

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WEATHERFORD U.S., L.P.
Petitioner

v.

HALLIBURTON ENERGY SERVICES, INC.,
Patent Owner

Case No. IPR2024-00990
U.S. Patent 11,333,007

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Patent Trial and Appeal Board
U.S. Patent and Trademark Office
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Submitted Electronically

PATENT OWNER'S SUR-REPLY

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Patent Owner's Exhibits	
No.	Exhibit Description
2001	Deposition Transcript of Dr. Michael R. Chambers re: IPR2024-00990 (February 21, 2025)
2002	Declaration of Robert A. Durham
2003	Curriculum Vitae of Robert A. Durham
2004	Second Declaration of Dr. Robert Durham
2005	U.S. Provisional Application No. 62/688,813
2006	Bourgoyne, Adam T., Jr., Keith K. Millheim, Martin E. Chenevert, and F.S. Young, Jr., <i>Applied Drilling Engineering</i> , Society of Petroleum Engineers (1986).
2007	Staff of Royal Dutch / Shell Group of Companies, <i>The Petroleum Handbook</i> , (1983).
2008	Rahman, S. S. and G. V. Chilingarian, <i>Casing design-theory and practice</i> (1995).
2009	IEEE RP 1017, "IEEE Recommended Practice for Field Testing Electric Submersible Pump Cable" (2004).
2010	Conaway, Charles F, <i>The Petroleum Industry: A Nontechnical Guide</i> . Pennwell Books (1999).
2011	Braek, A. M., R. A. Almehaideb, and R. Hughes, <i>Application of Eos to Optimize the Design of an Early Production Scheme of an Onshore Oil Field in Abu Dhabi</i> , Abu Dhabi International Petroleum Exhibition and Conference (1998).
2012	Omitted
2013	Deposition Transcript of Michael R. Chambers re: IPR2024-00990 (July 2, 2025)

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<i>Apple Inc. v. Andrea Elecs. Corp.</i> , 949 F.3d 697 (Fed. Cir. 2020)	9
<i>Ariosa Diagnostics v. Verinata Health, Inc.</i> , 805 F.3d 1359 (Fed. Cir. 2015)	4, 9
<i>First Alert, Inc. v. Walter Kiddie Portable Eqpt., Inc.</i> , IPR2023-00896, Paper 14 (PTAB Dec. 13, 2023)	10
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<i>In re Huang</i> , 100 F.3d 135 (Fed. Cir. 1996)	14, 15, 18
<i>In re Stepan Co.</i> , 868 F.3d 1342 (Fed. Cir. 2017)	9
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I. INTRODUCTION

Petitioners have not shown by a preponderance of the evidence that Claims 1-10 and 14-23 are unpatentable.

For Claim 1, PO's Response explained that Petitioner's art teaches upstream concentric 6x3 screens having thinner transport tube walls than those in downstream eccentric 2x2 screens. This is the opposite of what Claim 1 requires. With its initial obviousness theory debunked, Petitioner raises a new obviousness theory in its Reply—not in its Petition—that a POSITA would have used concentric 2x2 screens upstream of eccentric 2x2 screens. The Board should not consider this new theory first raised on reply. But even if it does, Ground 1 still fails. Petitioner offers no evidence that concentric 2x2 screens would have been suitable for use with the relevant embodiment of Petitioner's primary reference, *Yeh*, which requires a concentric screen rated to 6,500 psi and capable of gravel packing 5,000 feet. The art instead teaches concentric 2x2 screens could not obtain this performance and could not have been used in the relevant embodiment.

For Claims 2 and 4, Petitioner claims "routine optimization" would have motivated a POSITA to size and arrange packing tube nozzles in the claimed manner. But the precedent on which Petitioner relies describes optimizing a single variable known to improve a single performance metric, and Petitioner concedes that gravel packing systems involve numerous design parameters and performance

metrics not amenable to routine optimization. Petitioner's suggestion to vary all parameters until arriving at a successful result fails to establish obviousness, absent any teaching in the art to pursue the features of Claims 2 and 4.

Petitioner's challenge to Claim 5 fails for the same reasons as its challenge to Claim 1. It is also undisputed that eccentric 2x2 screens outperformed concentric 2x2 screens and allowed larger cross-sectional flow area in shunt tubes than concentric 2x2 screens. Accordingly, Petitioner's speculation that combining a concentric 2x2 screen and an eccentric 2x2 screen would yield upstream and downstream transport tubes having the same cross-sectional flow area is premised on a POSITA actively ignoring two key teachings in the art. First, a POSITA would not have used concentric 2x2 screens upstream of eccentric 2x2 screens because eccentric 2x2 screens outperformed concentric 2x2 screens. And second, concentric 2x2 and eccentric 2x2 screens would not use transport tubes having the same cross-sectional flow area because eccentric 2x2 screens enabled larger cross-sectional flow area for transport tubes.

For Ground 2 challenging Claims 14-20, Petitioner relies on "use" of an eccentric screen as teaching Claim 14's "low pressure shunt tube system." But Claim 14 requires more than just using a "low pressure shunt tube system." Claim 14 requires "selecting" the shunt tube system and "determining" its operating pressure "associated with the distal end of the production zone." Petitioner also fails

to meet its own standard for “determining a shunt tube system operating pressure associated with the distal end of the production zone” and “selecting a low pressure shunt tube system based on the distal end determined pressure,” as required in Claim 14. Ground 2 accordingly fails to render Claims 14-20 obvious.

And finally, for Grounds 3-4 challenging claims 21-23, Petitioner argues a POSITA would have used weaker material in eccentric screens to reduce costs. But Petitioner ignores its primary reference, *Yeh*, which teaches maximizing use of eccentrics screens to both improve performance and reduce cost. Petitioner’s proposed modification—using weaker material—would work against the very performance metric—cost—that Petitioner purports would have motivated the modification in the first place.

Petitioner fails to establish Claims 1-10 and 14-23 are obvious, and the Board should deny the Petition as to those claims.

II. GROUND 1: PETITIONER’S REPLY FAILS TO ESTABLISH THAT CLAIMS 1 IS OBVIOUS

A. The Board should disregard Petitioner’s arguments based on concentric 2x2 screens as a new obviousness theory not raised in the Petition.

“[A]n IPR petitioner may not raise in reply ‘an entirely new rationale’ for why a claim would have been obvious.” *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019). But that is exactly what Petitioner has done here. The Board should exclude or give no weight to Petitioner’s new obviousness

theory—based on 2x2 concentric screens—not identified in the Petition and first raised on reply. *See Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367 (Fed. Cir. 2015) (affirming Board’s refusal to consider evidence and embodiments not identified in petition and first raised on reply); *see also* 35 U.S.C. § 312(a)(3) (requiring petition to identify “with particularity . . . the grounds on which the challenge to each claim is based, and the evidence that supports the grounds . . .”); 37 C.F.R. § 42.104(b)(5).

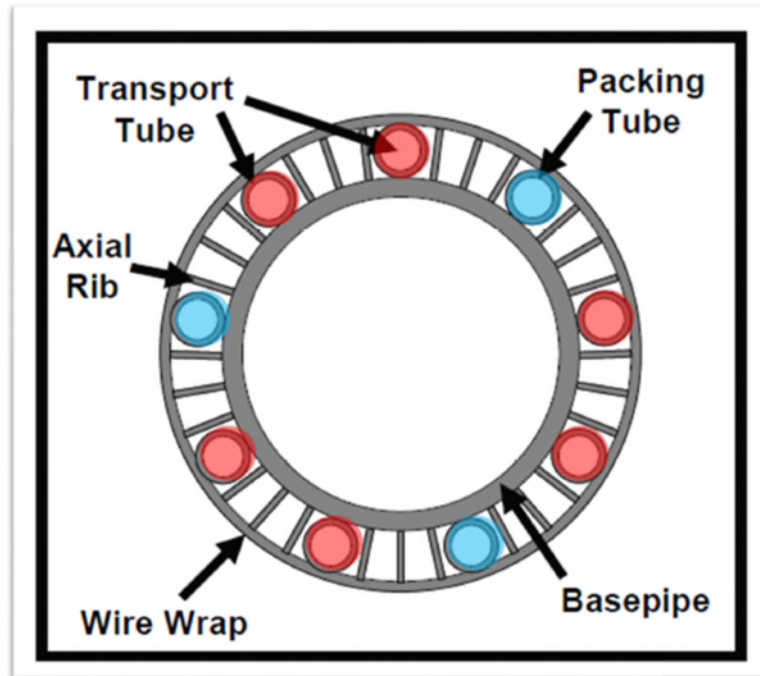
The Petition raised a single obviousness theory for Claim 1 based on a single embodiment from the *Yeh* reference. The Petition relied on *Yeh*’s embodiment containing a “concentric screen → crossover tool → eccentric screen.” Pet., pp.21-22, 33, 59-60; EX1005, 30:13-20. Under this theory, a concentric screen was located upstream (at the heel) and an eccentric screen was located downstream (nearer the toe). Pet., pp.21-22, 41, 60. Moreover, the upstream concentric screen “would have to contain a higher differential pressure, such as 6,500 psi near the heel in a 5,000-foot horizontal wellbore.” *Id.*, pp.41, 55, 60-61, 73; *see also* EX1003, ¶413; EX1005, 28:18-20 (“[A] 6,500 psi differential pressure is expected near the heel of [sic] when gravel packing a 5,000-foot horizontal completion interval”), 30:15-20.

Petitioner’s sole obviousness theory required a 6x3 concentric screen to achieve the 6,500-psi pressure rating required for using the concentric screen upstream. Petitioner’s expert confirmed that *Yeh*’s disclosure of concentric screens

packing 5,000 feet described 6x3 concentric screens. EX2013, 42:20-43:8 (agreeing “*Yeh* is referring to the ISAPT 6x3 concentric design” in its embodiment describing screens “capable of gravel packing 5,000 feet”); *see also* EX1005, 30:15-20.

The art further confirms *Yeh*’s concentric screen rated to 6,500 psi, and capable of packing 5,000 feet, was a 6x3 concentric screen. Before describing its embodiment requiring a 6,500-psi concentric screen, *Yeh* summarizes various references—*Hecker*, *Yeh* ’476, and *Barry*—as recent advances in “Alternate Path” (or “APT”) technology. EX1005, 3:20-21, 3:34-41. The Petition and Petitioner’s expert relied on these references, as well as *Yeh2*, in support of Petitioner’s single obviousness theory. Pet., 30-31; EX1003, ¶¶134-36, ¶143, ¶162-163, ¶316.

The *Yeh2*, *Hecker*, *Yeh* ’476, and *Barry* references each make clear that 6x3 concentric screens were required to achieve 6,500 psi and/or packing 5,000 feet. *Yeh2* explains that “[t]o extend Alternate Path technology to extreme lengths,” which it describes as “5,000 ft or longer,” “the number of shunt tubes was increased.” EX1006, pp.3-4. *Yeh2* then illustrates its concentric screen for 5,000-foot intervals (or longer) as having six transport tubes and three packing tubes:



EX1006, Fig. 9 (annotated). And the Petition makes clear that *Yeh2*'s 6x3 concentric screen is the concentric screen it relies on in Ground 1, stating “***Yeh2 describes the same APT system as Yeh*** in the same 5,000-foot horizontal wellbore” Pet., p.32. *Hecker* confirms this new “ISAPT” concentric screen incorporated “six transport tubes and three packing tubes,” with this “increase[d] shunt redundancy” being “particularly important in intervals requiring prolonged gravel packing.” EX1015, 3; *see also id.* Figs. 5-6 (illustrating same 6x3 concentric screen as *Yeh2* Figure 9, shown above). Petitioner’s expert agrees: 6x3 concentric screens achieved a 6,500-psi pressure capacity by increasing the number of transport tubes and reducing their size. EX2013, 39:14-41:10 (agreeing that “number and size of shunt tubes” in 6x3 concentric screen enabled “increased pressure capacity up to 6,500 psi”), 59:1-6.

Barry and *Yeh* '476 further confirm the Petition relied on 6x3 concentric screens. *Barry* evaluates “the size and number of round shunt tubes required” to pack 5,000 feet and settles on “six 20mm x 16mm (OD x ID) shunt tubes” (*i.e.*, transport tubes) to achieve “higher shunt system pressure capacity and longer packable length.” EX1027, pp.2-3, Fig. 2. *Yeh* '476 describes a 6x3 concentric screen, with “a working pressure of up to about 6,500” psi, to “increase the treatable length” to “5,000 feet.” EX1010, 23:41-51, Fig. 3. Not only did the Petition expressly state *Yeh*’s “APT system” for packing 5,000 feet was a 6x3 concentric screen, Petitioner’s art unanimously confirms the Petition’s reliance on 6x3 concentric screens for packing 5,000 feet. And Petitioner’s expert explains why: 6x3 concentric screens increased the number of transport tubes and reduced their size. EX2013, 39:14-41:10.

In its Response, PO pointed out that these 6x3 concentric screens (located upstream) in fact ***had thinner walls*** than eccentric screens (located downstream), the exact opposite of what Claim 1 requires. PO Response, pp.16-18. The 6x3 concentric screens had walls 2 mm thick versus walls 2.4 mm thick in 2x2 eccentric screens. *Id.*, p.17.

Confronted with this simple fact, Petitioner’s Reply now reads the prior art quite differently, as describing 2x2 concentric screens—not 6x3 concentric screens—upstream of a 2x2 eccentric screen. Petitioner’s Reply argues “Yeh

discloses that both concentric and eccentric screens use ‘two or more shunt tubes,’ . . . meaning that they could have the same number of transport tubes” (two). Reply, pp.9, 14, 22. The Reply further points to concentric screens with “two or more shunt tubes”—such as concentric screens having rectangular shunt tubes—that are not recited in the *Yeh* or *Yeh2* references Petitioner relies on for Ground 1. Reply, p.15. *Yeh*’s sole reference to screens having “two or more shunt tubes” generally describes differences between concentric and eccentric screens and is separate from its description of 6x3 concentric screens for packing long intervals. EX1005, 16:26-30, 30:13-20.

The Petition said nothing about 2x2 concentric screens. The Petition did not cite *Yeh*’s disclosure of concentric screens having “two or more” shunt tubes. Pet. Nor did Petitioner’s expert, Mr. Chambers. EX1003. The Petition nowhere explains that 2x2 concentric screens would have been rated to 6,500 psi or capable of packing 5,000 feet. Pet. The Petition did not describe any concentric screens having rectangular transport tubes. Pet. And Mr. Chambers points to 6x3 concentric screens for packing 5,000-foot intervals. See EX1003, ¶¶134-36 (pointing to *Yeh* ’476’s 6x3 screen for achieving 6,500 psi rating), ¶354 (pointing to *Yeh2*’s 6x3 concentric screen as accommodating “high hydraulic pressure” needed to pack 5,000 feet).

Petitioner first raised its 2x2-concentric-screen theory in its Reply. The Federal Circuit has affirmed rejecting a petitioner’s reliance on “previously unidentified portions of a prior-art reference” for the first time on reply. *Ariososa*, 805 F.3d at 1367; *see also Apple Inc. v. Andrea Elecs. Corp.*, 949 F.3d 697, 706 (Fed. Cir. 2020) (explaining that in *Ariososa*, reply raised new argument when “reply declaration pointed to an embodiment of the prior art that was not discussed in the petition”). Petitioner “had an opportunity to present this argument in its petition, but chose not to.” *See Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 775 (Fed. Cir. 2018) (affirming Board’s exclusion of arguments not raised in Petition). The Board should accordingly refuse to consider Petitioner’s arguments relying on 2x2 concentric screens.

B. Even if the Board considers Petitioner’s new concentric 2x2 theory, Petitioner nowhere explains how a POSITA would have combined or modified the distinct embodiments on which that theory relies.

As explained above, Petitioner’s Reply now adds 2x2 concentric screens to its obviousness theories, in addition to *Yeh*’s embodiment using 6x3 concentric screens. Reply, pp.9, 15, 22. Even if the Board considers this new theory (which it should not), to establish obviousness Petitioner must show how a POSITA would have combined these different disclosures in *Yeh*. *See In re Stepan Co.*, 868 F.3d 1342, 1346 n.1 (Fed. Cir. 2017) (requiring a “reasonable expectation of success” in “combining multiple embodiments from a single reference”); *Abiomed, Inc. v.*

Maquet Cardiovascular, LLC, IPR2017-01204, Paper 9 at 8-12 (PTAB Oct. 23, 2017) (denying institution because “Petitioner has failed to establish sufficiently that the features of those different embodiments” in single reference “are interchangeable or provide sufficient rationale to combine the teachings of those different embodiments”); *First Alert, Inc. v. Walter Kiddie Portable Eqpt., Inc.*, IPR2023-00896, Paper 14 at 21 (PTAB Dec. 13, 2023).

But Petitioner does not articulate how a POSITA would have combined or modified *Yeh*’s disclosure of “two or more” tubes and *Yeh*’s 6x3 concentric embodiments to achieve Claim 1. Petitioner’s Reply does not explain why a 2x2 concentric screen would have been used upstream of a 2x2 eccentric screen, how a 2x2 concentric screen would have achieved the 6,500-psi pressure rating and 5000-foot packing length required for use upstream, or why a 2x2 concentric screen would have thicker transport tube walls than a 2x2 eccentric screen. *See Reply*.

Instead of explaining how 2x2 concentric screens would handle 6,500 psi and pack 5,000 feet, Petitioner argues 2x2 concentric and 2x2 eccentric screens “could have the same number of transport tubes” and the same tube shape. *See Reply*, pp.9, 15. Neither of these arguments supports rating a 2x2 concentric screen to 6,500 psi, packing 5,000 feet with it, or locating it upstream of a 2x2 eccentric screen rated to a lower pressure, as required by *Yeh*. *See EX1005*, 28:17-20, 30:15-20. Petitioner’s failure to explain how to combine *Yeh*’s distinct teachings is fatal to Ground 1.

Moreover, Petitioner cannot articulate how a POSITA would have combined or modified a 2x2 concentric screen and *Yeh's* 6x3 concentric screen because concentric 2x2 screens were not rated to 6,500 psi and could not pack 5,000 feet. First, Petitioner's art and Petitioner's expert agree that eccentric screens achieved the best gravel-packing performance in a 2x2 configuration. *See* EX1013, Fig. 5 (illustrating eccentric screen achieving same cross-sectional flow area as concentric screen, but with smaller tool diameter); EX1003, ¶111 (“[T]he conventional 2x2 eccentric shunt tube design has become commonplace in the industry.”); EX2013, 65:5-14 (admitting that the industry “had evolved to that [eccentric 2x2] design”). This is because eccentric screens offered more space for transport tubes. *See, e.g.,* EX1005, 3:23-24. Petitioner's expert admits as much. EX1003, ¶102, ¶128; EX2013, 65:5-14 (agreeing “eccentric screens had more space for the shunt tubes than concentric screens in 2x2 designs”). Petitioner itself explains “an eccentric arrangement can provide more annular space for shunt tubes while maintaining the same primary flow path diameter and overall sand screen assembly diameter, permitting the use of larger cross-sectional area shunt tubes than are typically used in a concentric sand screen assembly.” *See* Mot. Amend. Opp., p.5.

With this extra space, eccentric screens commonly used rectangular tubes with larger cross-sectional flow area to support required pumping rates, reduce friction, minimize tool size, and pack longer distances relative to 2x2 concentric screens.

EX1003, ¶129 (“Shunt tubes were often rectangular to take advantage of the larger cross-sectional area they provided”); EX1015, p.2 (explaining that “rectangular-shaped tubes and an eccentric” screen “minimize the effective outside diameter of the assembly”); EX1005, 3:23-24, 24:54-60 (explaining that eccentric screens “reduce the overall friction or extend the maximum gravel packing length”); EX2013, 47:7-15 (stating that “a larger cross-sectional area” in transport tubes “will provide less friction”), 57:2-6 (agreeing that “rectangular tubes would permit a larger flow area” than round tubes). These benefits of eccentric screens were so pronounced that concentric 2x2 designs were not even pursued. EX2013, 66:8-11 (“I don’t know there was a 2x2 concentric design.”). Neither Petitioner nor its expert dispute that 2x2 eccentric screens outperformed 2x2 concentric screens.

And second, despite outperforming 2x2 concentric screens, 2x2 eccentric screens were limited to approximately 3,000 psi and 3,000 feet. EX1005, 30:15-20; EX1003, ¶132. As 2x2 eccentric screens offered more space for shunt tubes and lower friction than 2x2 concentric screens, performance of 2x2 eccentric screens sets an upper limit for performance of 2x2 concentric screens. Petitioner cannot explain how 2x2 concentric screens—which were demonstrably inferior to 2x2 eccentric screens—would have been rated to 3,000 psi or packing 3,000 feet, much less withstand 6,500 psi and pack the 5,000 feet *Yeh* required. See EX1005, 28:17-20, 30:15-20; *see also* EX2013, 42:10-15. Petitioner’s expert confirmed that transport

tubes of a 2x2 concentric screen not rated to 6,500 psi would burst when packing 5,000 feet. EX2013, 56:1-14. Not only has Petitioner failed to show how 2x2 concentric screens would have obtained the performance of 6x3 concentric screens or packed 5,000 feet, Petitioner's art and arguments demonstrate that 2x2 concentric screens could not do so.

"It is in such circumstances," where "the necessary reasoning is absent," "that it is especially important to guard against the dangers of hindsight bias." *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354 (Fed. Cir. 2013). Hindsight is evident here. Petitioner switches between different obviousness theories and embodiments without articulating how those embodiments would be combined or modified to achieve Claim 1. PO Response, §VI.B.5.

C. Each of Petitioner's remaining scattershot arguments against Claim 1 assumes away key teachings in the art.

Petitioner's Reply raises a few additional arguments for modifying the art to arrive at Claim 1. None is sufficient to render Claim 1 obvious.

First, Petitioner claims a POSITA would have "optimized" wall thickness based on *Yeh*'s teaching to maintain mechanical integrity. Reply, pp.9-10. But *Yeh* does not teach modifying transport tube wall thickness, much less an upstream transport tube having greater wall thickness than a downstream transport tube. See EX1005, 28:17-24; PO Response, §VI.B.1. Petitioner admits "*Yeh* never specifies the wall thickness for any shunt tubes." Reply, p.8. Petitioner also admits *Yeh*2

“says nothing about tubing wall thickness at all.” Reply, p.10. In Petitioner’s view, a POSITA would optimize shunt tube wall thickness despite the art teaching nothing about it. And in Petitioner’s view, a POSITA would have ignored the art’s teaching to obtain higher pressure ratings with other design parameters such as tube shape, tube size, and number. See, e.g., EX1006, p.4 (“To extend Alternate Path technology to extreme lengths, the number of shunt tubes was increased”); EX1027 , p.3 (“Round shunt tubes provide a higher burst capacity”). Nothing in the art supports Petitioner’s view.

Moreover, the precedent Petitioner cites to support optimizing wall thickness does not apply here. In *Huang*, the Court found obvious a specific range for a single variable (thickness of a polyurethane layer) that the art expressly identified and linked to a single performance metric (shock absorption) that a POSITA was motivated to optimize. *In re Huang*, 100 F.3d 135, 139 (Fed. Cir. 1996). That is not the case here. Gravel packing technology involves numerous design variables and performance metrics, with a complex set of phenomena relating the two. See EX1003, ¶96 (describing “so many variables” that optimization “was nearly impossible”). And the art here pursues design paths other than thickening shunt tube walls. PO Response, pp.16-19. The Board in *Huang* faced no such teaching. *In re Huang*, 100 F.3d at 139.

Second, in response to PO's argument that *Yeh2* taught a POSITA to "achieve higher pressure ratings by changing numerous design parameters other than shunt tube wall thickness" (PO Response, p.18), Petitioner points out that *Yeh2* says nothing about wall thickness. Reply, p.10. But *Yeh2*'s silence on wall thickness only proves the point: *Yeh2* does not disclose wall thickness precisely because it modified other design parameters, such as shunt tube number, size, and shape, to achieve higher pressure rating. See PO Response, pp.18-19. And additional references describing 6x3 concentric screens—*Hecker*, *Barry*, and *Yeh '476*—make abundantly clear that these design choices resulted in a 6x3 concentric screen having thinner transport tube walls than in 2x2 eccentric screens. EX1010, 24:7-20 (describing concentric screen having "[s]ix 20 mm x 16 mm (OD x ID) shunt tubes"); EX1027, p.3 (same); EX1006, p.4 (stating "shunt tube" has "16 mm ID," the same as in *Barry* and *Yeh '476*). Petitioner's concession that *Yeh2* does not disclose wall thickness only confirms that the art achieved high pressure ratings with other design parameters.

Third, Petitioner argues eccentric screens had burst pressures of 5,000 psi, so "there was room" to thin eccentric screen walls. Reply, pp.11-12. But the *Yeh* and *Hecker* references unequivocally teach that eccentric screen capabilities were limited to approximately 3,000 psi and 3,000 feet. EX1005, 30:15-20 ("[K]nown concentric screens are capable of gravel packing to 5,000 feet, compared to 3,000

feet with the commercial eccentric screens); EX1015, 1 (describing “eccentric 2x2” screens “[m]aximum shunt system working pressure of 3,000 psi which limits the packable length to ~3,200 ft”). Petitioner has not identified any teaching that eccentric screens could pack anywhere near the 5,000-foot interval described in *Yeh*. See EX1005, 28:17-20, 30:15-20. As packable distance for eccentric screens was their limiting factor, a POSITA would not have thinned eccentric tube walls and further reduced their packing distance, particularly when *Yeh* taught to use eccentric screens to maximize packing distance. See EX1005, 24:54-60 (stating “the use of eccentric screens” will “extend the maximum gravel packing length”). Petitioner also overlooks *Yeh*’s additional teachings to maximize use of eccentric screens due to their lower cost, lower friction, and greater availability. EX1005, 24:54-60, 30:20-32. A POSITA would not have reduced eccentric screen pressure rating, and thus packable length, in direct contradiction to *Yeh*’s instruction to maximize their use to improve both performance and cost.

Fourth, Petitioner claims rectangular tubes in some eccentric screens in fact had thinner walls (1.6 mm thick) than round tubes in concentric screens. Reply, pp.8-9. Not so. The tube that Petitioner claims has thinner walls is a packing tube, not a transport tube as recited in Claim 1. See EX1003, ¶¶161-62 (citing to *Jones* reference of EX1041 for 1/16”, or 1.6 mm, wall thickness); EX1041, 3:54-58, Figs. 1-7 (teaching and illustrating in *Jones* reference a “1/16 inch thick wall” for packing

tubes, not transport tubes). This is unsurprising; Petitioner’s expert explains that packing tubes commonly had thinner walls than transport tubes due to their smaller size. EX1003, ¶183. Moreover, *Jones* arranges its packing tubes having 1.6 mm-thick walls in a concentric screen, not an eccentric screen. EX1041, Fig. 1. Petitioner has both the wrong type of tube and the wrong type of screen.

Petitioner’s arguments either simply mistake facts or speculate as to options a POSITA could have pursued, without showing that a POSITA would have pursued such options or reasonably expected success in doing so.

III. GROUND 1: PETITIONER’S REPLY FAILS TO ESTABLISH THAT DEPENDENT CLAIMS 2, 4, AND 5 ARE OBVIOUS

A. For claims 2 and 4, Petitioner has not shown that the claimed nozzle sizing and spacing was “routine optimization.”

Petitioner’s Reply argues the number and sizing of nozzles in Claims 2 and 4 is obvious as “routine optimization.” Reply, pp.16-17, 22. To support this argument, Petitioner relies on case law optimizing a result-effective variable. *R.J. Reynolds v. Philip Morris*, IPR2021-00585, Paper 36 at 47 (PTAB Sept. 8, 2022). The parties in *R.J. Reynolds*, however, did not dispute that the single parameter at issue in that case was a result-effective variable. *Id.* And as discussed above for *In Re Huang*, this is not a case of optimizing a single variable having a clear relationship to a desired result.

Gravel packing systems involve numerous design variables and performance metrics interacting in unpredictable fashion. Design parameters impacting gravel packing performance include: (1) transport tube shape; (2) transport tube size; (3) packing tube shape; (4) packing tube size; (5) number of transport tubes; (6) number of packing tubes; (7) transport tube wall thickness; (8) packing tube wall thickness; (9) transport tube material/metallurgy; (10) packing tube material/metallurgy; (11) shunt tube connectors; (12) shunt tubes placement internal or external to the screen; (13) connections between screen sections; (14) manifolds or junction blocks between screens; (15) jumper tube shape, size, and material, (16) packing tube nozzle size; (17) number of packing tube nozzles; (18) packing tube nozzle orientation, (19) nozzle spacing from the junction block or manifold; (19) packing tube nozzle angle; (20) open-ended or closed-ended packing tubes; (21) base pipe diameter; (22) overall tool diameter; (23) gravel slurry composition and rheology, including gravel size, density, carrier fluid, and friction; (24) system and component weight; and (25) system and component cost. EX2013, 67:11-71:9. All of these 25+ design parameters “have to work together” to achieve an effective gravel pack. EX2013, 73:4-11. And these design parameters working together influence at least seven performance metrics, including gravel slurry pumping rate, friction pressure loss, leak-off of fluid from the gravel slurry, shunt sytem burst pressure, erosion

resistance, assembly and installation time, and the rate of oil production through the primary flow path. EX2013, 71:10-72:11.

Petitioner has not shown that nozzle number and sizing, much less varying nozzle number and sizing between upstream and downstream screens, is a result-effective variable. In contrast, Petitioner's expert claimed the "large number of variables" in designing gravel packing systems renders optimization "nearly impossible." EX1003, ¶96. And the art in *Yeh* and *Yeh2* provides no teaching to vary nozzle size or number between upstream and downstream screens. See EX1005, EX1006.

Despite the complexity of the art, Petitioner argues that because a POSITA recognized nozzle number and sizing as design parameters, it would have been obvious to optimize these variables to achieve Claims 2 and 4. Reply, pp.17-18, 21. This is insufficient to find obviousness. See *Grunenthal GMBH v. Alkem Lab's Ltd.*, 919 F.3d 1333, 1345 (Fed. Cir. 2019) ("[O]bviousness does not follow from merely 'vary[ing] all parameters or try[ing] each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful.'")

B. For claim 5, Petitioner's pivot to a new obviousness theory still fails to establish that upstream and downstream transport tubes would have had the same cross-sectional flow area.

Petitioner's Reply does not dispute that the round tubes of *Yeh* and *Yeh2*'s 6x3 concentric screens, with 16 mm inner diameter, had a smaller cross-sectional flow area than the 1.5"x0.75" rectangular tubes of 2x2 eccentric screens. Petitioner's expert confirmed that cross-sectional flow area of transport tubes in 6x3 concentric screens was smaller than cross-sectional flow area of transport tubes in 2x2 eccentric screens. EX2013, 23:10-24:15, 29:18-30:11 (confirming that "each of those six transport tubes" in 6x3 concentric screen "is smaller than each of the two transport tubes in the eccentric 2x2 design").

Faced with this undisputed fact, Petitioner constructed a new theory: that using 2x2 concentric screens upstream of 2x2 eccentric screens—assuming both screens used round tubes—could result in upstream and downstream transport tubes having the same cross-sectional flow area. Reply, p.9. But as noted above, the Petition did not present this theory, and Petitioner has not articulated how 2x2 concentric screens would achieve the performance of 6x3 concentric screens or otherwise meet *Yeh*'s requirements of 6,500 psi and 5,000 feet. *See supra* § II.A-B.

And even assuming 2x2 concentric screens could have been used upstream (they could not), Petitioner ignores the art's consistent teaching that transport tubes of 2x2 eccentric screens would have a larger cross-sectional flow area than in 2x2

concentric screens of the same size because eccentric screens offered more space for transport tubes. See EX1005, 3:23-24; EX1013, p.3, Fig. 5. Eccentric screens having larger tubes than concentrics is consistent with their lower pressure rating and lower friction. See EX2013, 45:9-46:6, 47:10-48:5. Petitioner's expert confirms that eccentric screens allowed larger transport tubes. EX1003, ¶102 (“[A]n eccentric design allowed for placement of the largest tubes”), ¶128; EX2013, 65:5-14 (agreeing “eccentric screens had more space for the shunt tubes than concentric screens in 2x2 designs”).

In sum, for transport tubes of an upstream concentric 2x2 screen and a downstream eccentric 2x2 screen to have the same cross-sectional flow area, a POSITA would have to simply not use space available in the eccentric screen. This directly contradicts every teaching in *Yeh* regarding eccentric screens, including that eccentric screens offered lower friction and packing length with eccentric screens should be maximized. EX1005, 24:54-60, 30:20-32. Claim 5 is nonobvious for these reasons.

IV. GROUND 2: THE PETITION AND REPLY IGNORE CLAIM 14'S PLAIN LANGUAGE

A. Petitioner's arguments that a POSITA would have “used” an eccentric screen at the toe do not establish either step required by claim limitation 14[c].

Claim limitation 14[c] requires both (1) “determining a shunt tube system operating pressure associated with the distal end of the production zone” and (2)

“selecting a low pressure shunt tube system based on the distal end determined pressure.” But Petitioner argues that eccentric screens—allegedly having Claim 14’s “low pressure shunt tube system”—could be “use[d] . . . at any point at which the slurry pressure dropped below the pressure capacity of the eccentric screen shunt tubes, which is about 3,000 feet from the toe.” Reply, pp.24-25; Pet., p.66. Petitioner nowhere address how the downstream screen “operating pressure” would be “determine[ed]” or how the shunt tube system would be “select[ed]”—as required by Claim 14—just how the downstream screen would be “**used**.” The Petition and Reply seem to construe Claim 14 to merely require use of a “low pressure shunt tube system” at the toe, but that is not what Claim 14’s plain language requires.

And even under Petitioner’s muddled interpretation of Claim 14, Petitioner has not shown that using an eccentric shunt tube system rated to 3,000 psi teaches either of Claim 14’s “determining” or “selecting” steps. Petitioner defines the “downstream distal end” as the toe. Pet., pp.63-64. But Petitioner does not describe any process for “determining a shunt tube system operating pressure” that is “associated” with the toe, nor for “selecting a low pressure shunt tube system based on” the pressure determined at the toe. Pet., pp.66-67. The Petition instead points to the claimed “low pressure shunt tube system” having a “pressure capacity” of approximately 3,000 psi. *Id.* This 3,000 psi pressure capacity is demonstrably not associated with the toe, but with a location “about 3,000 feet from the toe.” Pet.,

pp.66-67. Petitioner fails to meet its own standard in Ground 2, and the Board should find Claims 14-20 nonobvious.

V. GROUNDS 3-4: PETITIONER’S REPLY ADMITS THAT CLAIMS 21-23 ARE NONOBVIOUS

A. Petitioner does not dispute that a POSITA would have been motivated to maximize use of eccentric screens.

In its Reply, Petitioner admits that a POSITA would have been motivated to maximize use of eccentric screens because they were less expensive and more readily available. Reply, p.25 (“Yeh taught a skilled artisan to reduce overall cost of completion by using less expensive and more readily available eccentric screens where possible in place of more costly concentric screens”); PO Response, p.40-41 (arguing the same). Yeh clearly teaches as much. EX1005, 30:20-32. But maximizing distance packed with eccentric screens would motivate *stronger* material in eccentric screens, not weaker material. See EX2013, 35:8-16 (agreeing that “increased pressure capacity” allows “pack[ing] longer intervals”). Petitioner’s admission that the art maximized use (*i.e.*, packing distance) of eccentric screens is dispositive as to Grounds 3-4.

Petitioner nonetheless claims cost savings would have motivated using weaker (and allegedly cheaper) material in downstream eccentric screens. Reply, p.26. But reducing strength—and thus pressure rating—of downstream eccentric screens would not reduce cost. Petitioner’s Reply itself makes this clear, explaining

that expanding use of eccentric screens—by, for example, increasing the screen’s pressure rating, and thus packable length, with stronger material—would “reduce overall cost of completion.” *See* Reply, p.25. In contrast, reducing eccentric screen pressure rating—by, for example, using weaker shunt tube material—would reduce distance packed with the eccentric screen, and more expensive concentric screens would have to pack every foot not packed by eccentric screens, increasing overall cost of completion.

Petitioner also reiterates that, because eccentric screens were allegedly rated to 5,000 psi, a POSITA *could* have reduced pressure rating of the eccentric screen by using weaker materials.¹ *Yeh*, however, unequivocally limits packing intervals to “3,000 feet with the commercial eccentric screens.” EX1005, 30:19-20. So regardless of pressure rating, a POSITA would not have reduced packable length with eccentrics below 3,000 feet, given the need to pack any remaining distance of the 5,000-foot interval with concentric screens that were more expensive and higher

¹ The Petition clearly stated eccentric screens were limited to approximately 3,000 psi and 3,000 feet, when Petitioner needed to show eccentric screens had lower pressure rating than concentric screens. Petition, pp.27, 66-67; EX1003, ¶132. Now that Petitioner needs a reason to use weaker materials, it claims eccentric screens were rated to 5,000 psi. Reply, pp.12, 26. Petitioner cannot have it both ways.

friction. As discussed above, a POSITA would not have used weaker materials in the downstream eccentric screen because (1) that would reduce the screen's packable distance; and (2) *Yeh* teaches to maximize use of eccentric screens for their lower cost, lower friction, and greater availability. *Supra* § II.C; EX1005, 24:54-60, 30:20-32. Regardless of whether eccentric screens were rated to 3,000 psi or 5,000 psi, *Yeh* unambiguously teaches to extend their use relative to concentric screens. EX1005, 30:20-32.

Neither of Petitioner's arguments for Grounds 3-4 holds up under close inspection. The art makes clear that a POSITA looking to reduce cost and extend gravel packing length would have maximized use (and thus material strength) of the downstream eccentric screen.

Claims 22-23 are nonobvious as they depend from Claim 21, and Claim 22 is also nonobvious for the reasons discussed above for Claim 1.

VI. CONCLUSION

Patent Owner respectfully requests that the Board uphold the validity of the Challenged Claims.

July 11, 2025

Date



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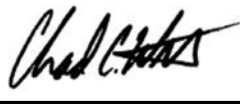
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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing **PATENT OWNER'S SUR-REPLY** contains 5,552 words, exclusive of the exempted portions provided in 37 C.F.R. § 42.24(c), as measured by the word-processing system used to prepare this paper, and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(c)(4).

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CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 11th day of July, 2025, a complete and entire copy of PATENT OWNER'S SUR-REPLY was served on Petitioner via electronic mail at the following addresses:

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