidence of a long-felt but unsolved need such that the

intervening time between the prior art and the combination claimed in the '634 patent is probative of non-obviousness.

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 believed that the manner in which to achieve the most efficient and profitable horizontal fracturing well completions was by casing and cementing the wellbore 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), Patent Owner asserts that "[c]asing and cementing the horizontal section allows fracture initiation points to be controlled in placing multiple fractures." PO Resp. 22. 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 were conventional and provided a successful method for multi-stage fracture stimulation of a well. *See* PO Resp. 21–27 (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 Yost, to show that open hole completions had been successful, and were also known to those of ordinary skill in the art. Pet. Reply 21–23. 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 wellbore fracturing, as illustrated by a paper authored by McLellan. *Id.* at 22 (citing Ex. 1042, 3).

As noted above, a person of ordinary skill in the art would have known that it was conventional to cement and line a wellbore with a cemented casing for a multi-stage fracturing completion, and a person of ordinary skill in the art also would have known that there existed circumstances in which open hole multi-stage fracturing would also be successful. *See* Section IV.B.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 and Abass paper") discussing fracture initiation in horizontal wellbores and stating that "[a]n openhole completion would be preferred if the formation rock is competent enough to maintain the wellbore 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 a person of ordinary skill in the art.

Additionally, we are 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 published in

2010 by the Society of Petroleum Engineers. PO Reply 24–26 (citing Ex. 2015 ("The Barnet Shale Paper")). The Barnett Shale paper explains that OHMS completions in the Barnett shale formation in Texas apparently 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 and Abass paper, that where the formation can support open hole completions, such open hole completions were preferred. Ex. 1043, 15.

Additionally, Thomson and Yost recognized many of the positive results espoused by the Barnett Shale paper. Thomson recognized that multistage fracturing using its tool "reduces operational time normally required to stimulate multiple zones," such that "cost savings are realized from the time reduction. As more experience is obtained with the system, increased efficiency will undoubtedly be generated, allowing additional time reduction and even greater cost savings when compared to traditional stimulation procedures." Ex. 1003, 5. Yost recognized that open hole, multistage fracturing "eliminate[d] the need for tubing-conveyed perforating of numerous treatment intervals." Ex. 1002, 1.

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 indica of non-obviousness.

5. *Whether It Would Have Been Obvious to Combine Prior Art*

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 (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).

As noted above in Section IV.B, Petitioner asserts that Thomson anticipates claim 20, and that it would have been obvious "to use Thomson's system in multistage fracturing or any other fluid treatment in an open hole well," in accordance with claim 25. Pet. 27. Petitioner asserts that, based on the teachings of Ellsworth and Yost, a person of ordinary skill in the art

would have had motivation to use Thomson's system "without casing to minimize the time and expense of completing a well." *Id.* at 46. Petitioner contends a person of ordinary skill in the art would have found it straightforward to use Thomson's system in an uncased well, and that doing so would have yielded no more than predictable results. *Id.* at 47–48 (citing Ex. 1007 ¶¶ 69, 75–80; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Petitioner asserts that Thomson and Ellsworth teach known alternatives for the ported collar sliding sleeves and inflatable packers of Yost's system. *Id.* at 48 (citing Ex. 1007 ¶¶ 71–72, 74–76). In connection with this, Petitioner asserts that a person of ordinary skill in the art would have had motivation to use Thomson's system to do multi-stage fracturing of open hole wells to reap a number of benefits disclosed in the prior art. *Id.* at 48 (citing Ex. 1007 ¶¶ 68–82; Ex. 1002, 1; Ex. 1003, 1, 2; Ex. 1004, 10, 11).

Petitioner contends that using Thomson's system in an open hole well constitutes "simply applying the known techniques of open hole fracturing and Ellsworth's open hole isolation and stimulation to a known device (the Thomson system for fracturing a cased hole), which is ready for improvement to yield predictable results." *Id.* at 49 (citing Ex. 1007 ¶ 78). In connection with this, Petitioner asserts that it was known to fracture in an open hole, and that Yost establishes that it was also known "to fracture in open hole using alternating packers for zonal isolation and ported sliding sleeves for injection of the well treatment." *Id.* at 48–49.

Petitioner also asserts that it would have been obvious to try using Thomson's system in an open hole. *Id.* at 49 (citing Ex. 1007 ¶ 79). Petitioner adds that the invention would have been obvious because known

work in cased wells could easily prompt variations for use in the same field in open hole wells, "as seen in Ellsworth and Yost." *Id.*

Patent Owner makes several arguments contending that a person of ordinary skill in the art would not have combined Thomson, Ellsworth and Yost. PO Resp. 61–65. Patent Owner argues that Petitioner has provided neither a motivation to use Thomson's apparatus without a wellbore casing, nor a reasonable expectation of success in doing so. *Id*. Noting that Ellsworth and Yost disclose operations in open hole wellbores, Patent Owner argues that Ellsworth and Yost nonetheless do not provide motivation to use Thomson's apparatus in an open hole wellbore. *Id.* at 61–63. Specifically, Patent Owner argues that, because Ellsworth and Yost do not perform the exact same operation in the exact same environment as Thomson, Ellsworth and Yost would not provide motivation to use Thomson in an open hole. *Id.*

Patent Owner contends that Yost was not a commercially viable enterprise, but simply a DOE experiment "[a]nd those experiments would seem to confirm the fears raised by the conventional wisdom. The DOE reported fluid communication between multiple zones and it doubted whether the process actually induced new fractures." *Id.* at 62. Patent Owner contends that "Yost's reports of fluid communication between zones (i.e., failed zonal isolation) would strongly encourage a [person of ordinary skill in the art to employ cemented casing to avoid that problem. Indeed, that is the teach Mr. Yost himself endorsed in subsequent work." *Id.* at 62–63 (citing Ex. 2100, 211). Patent Owner also argues that the authors of Thomson had a reason to improve efficiency, but still did not implement the

proposed modification of using Thomson's apparatus in an open hole well. *Id*. at 64 (citing Ex. 2044, 65:11–19). Additionally, Patent Owner again argues that a person of ordinary skill in the art would have thought that the only way to perform open hole multi-stage fracturing would have been using a cemented casing. *Id.* at 65.

We find that Petitioner has demonstrated a person of ordinary skill in the art would have had motivation to use Thomson's apparatus in an open hole wellbore, and a reasonable expectation of success in doing so. Patent Owner does not dispute Petitioner's position that a person of ordinary skill in the art would have recognized the possibility of minimizing completion time and expense by using Thomson's multi-stage apparatus in an open hole wellbore. Pet. 46–50; Ex. 1007 ¶¶ 68–82; *see* PO Resp. 61–65. Indeed, Yost itself 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. Thus, instead of arguing that there would not have been any known reason to perform the modification, Patent Owner emphasizes uncertainty about whether the modification could be successfully implemented in a commercially viable way. In particular, Patent Owner asserts that Yost does not show sufficient *economic* benefits, e.g. increasing profitability of a well, such that one of ordinary skill in the art would have used open hole completions for multi-stage fracturing. PO Resp. 63 (citing Ex. 2081 § 9.2; Ex. 2084 § 9.2). We disagree.

Reading Yost through the lens of one of ordinary skill in the art, it is clear that while cased wellbores were conventional, open hole completions were an option that was known to those of ordinary skill in the art. See Section IV.B.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. A reasonable reading of Yost clearly discloses specific considerations of open hole completion for a multi-stage fracture operation, and expressly recognizes the success of such a completion 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 skin 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.
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. In connection with this, Patent Owner contends that the characteristics of the field in Yost differed from those that would be used for commercial production. See PO Resp. 47–48 (citing Ex. 2081 § 9.5; 2084 § 9.5). 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. Moreover, we agree with Petitioner's argument that there is no necessity that prior art disclose a commercial system as opposed to a non-commercial system. Pet. Reply 8 (citing *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.")).

Citing Mr. McGowen's testimony, Patent Owner also argues that "the modest production boost described in Yost 'represents performance that is about the same as would be expected from an unfrac'ced horizontal well in this are drilled into normally pressured naturally fractured section of the reservoir.'" PO Resp. 63 (citing Ex. 2081 § 9.2; Ex. 2084 § 9.2). Because Mr. McGowen cites no supporting evidence for this testimony on this point (*see* Ex. 2081 § 9.2; Ex. 2084 § 9.2), we find Patent Owner's argument on this point unpersuasive.

Moreover, Patent Owner's suggestion that a wellbore 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."). Contrary to Patent Owner's position, obviousness does not require a "guarantee" of success. *See* Tr. 29:20–24.

We find persuasive Dr. Rao's rebuttal testimony 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 Facture Initiation From Horizontal Wellbores: Laboratory Experiments," *Rock Mechanics As A Multidisciplinary Science* (1991) ("Kim & Abass"). *Id.* at ¶ 7–8. Discussing experimental results of fracture initiation in horizontal wellbores, Kim & Abass wrote, "[i]t appears that the type of wellbore completion is not a critical factor. However, an openhole completion would be preferred if the formation rock is competent enough to maintain the wellbore 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 Yost, Kim & Abass, and McClellan, we are persuaded that although certain evidence may show that cemented and perforated cased wellbore 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").

6. *Conclusion on Obviousness*

Having considered each of the *Graham* factors individually, we now weigh them collectively. The scope and content of the prior art, as well as the differences between the prior art and claim 25, weigh heavily in favor of Petitioner's contention that claim 25 would have been obvious. As explained above in Section IV.B.2, the only difference between Thomson and claim 25 is that Thomson's apparatus is used in a cased wellbore, not an open wellbore. And the only difference between Yost and claim 25 is that Yost does not use an apparatus exactly like that disclosed in Thomson to perform the multistage open hole fracturing that Yost describes. Additionally, Ellsworth indicates that an apparatus like Thomson's could be expected to successfully achieve sealing between an open hole wellbore and solid body packers in at least some circumstances. *See*, *e.g.*, Ex. 1004, 5; Pet. 10–12. And Yost recognizes expressly the success of open hole multistage fracturing in at least some circumstances. *See*, *e.g.*, Ex. 1002, 5. Furthermore, Yost and Ellsworth indicate that performing operations in an open hole wellbore provides advantages in the form of reduced time and complexity, as compared to casing the wellbore. *See*, *e.g.*, Ex. 1002, 1.

The level of ordinary skill in the art also weighs in favor of Petitioner's assertion that claim 25 would have been obvious. In view of the teachings of the prior art, we are persuaded that a person of ordinary skill in the art would have viewed it as desirable to omit a wellbore casing. And

although a person of ordinary skill in the art may have viewed cased hole completions as a conventional way to perform multistage fracturing, a person of ordinary skill in the art would have also understood that open hole multistage fracturing could be performed to advantage in at least some circumstances.[10] *See* Sections IV.B.2, IV.B.4.f. Additionally, for the reasons explained in Section IV.B.5, we find that a person of ordinary skill in the art would have had a reasonable expectation of success in implementing Thomson's system within an open hole. That it might not have been thought appropriate to perform open hole multi-stage fracturing in all circumstances does not matter. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 416 (2007) ("If the claim extends to what is obvious, it is invalid under § 103.").

Some of the objective indicia of non-obviousness advanced by Patent Owner weigh in favor of non-obviousness. In particular, Patent Owner's evidence of copying weighs against obviousness. *See* Section IV.B.4.d. Patent Owner's evidence of industry praise also weighs in favor of non-obviousness, though to a lesser extent because some of that evidence may relate at least somewhat to factors other than the claimed invention as a whole. *See* Section IV.B.4.c. The other evidence of objective indicia of non-obviousness does not weigh in favor of Patent Owner. *See* Sections IV.B.4.a, b, e, and f.

[10] Consistent with this, the '634 patent does not indicate any prior concerns about performing multi-stage fracturing in an open hole wellbore, stating instead that "[t]he apparatus and methods of the present invention can be used in various borehole conditions including open holes, cased holes, vertical holes, horizontal holes, straight holes or deviated holes." Ex. 1001, 2:31–35.

On the whole, because they weigh heavily in favor of obviousness, we determine that the first three *Graham* factors outweigh the evidence of copying and industry praise. Accordingly, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claim 25 would have been obvious.

V. CONCLUSION

For the reasons expressed above, we determine that Petitioner has demonstrated by a preponderance of the evidence that the subject matter of claim 25 would have been obvious in view of Thomson, Ellsworth, and Yost.

VI. ORDERS

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

ORDERED that claim 25 has 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.

IPR2016-01514
Patent 7,543,634 B2

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