

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIBERTY ENERGY, INC. and LIBERTY OILFIELD SERVICES LLC,
Petitioners,

v.

U.S. WELL SERVICES, LLC,
Patent Owner.

IPR2025-01539
U.S. Patent No. 11,668,420 B2

PATENT OWNER'S PRELIMINARY RESPONSE

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2001	Declaration of Richard H. Quarles ISO PHV Admission
2002	Civil Action No. 2:24-cv-00884-JRG-RSP – Defendants' Amended Answer and Counterclaims (Adding Patent Infringement Counterclaims) to Plaintiff's Complaint
2003	Case No. 2:24-cv-00884-JRG-RSP – Order to Sever Counterclaims
2004	Case No. 2:25-cv-00522-JRG-RSP – Scheduling Order
2005	Case No. 2:25-cv-00522-JRG-RSP – Liberty's Invalidity Contentions
2006	Federal Court Management Statistics-Profiles, <i>available at</i> https://www.uscourts.gov/data-news/reports/statistical-reports/federal-court-management-statistics/federal-court-management-statistics-june-2025 (last visited Nov. 5, 2025)
2007	USPTO Rescission of Memorandum Addressing Discretionary Denial Procedures
2008	Case No. 4:24-CV-00839-KPE – Liberty Motion to Stay
2009	Case No. 2:25-cv-00522-JRG-RSP – Joint (Agreed) Motion for Entry of Docket Control Number

I. INTRODUCTION

For all grounds, the Petition failed to provide sufficient evidence demonstrating a POSITA would have been motivated to combine the prior art in the way proposed without using hindsight knowledge gained from the challenged patent. Instead, Petitioners' motivation to combine rationale is conclusory and unsupported. Further, Petitioners' supposed motivations to combine show only that an adaptation of the combination could have been made, not that a POSITA would have been motivated to make such a combination. Petitioners' expert, Dr. Durham, also fails to account for the specific technological innovations called out in the patent claims that address fluid flow problems. As shown herein, the evidence confirms that Petitioners' POSITA would not have been motivated to combine the prior art in the way Petitioners propose without relying on impermissible hindsight.

Further, as identified in Patent Owner's Discretionary Denial Brief (Paper 8) ("DDB"), U.S. Patent No. 11,668,420 (the "420 Patent") is one of six U.S. Well Services patents asserted against Petitioners as part of the lawsuit *ProFrac Services, LLC, et al. v. Liberty Energy Services LLC*, Case No. 2:25-cv-00522 (E.D. Tex.) (the "522 District Case" or the "Parallel Litigation"). DDB, 3–4. Two of the other six patents in the Parallel Litigation—U.S. Patent No. 11,211,801 (the "801 Patent") and U.S. Patent No. 11,009,162 (the "162 Patent")—are the subject of IPR2025-01424 and IPR2025-01445, respectively. DDB, 3, 4; *see Liberty*

Energy Inc. v. U.S. Well Servs., LLC, IPR2025-01424, Paper No. 1 (PTAB Aug. 27, 2025); *Liberty Energy Inc. v. U.S. Well Servs., LLC*, IPR2025-01445, Paper No. 1 (PTAB Aug. 29, 2025). On Jan. 9, 2026, Director Squires ***discretionarily denied both IPR2025-01424 and IPR2025-01445***. See IPR2025-01424, Paper 13, 1; IPR2025-01445, Paper 13, 1. Here, ***the merits of the instant IPR2025-01539 are even less compelling*** than either IPR2025-01424 or IPR2025-01445 as discussed herein. And the *Fintiv* factors even more strongly favor denying institution of the IPR2025-01539 petition, at least because the statutory deadline for the final written decision would be over ***six months after*** the scheduled trial date, which is an even longer gap between the statutory deadlines and the scheduled trial date for either IPR2025-01424—***at least three months*** after the scheduled trial date—or IPR2025-01445—***at least three months*** after the scheduled trial date. DDB, 8–9; IPR2025-01424, Paper 9, 8–9; IPR2025-01445, Paper 9, 8–9. Thus, the rationale for denying institution of the instant IPR2025-01539 petition is ***even more compelling*** than for the IPR2025-01424 or IPR2025-01445 petitions, both of which the Director discretionarily denied as discussed above.

Patent Owner therefore respectfully requests that the Director deny institution of the Petition.

II. CHALLENGED U.S. PATENT NO. 11,668,420

A. Overview of 420 Patent

The effective filing date for the 420 Patent is December 27, 2019, which Petitioners do not dispute.

The 420 Patent is directed to a hydraulic fracturing (fracking) system in oil and gas wells, which entails pumping fluid into underground formations at high pressure using a multi-plunger pump configured to pressurize a fracturing fluid and inject it into a wellhead for fracturing the subterranean formation. EX-1001, Abstract. The 420 Patent recognizes the problems with existing fracturing systems that utilize a 4-inch supply hose to connect a manifold to a fracturing pump for delivery of fracturing fluid to be pressurized by the fracturing pumps, which include “insufficient volume of fracturing fluid to a pump utilize[ed] in [the] hydraulic fracturing operation.” *Id.*, 4:16–22. The 420 Patent further recognizes that such insufficient volume problems can be exacerbated when 4-inch connections are also used. *Id.*, 4:23–24. The 420 Patent further recognizes that hydraulic fracturing pumps tend to have 6-inch connection types. *Id.*, 4:16–20. To solve these problems, the 420 Patent discloses a novel system that “remov[es] the standard 4" (0.1016m) supply hoses while maintaining standard 6" connection types.” *Id.* Doing so “supplies more volume [of fracturing fluid], reduces pressure

drop, and reduces cavitation and other poor conditions pumps can experience when not supplied adequately.” *Id.*, 4:24–27.

B. Relevant Prosecution History

In an office action dated November 7, 2022, the Examiner issued an allowance of the challenged claims, noting that USPN 10,480,300 (“Guidry”), USPN 2013/0284278 (“Winborn”), and USPN 10,669,804 (“Kotrla”) “were found to be the most applicable prior art references.” EX-1003, 157–60. The Examiner further noted that “[n]either Guidry, nor any additionally cited art of record teaches or fairly suggests, alone or in combination, *inter alia*, wherein a system comprising an electric powered multi-plunger hydraulic fracturing pump, a fluid source, and a hose extended between the two, wherein the hose comprises a pair of fittings with diameters as claimed.” *Id.*, 160.

Notably, during prosecution of U.S. Pat. No. 11,009,162 (the “Parent 162 Patent”), the *same Examiner* issued a section 103 obviousness rejection of claims 1–7 as being unpatentable over Winborn in view of Kotrla. EX-1056, 481–83. The Examiner noted that Winborn discloses, *inter alia*, “a hose (19) extending between the fluid source and the electric powered pump, the hose being flexible and having a first diameter.” *Id.* The Examiner further explained that *Kotrla* “***teaches a hose and fitting arrangement (Figure 6) comprising the fitting (60) having a first end for receiving the hose at the first diameter and a second end for coupling to the***

*electric powered pump at a second diameter, the second diameter being larger than the first diameter.”*¹ *Id.*

In a September 29, 2020 office action response, Applicant amended claim 1 to specify a “hydraulic fracturing” pump and explained, *inter alia*, that the prior art failed to “identify the problem associated with efficient flow rates for fracturing operations.” EX1003, 426–33. Applicant further explained:

Traditional fracturing systems typically use 6" connections for equipment [(e.g., hydraulic fracturing pump)] and 4" hoses for fluid flow. ... While this configuration may enable desirable flow characteristics, insufficient flow volume is provided with the 4" hoses, which may lead [to] an increased number of units on a well site, which may increase costs. *The present application has identified that it is insufficient to merely provide larger hoses because of other competing factors, such as flow rates, pump capabilities, and drop out rates for proppant suspended in the fluid.* Furthermore, providing additional equipment at a well site is rarely desirable, due to the congestion and a small footprint.

Embodiments of Applicant's disclosure have *identified a potential substitution for a 5" hose along with a fitting that enables quick coupling to the existing 6" standard connections.* This 5" selection, however, is more than merely an attempt to make an efficiently function design. Instead, *Applicant has identified how factors such*

¹ All emphasis herein added unless stated otherwise.

[as] a pump's operations thresholds along with drop out rates should be combined in order to determine that the traditional hoses may be replaced for larger hoses without sacrificing other characteristics of the fracturing operation. The cited references fail to identify this problem all together.

Id., 433–34 (internal citations omitted).

In response, the Examiner allowed the claims. *Id.*, 280–85.

III. ASSERTED PRIOR ART

A. Cicci (EX-1004), Cicci Provisional (EX-1005)

Cicci is directed to a system and method of coupling multiple pumps to a manifold using a flexible hose configured to connect the manifold and the pumps as illustrated in Figure 5 reproduced below. EX-1004, Abstract, Fig. 5.

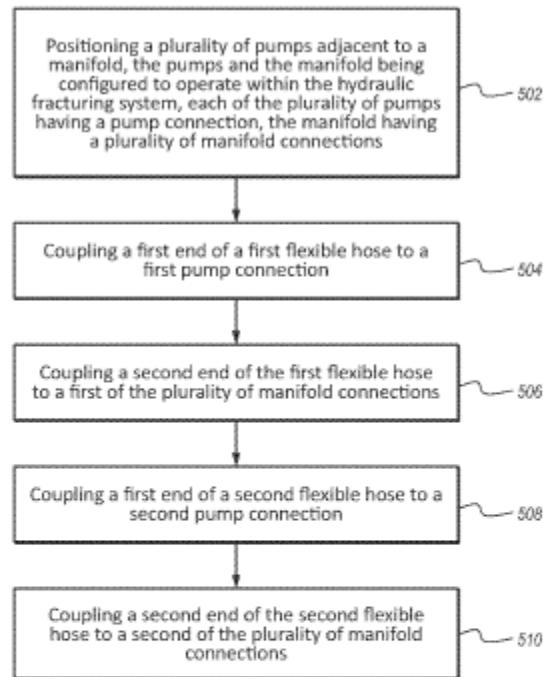


FIG. 5

Id., Fig. 5.

B. Coli (EX-1006)

Coli is directed to a “method and system for providing on-site electrical power to a fracturing operation.” EX-1006, Abstract. While Coli does not mention fittings, hoses, or hose sizes (*see generally id.*), Coli aims to improve controls used in electric-powered fracturing operations as “a significant improvement over that of conventional diesel powered systems.” *Id.*, ¶ 65. Coli teaches a “single natural

gas powered turbine generator 30" that generates power to supply "several electric motors 21" and "pumps 22," as shown in Figure 2 and reproduced below. *Id.*, ¶ 44, Fig. 2.

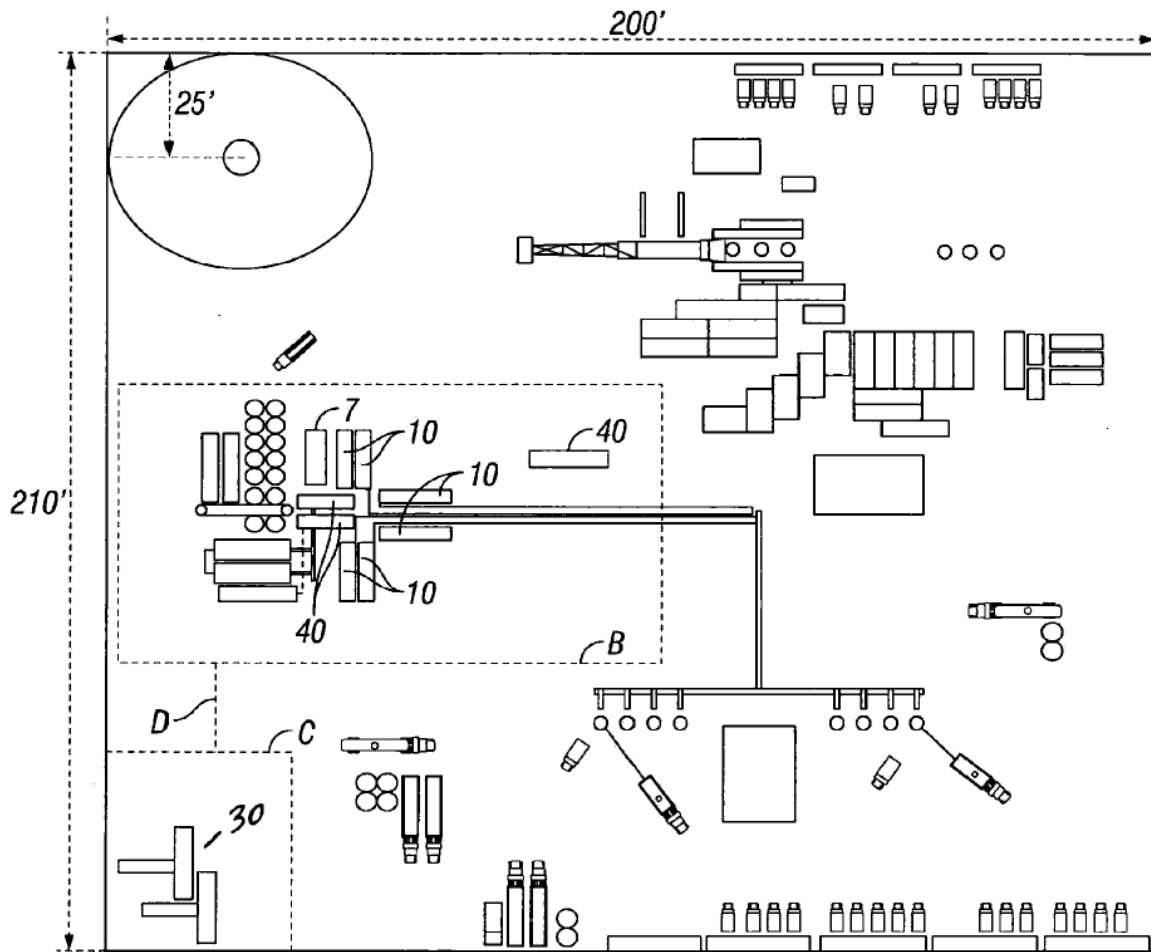


FIG. 2

Id., Fig. 2.

C. Liu (EX-1007)

Liu is directed to pipeline engineering and contains a review of "established scientific principles" related to pipelines. Pet., 23. Liu describes the term

“pipeline” as a “relatively large pipe spanning a long distance” which, as generally used in Liu, has “a minimum length of 1 mi[le]” EX-1007, 14, Fig. 1.1.



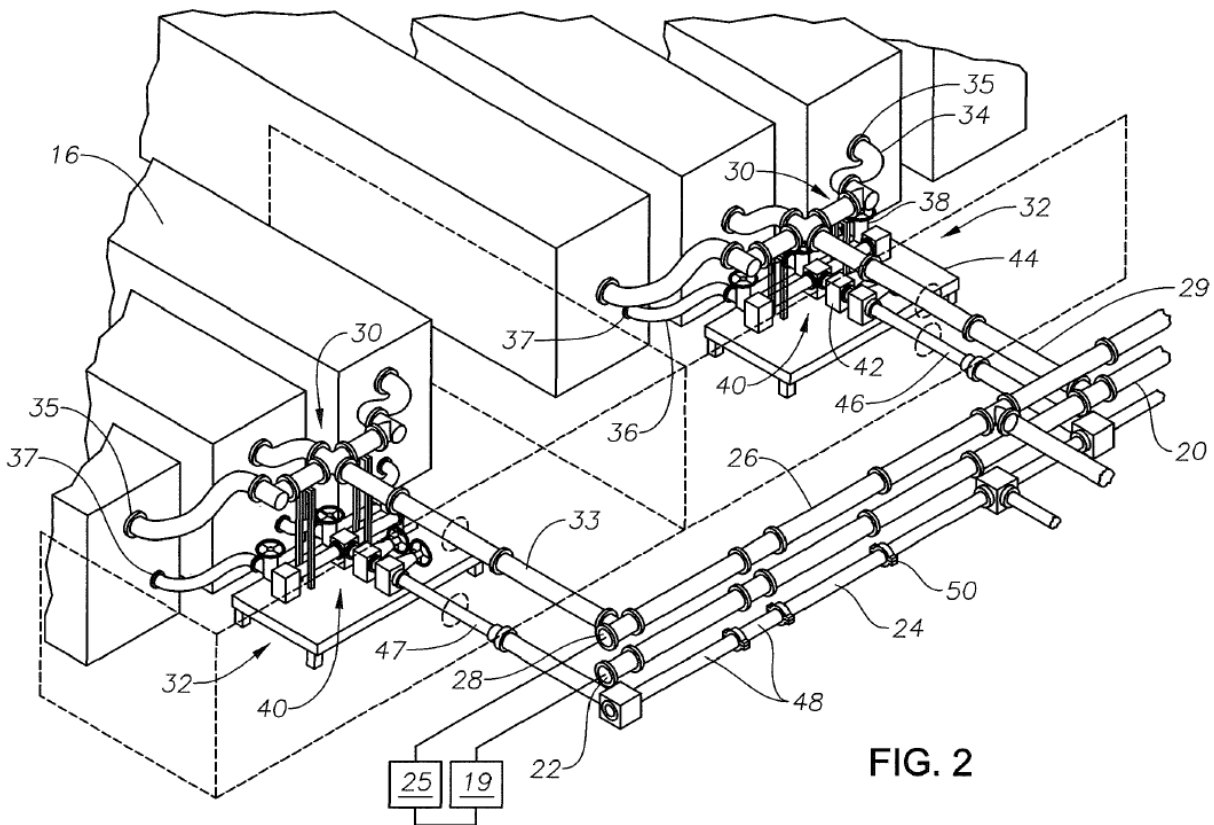
FIGURE 1.1 The Big Inch pipeline under construction in 1942; historic photograph showing the pipeline crossing a cotton field near the Arkansas–Missouri border. (Courtesy of Duke Energy.)

Liu, Fig. 1.1 (EX-1007).

D. Kajaria (EX-1008)

Kajaria is directed to “manifolds for delivering fluids under pressure.”

EX-1008, 1:14–17. Kajaria teaches a “low-pressure pipeline 20”—as opposed to a flexible hose—for conveying fracturing fluid to “pump trucks 16” for pressurizing fracturing fluids as illustrated in Figure 2 reproduced below. *Id.*, 4:9–18, Fig. 2.



Id., Fig. 2.

E. Dixon Catalogs (EX-1009, EX-1012)

Dixon-Australia (EX1009) and Dixon-U.S. (EX1012) (collectively, “Dixon”) are product catalogs directed to valve and coupling products. EX-1012, 995. Dixon explains that it is “intended as a product offering” and it is “not intended to be a user or technical manual.” EX-1009, 11; EX-1012, 995. Dixon also explains that “[t]he safe use of any product in [the Dixon] catalog is dependent upon the correct selection of the hose, fittings and method of attachment. To ensure

such a proper selection, the user must inform the distributor of the application and pressure involved when ordering hose assemblies.” EX-1009, 632; EX-1012, 918.

IV. SKILL LEVEL OF A POSITA

For purposes of this preliminary response only, Patent Owner applies the same skill level proposed by Petitioners. *See* Pet., 16–17.

V. CLAIM CONSTRUCTION

Petitioners have not proposed any construction for the terms of the 420 Patent. *Id.*, 17. Patent Owner addresses claim construction positions, if any, in the body of its arguments below. Patent Owner reserves the right to propose constructions for any claim terms if the Board institutes a proceeding.

VI. THE PETITION HAS NOT SHOWN A REASONABLE LIKELIHOOD OF SUCCESS IN PREVAILING IN ANY GROUND BECAUSE IT WAS NOT OBVIOUS TO A POSITA TO MODIFY THE ASSERTED REFERENCES TO INCLUDE DIXON'S 3-INCH FITTING.

A. The Petition fails to provide a sufficient reason to combine Dixon's 3-inch fitting in the systems of the other Asserted References.

Petitioners' failure to provide a sufficient motivation to combine is like the failure of the prior art of record—which included Kotrla—during prosecution of the Parent 162 Patent, which, as Applicant explained, failed to “identify the problem associated with efficient flow rates for fracturing operations.” EX1056, 433. For example, and as explained above (*see supra*, § II.B), the same Examiner

considered Kotrla during prosecution of the Parent 162 Patent and initially determined that Kotrla “teaches a hose and fitting arrangement (Figure 6) comprising the fitting (60) having a first end for receiving the hose at the first diameter and a second end for coupling to the electric powered pump at a second diameter, *the second diameter being larger than the first diameter.*” EX-1056, 483; *see also supra* § II.B. But the Examiner reconsidered and allowed the claims after Applicant explained *how* the prior art failed to “identify the problem associated with efficient flow rates for fracturing operations,” effectively explaining why the prior art failed to provide a motivation to combine Kotrla’s fitting. EX-1056, 433. Specifically, Applicant explained:

Traditional fracturing systems typically use 6" connections for equipment [(e.g., hydraulic fracturing pump)] and 4" hoses for fluid flow. While this configuration may enable desirable flow characteristics, insufficient flow volume is provided with the 4" hoses, which may lead [to] an increased number of units on a well site, which may increase costs. *The present application—[like the application that led to the 420 Patent]—has identified that it is insufficient to merely provide larger hoses because of other competing factors, such as flow rates, pump capabilities, and drop out rates for proppant suspended in the fluid.* Furthermore, providing additional equipment at a well site is rarely desirable, due to the congestion and a small footprint.

Embodiments of *Applicant's* disclosure have ***identified a potential substitution for a 5" hose along with a fitting that enables quick coupling to the existing 6" standard connections.*** This 5" selection, however, is more than merely an attempt to make an efficiently function design. Instead, *Applicant has identified how factors such [as] a pump's operations thresholds along with drop out rates should be combined in order to determine that the traditional hoses may be replaced for larger hoses without sacrificing other characteristics of the fracturing operation.* The cited references fail to identify this problem [the "Fluid Rate Problem"] all together.

Id., 433–34 (internal citations omitted).

Petitioners' asserted references in the instant Petition are no better. Specifically, none of the asserted references identify the problem the 420 Patent solves, which includes identifying that "***insufficient flow volume is provided with the 4" hoses***" and "that it is insufficient to merely provide larger hoses because of other competing factors, such as flow rates, pump capabilities, and drop out rates for proppant suspended in the fluid" (the "Flow Rate Problem"). *Id.* Petitioners therefore parrot ***a portion*** of the 420 Patent's identification of the Flow Rate Problem—" [T]he '420 Patent describes 'problems with flow rates, as flow rates that drop below a threshold may experience drop out of particulates, leading to blockages and other problems at the well site.'" (Pet., 23–24)—and vaguely suggest Liu's "scientific principles" are "pertinent to the problem of efficient fluid

flow rates for fracturing operations [*identified by the 420 Patent*].” *Id.* This is improper because Liu—and all other asserted references—fail to identify or discuss—with the required level of specificity—the complete Fluid Rate Problem.

Further, Petitioners completely ignore a major portion of the problem that the 420 Patent seeks to solve—namely, that “insufficient flow volume is provided with the [traditional] 4" hoses” as identified by the 420 Patent. EX-1056, 433; EX-1001, 4:16–20 (“Embodiments of the present disclosure present an *improvement over existing systems by removing the standard 4" (0.1016 m) supply hoses* while maintaining standard 6" connection types by utilizing a particularly designed ferrule.”). Ignoring that a POSITA would not be motivated to *reduce the hose size over conventional 4-inch hoses*, Petitioners argue—regarding Dixon’s fittings—that “[a] POSITA would have been ... motivated to *reduce the hose size to 5-inches* to increase the slurry’s velocity, thus reducing the propensity of the proppant to drop out of the slurry and form a bed in the bottom of the hoses, potentially causing a screen out (plugging) of the hoses.” Pet., 22. Likewise, Petitioners argue that “[a] POSITA would have been motivated to apply Liu’s principles to the Cicci-Coli-Dixon system to gain the benefits of maintaining sufficient fluid velocity and flow, and thus reducing the possibility of slurry drop-out, plugging the hoses, and/or damaging cavitation, as taught by Liu.” *Id.*, 26. Petitioners’ omission is not surprising because all asserted references fail to

identify one of the primary problems the 420 Patent solves—namely, that *insufficient flow volume is provided with the 4-inch hoses*. EX-1001, 4:16–20 (“Embodiments of the present disclosure present an *improvement over existing systems by removing the standard 4" (0.1016 m) supply hoses* while maintaining standard 6" connection types by utilizing a particularly designed ferrule.”), 1:44–49 (“Many flow lines utilized in the industry have a *4 inch diameter*. However, *this flow diameter limits fluid inlet into the pumps*, which may be undesirable, because pumps operating at lower flow rates and/or pressures than desired may experience premature wear and failures.”).

Thus, Petitioners rely on the 420 Patent itself for identification of the problem solved by the claimed invention and then cobble together the asserted references to allegedly render obvious the claims. This is plainly improper because the motivation to combine cannot come from the patent itself. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143 (Fed. Cir. 1985). The failure of the Petition to find the motivation to combine in the asserted references, as opposed to the 420 Patent itself, demonstrates that Petitioners have not met their burden to show a reasonable likelihood the claims are invalid, as further explained below.

1. The Petition's rationales predicated on any improvement or design incentives are conclusory and unsupported by the cited evidence.

The Petition does not mention any purported advantage or improvement—other than parroting *a portion of* the novelty and advantages identified by the 420 Patent—to substitute a modification of Dixon's 3-inch to 4-inch fitting (the "Hypothetical Dixon Fitting")² over the fittings already used in Cicci, Coli, or any of the asserted references. *Compare* Pet., 22 ("A POSITA would have been ... motivated to reduce the hose size to 5-inches to increase the slurry's velocity, thus reducing the propensity of the proppant to drop out of the slurry and form a bed in the bottom of the hoses, potentially causing a screen out (plugging) of the hoses"), *with* EX-1001, 4:16–27 ("Embodiments of the present disclosure present *an improvement over existing systems by removing the standard 4" ... supply hoses while maintaining standard 6" connection types* by utilizing *a particularly designed ferrule. The standard 4" supply hose provides an insufficient volume of*

² Patent Owner notes that Dixon's 3-inch to 4-inch fitting would not fit Coli's Gardner-Denver SWGS-2500 pump, which Petitioners admit had "a *6-inch* standard fitting" (Pet., 35), or the 5-inch hose Petitioners claim a POSITA would have been motivated to implement. *Id.*, 22 ("A POSITA would have been ... motivated to reduce the hose size to *5-inches.*").

fracturing fluid to a pump[.] ... *Using a 5" diameter hose supplies more volume, reduces pressure droop, and reduces cavitation and other poor conditions* pumps can experience when not supplied adequately”).

Indeed, the Petition cites no support from Cicci, Coli, Dixon, Liu, Gardner-Denver, ANSI/HI 6.1, or Kajaria that identifies the ***complete*** Flow Rate Problem or the 420 Patent's novel hose/fitting solution to that problem, but instead cites vague, conclusory allegations. *See* Pet., 18 (Coli's pump “implementation details”), 21 (Cicci's “fittings”—none of which teach or suggest the claimed “pair of fittings”), 21 (Dixon's “fittings”—none of which disclose the claimed “pair of fittings”), 24 (Liu's “scientific principles”), 68 (Gardner-Denver's “implementation details and operating parameters”), 86 (ANSI/HI 6.1's “implementation details”), 78 (Kajaria's “single flow [pipe]line”—not the required hose).

Aside from parroting the 420 Patent, the Petition fails to properly identify disclosures in the asserted references that would have led a POSITA to combine the asserted references in the manner Petitioners propose. Without doing so, the Petition lacks the “reasoned explanation” required of an obviousness analysis. *In re Nuvasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (“[C]onclusory statements alone are insufficient and, instead, the finding must be supported by a reasoned explanation.”) (internal quotes omitted). This deficiency in the Petition is further emphasized by the cited portion of Dr. Durham's declaration that only parrots the

conclusory statements in the Petition. *See* EX-1002, ¶¶ 146, 156–158, 167, 350–352, 395, 412; *Kinetic Techs., Inc. v. Skyworks Sols., Inc.*, IPR2014-00529, Paper 8 at 15 (PTAB Sep. 23, 2014) (“Merely repeating an argument from the Petition in the declaration of a proposed expert does not give that argument enhanced probative value.”).

Like the Petition, Dr. Durham's analysis fails to properly identify disclosures in the asserted references that would have led a POSITA to combine the asserted references in the manner Petitioners propose to arrive at the claimed invention. This failure renders the Petition's purported *KSR* rationales for advantages, improvements, or design incentives as “merely offered conclusory assertions without underlying factual support” and thus deficient. *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 (on Director Review) at 5 (PTAB Feb. 10, 2023) (precedential) (“[T]he Board was correct in giving little weight to Petitioner's Expert because the expert declaration merely offered conclusory assertions without underlying factual support and repeated, verbatim, Petitioner's conclusory arguments.... The declaration does not provide any technical detail, explanation, or statements supporting why the Expert determines that the feature in question was required or would have been obvious based on the prior art disclosure.”). Like the Petitioner in *Nuvasive*, the Petition here has presented only

“insufficient articulations of motivation[s] to combine.” *Nuvasive*, 842 F.3d at 1383–85.

Given the differences between the Hypothetical Dixon Fitting and the disclosures in the other asserted references, the proposed modification in the Petition is driven by hindsight using the 420 Patent as a blueprint. *Interconnect Planning Corp.*, 774 F.2d at 1143, (holding that it is insufficient to select from the prior art the separate components of the inventor's combination, using the blueprint supplied by the inventor); *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”).

To mitigate hindsight concerns, Petitioners and their expert should have identified any alleged improvement or advantage—other than parroting the novelty and advantages of the 420 Patent, along with an analysis, that would motivate a POSITA to substitute the fittings used by Cicci's or Coli's systems with the Hypothetical Dixon Fitting. Without doing so, the Petition's purported motivations for advantages, improvements, or design incentives are based on impermissible hindsight. *Stevenson v. Int'l Trade Comm'n*, 612 F.2d 546, 554 (C.C.P.A. 1979) (“To read into the up-swept tail of the rocker board the teachings of appellant's kicktail is precisely the hindsight reasoning cautioned against in *Graham v. John*

Deere[]. ***Simplicity and hindsight are not proper criteria for resolving the issue of obviousness.***”). As the Court of Customs and Patent Appeals held in *In re Van Wanderham*:

We think this case is one of that category of inventions which, ***when viewed after disclosure and explanation by an applicant, seem simple and such as should have been obvious to those in the field. Yet this does not necessarily negative [sic, negate] invention or patentability.*** Indeed, ***simplicity may even be some evidence of invention.*** The fact that the invention seems simple after it is made is not determinative of the question of obviousness. If this were the rule, many of the most beneficial patents would be stricken down. If those skilled in the mechanical arts are working in a given field and have failed to discover a certain new and useful improvement, the one who first makes the discovery frequently has done more than make an obvious improvement which would have suggested itself to a mechanic skilled in the art, and such an invention is entitled to the grant of a patent thereon.

378 F.2d 981, 987 (C.C.P.A. 1967) (internal citations omitted). And as the Federal Circuit held in *InTouch Techs., Inc. v. VGO Commc'ns, Inc.*:

[Expert] testimony was nothing more than impermissible hindsight; she opined that all of the elements of the claims disparately existed in the prior art, but failed to provide the glue to combine these references. While she opined that the references were like separate pieces of a simple jigsaw puzzle, she did not explain what reason or

motivation one of ordinary skill in the art at the time of the invention would have had to place these pieces together.

751 F.3d 1327, 1348–49 (Fed. Cir. 2014).

B. Petitioners' motivations to combine are predicated on Dr. Durham's flawed testimony that fails to address that a POSITA would not have had sufficient understanding of the Flow Rate Problem or hose/fitting system design to make the modifications Petitioners propose without hindsight knowledge gained from the challenged patent.

Petitioners and their expert define a POSITA as one having:

either (1) a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Petroleum Engineering or an equivalent field as well as at least 2 years of academic or industry experience in the oil and gas industry, including well drilling, completion, or production, including design and/or analysis of hydraulic fracturing systems or (2) at least four years of industry experience in the oil and gas industry including well drilling, completion, or production including design and/or analysis of hydraulic fracturing systems.

Pet., 16–17; EX-1002, ¶ 48. The invention in the 420 Patent and claims, however, is directed to using a “particularly design ferrule” (i.e., fitting) for replacing the “standard 4" supply hose[s]” with “5" diameter hose[s]” “while maintaining standard 6" connection types.” EX-1001, 4:16–27.

Petitioners have not shown that a POSITA as defined, without the benefit of the 420 Patent, would have the required knowledge and experience to identify the

Flow Rate Problem and understand hose/fitting system design from the prior art to combine³ the references in the way that the Petition proposes. EX-1009, 11; EX-1012, 918 (“The *safe use* of any product in [the Dixon] catalog is *dependent upon the correct selection of the hose, fittings and method of attachment*. To ensure such a proper selection, *the user must inform the distributor of the application and pressure involved when ordering hose assemblies*.”). While it is true that hose/fitting systems have been used for many decades, the design of hose/fitting systems for specified applications is a complex field that requires specialized knowledge that is beyond the expertise of Petitioner’s POSITA. EX-1012, 918. Dixon explains that “[a]ccidents and down time may occur if hose

³ Patent Owner notes that the prior art must enable a POSITA to arrive at the claimed invention. The Federal Circuit has held, “[t]o render a claim obvious, the prior art, taken as a whole, must enable a skilled artisan to make and use the claimed invention.” *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1380 (Fed. Cir. 2021). For example, the Petition has limited analysis beyond conclusory assertions to explain how a POSITA would recognize the Flow Rate Problem before safely modifying the prior art to purportedly satisfy limitation 1[f] and 1[g]. Pet. 33–45.

assemblies are not properly selected for the specific application.” EX-1012, 919, 918 (“If hose or couplings are not used in correct applications or are incorrectly applied, accidents and downtime can result.”).

This objective evidence shows that hose/fitting system design is not something that engineers merely dabble in, given the potential dangers surrounding “[f]luid hose couplings,” especially when “petroleum products or other hazardous liquids are involved.” EX-1012, 918.

Petitioners and their expert fail to account for the complexity and challenges of designing and implementing a specific hose/fitting system into an oil/gas extraction system. Petitioners do not acknowledge the fact that hose/fitting system design is a specialized field requiring expertise that is well beyond Petitioners’ defined level of skill in the art—especially given Dixon’s disclosures to the contrary. *Id.* (emphasizing the importance of hose couplings that have been “carefully engineered to meet specific requirements”). The crux of the claimed 420 Patent invention is its novel solution to the Flow Rate Problem using a hose/fitting system that includes a “hose” and a “pair of fittings.” EX-1001, claim 1, 3:66–4:15 (“[T]he present disclosure include[s] *specialty-sized hoses* developed in order to allow *greater flow/supply to frac pumps*” to “*reduce[] cavitation events* and *prolong[] equipment life*” while “*allow[ing] for fluid velocity to be maintained above a threshold*” at which sand particles would begin to fall out and eventually

cause a blockage [of the] hose.”); 4:16–27 (“Embodiments of the present disclosure present an improvement over existing systems by *removing the standard 4" (0.1016 m) supply hoses* while *maintaining standard 6" connection types* by utilizing a *particularly designed ferrule*”). Yet, Petitioners’ level of skill makes no mention of hose/fitting system design expertise at all. EX-1002, ¶ 48.

Thus, Petitioners’ argument that, before the 420 Patent, a POSITA would have been motivated to select and/or adapt the hose/fitting system disclosed in Dixon (EX-1009, EX-1012) in either Cicci’s (EX-1004) or Coli’s (EX-1006) fracturing pump system fails, even in view of Liu’s vague “scientific principles.” Pet., 26. Without the teachings of the 420 Patent (and its identification of the Flow Rate Problem), a POSITA as defined by Petitioners instead would have understood that the hose/fitting systems in place in Cicci and Coli were acceptable for their purpose and would not have looked to modify or change them using the Dixon catalog or teachings of Liu.

Thus, Petitioners have failed to show that a POSITA as defined would have had the knowledge and experience with hose/fitting systems design before the 420

Patent necessary to have been motivated to make the section 103 combinations

Petitioners assert.⁴ This also supports denying institution.

1. The Petition's supposed express motivations show only that the combination could be made, not that a POSITA would be motivated to make such a combination.

The Petition's express motivations merely show that the Petition's proposed combination could be made—not that a POSITA would have been motivated to do so. Notably, the Petition's motivations to combine recognize that multiple “fittings, hoses, and couplings” exist, but provide no reason why a POSITA would have been motivated to implement Dixon's 3-inch fitting solution over any other fitting configuration:

A POSITA would have been motivated by Cicci's disclosure of fittings to look to references that teach about fittings and hoses. EX1002, ¶¶157-158. For example, Cicci discloses fittings or couplings connecting the pump to flexible flow lines. *Id.*; EX1004, 5:31-37, 7:42-47; EX1005, ¶¶[24], [30]. A POSITA would have been motivated to look to Dixon for implementation details about such

⁴ In contrast, a POSITA having the 420 Patent would have understood the importance of the terms used in the claims and would have been able to make and use the claimed invention without difficulty, given the detailed disclosure in the specification.

fittings, hoses, and couplings. EX1002, ¶¶159-162. Dixon contains information about commercially available hoses and fittings for “slurry” systems and hydraulic fracturing applications. *Id.*; EX1009, 11, 58, 149-151; EX1012, 78-82, 118. Dixon also teaches other fittings useful in fracturing systems, including hammer unions, reducers, hose and hose assemblies, industrial hose fittings and pipe and pipe welding fittings, a POSITA would have found useful in the Cicci-Coli system. *Id.*; EX1009, 154, 405; EX1012, 628, 681-83.

A POSITA would have been motivated to incorporate Dixon's fittings into the Cicci-Coli system to obtain the express benefits of Dixon's fittings. EX1002, ¶163. For example, Dixon's fittings have a “[o]ne piece design [which] eliminates leak path experienced with two-piece threaded systems.” EX1009, 149; EX1012, 78 (similar). These Frac Fittings also are “[d]urable and safe with reliable hose retention when crimped as specified.” EX1009, 149. Dixon shows various examples of fitting sizes, including fittings for connecting the same size hose and union (Complete Male/Female Assembly) and combinations of Male/Female assemblies that would have attached a larger union to a smaller hose. EX1009, 149; EX1012, 78.

Pet., 21–22 (citations omitted).

The above statements are not sufficient to evidence a motivation for combining the references. Petitioners argue that the above arguments demonstrate “express benefits” to combine, but there is no such express statement in either reference. For example, the Petition's statements show that a POSITA could have

considered multiple “combinations of Male/Female assemblies” and “other fittings useful in fracturing systems” that at most show that Dixon offers a POSITA design options. *See id.* Thus, these statements merely show, at best for Petitioner, that a POSITA could combine the references—not that a POSITA would have been motivated to do so. *InTouch Techs.*, 751 F.3d at 1352 (concluding that a party’s expert “succumbed to hindsight bias in her obviousness analysis” where such analysis “primarily consisted of conclusory references to her belief that one of ordinary skill in the art *could* combine these references, not that they *would* have been motivated to do so”). These purported express statements from the prior art are thus insufficient to show a POSITA would have been motivated to combine Dixon with either Cicci or Coli. *See Innogenetics, N.V. v. Abbott Lab’ys*, 512 F.3d 1363, 1373–74 (Fed. Cir. 2008) (rejecting generalized testimony concerning a motivation to combine to specific references).

Further, the Petition fails to address the complexity of the proposed combination of prior art by incorrectly presenting the combination as “applying a known technique ... to a known system ... ready for improvement” where “Dixon teaches specific fitting configurations,” yet failing to show how Cicci, Coli, Dixon, or any other asserted references disclose the 420 Patent’s novel hose/fitting solution. Pet., 23. The Petition’s proposed combination involves coupling Cicci’s “hose[] body” having a “third diameter” to an adaptation of Dixon’s “3-inch shank

end” to “**4-inch female union**” fitting to Coli’s “Gardner-Denver SWGS-2500, which had **6-inch standard fitting[s]**.” *Id.*, 34–35. Patent Owner notes that Dixon’s 3-inch to 4-inch fitting would not fit Coli’s Gardner-Denver SWGS-2500 pump, which Petitioners admit “had **6-inch** standard fittings” (*id.*, 35), or the 5-inch hose Petitioners claim a POSITA would have been motivated to implement. *Id.*, 22 (“A POSITA would have been ... motivated to reduce the hose size to **5-inches**.”). Even assuming—without conceding—that a POSITA would have been motivated to make the numerous design modifications to Petitioners’ faulty combinations, this proposed combination fails to address the complexity of and “diverge[nt]” teachings of the prior art. *Id.*, 19 (“Dixon’s fittings have a one piece design which eliminates leak path experienced with two-piece **threaded** systems.”); *see Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018) (“[A] reference must be considered for all it taught, disclosures that diverged and taught away from the invention at hand as well as disclosures that pointed towards and taught the invention at hand.”). This failure to account for complexity and failure to account for the asserted references teaching against each other demonstrates that Petitioners have not met their burden to show a reasonable likelihood the claims are invalid.

2. The asserted references fail to disclose or render obvious the proppant falling out of suspension point, without which a POSITA would not have arrived at the claimed hose/fitting solution.

Liu—and all other asserted references—fail to disclose or render obvious the point at which “proppant ... fall[s] out of suspension” (EX-1001, 6:59–61) (the “Proppant Fallout Point”), without which a POSITA would be unable to derive the claimed hose/fitting solution. Indeed, the Proppant Fallout Point is required to arrive at the claimed hose/fitting solution, which “provide[s] improved operations at a well site ... because greater volumes of fluid may be provided to fracturing pumps while *maintaining flow rates above a threshold amount where particulates begin to drop out of the flow.*” *Id.*, 5:49–53. The 420 Patent explains:

[F]rac slurry often consists of sand media also known as proppant, at low fluid velocities this proppant can begin to *fall out of suspension*. Some industry data notes that *sand fall out begins at 2.21 ft/sec*, which equates to 3.2 BPM in a 5" hose. *Sand fall out is substantial at 1.72 ft/sec*, which equates to 2.2 BPM in a 5" hoses. As a result, systems [(*e.g., the claimed hose/fitting solution*)] may be deployed to ensure that flow rates are maintained above these levels (which may be set as the *thresholds*) during operation.

Id., 6:59–67.

The 420 Patent further discloses the analysis and conclusions based on threshold flow rates to arrive at a hose/fitting solution that differs from and improves upon

the conventional 4-inch hose/fitting designs. The 420 Patent explains and illustrates using Figure 4:

FIG. 4 [reproduced below] is a graphical representation 400 illustrating pump *flow rates and respective suction piping sizes*. The x-axis 402 corresponds to suction pipe diameter (in inches) and the y-axis 404 corresponds to flow rate (in BPM). An *operational window 406* is provided indicative of typical ranges where fracturing operations may occur. In this embodiment, the operational window 406 extends from approximately 1 BPM to approximately 7 BPM.

Each respective suction pipe diameter includes a *threshold flow rate*, which may be obtained through experimental procedures and/or reference materials. For example, a 4" suction pipe illustrated at 408 has a threshold 410 of approximately 4.3 BPM, a 5" suction pipe illustrated at 412 has a threshold 414 of approximately 5.5 BPM, and a 6" suction pipe illustrated at 416 has a threshold 418 of approximately 6.5 BPM. The operational window 406 includes a portion that exceeds each of the illustrated thresholds 410, 414, 418.

Operations using the 4" suction pipe 408 include an operating range that is approximately 40% larger than the threshold 410. As a result, there is a high likelihood that operations will exceed the threshold due to demands to supply additional fluid for fracturing operations.

Similarly, operations using the 5" suction pipe 412 and the 6" suction pipe 416 also exceed threshold 414, 418 by approximately 22% and 7%, respectively. The instant application has identified that while the 6" suction pipe 416 enables the largest flow rate, that *problems*

associated with fluid velocities and drop out make the 6" suction pipe 416 undesirable. Accordingly, *embodiments may incorporate the 5" suction pipe 412, which provides significant improvements over the 4" suction pipe 408* while also reducing the likelihood of drop out. *The 5" suction pipe 412 also has less pressure drop, when compared to the 4" suction pipe 408, providing an additional improvement over existing configurations.*

Id., 7:11–45.

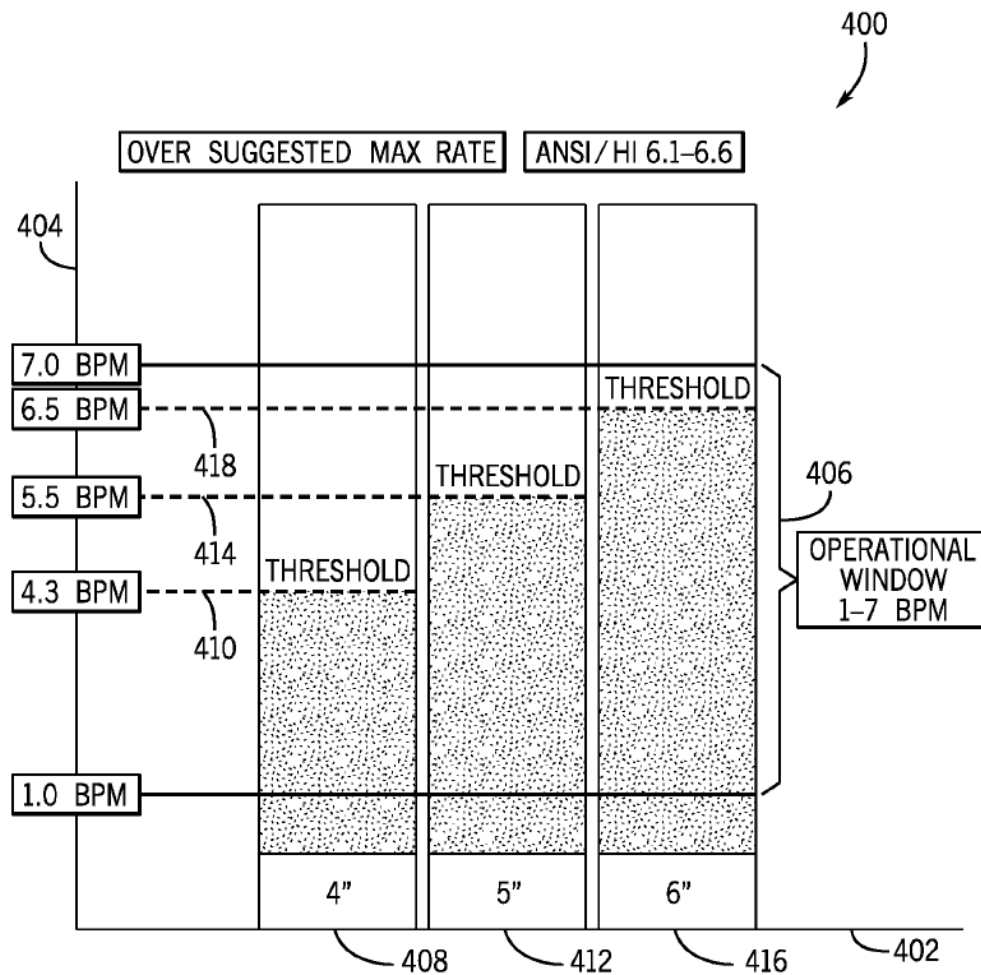


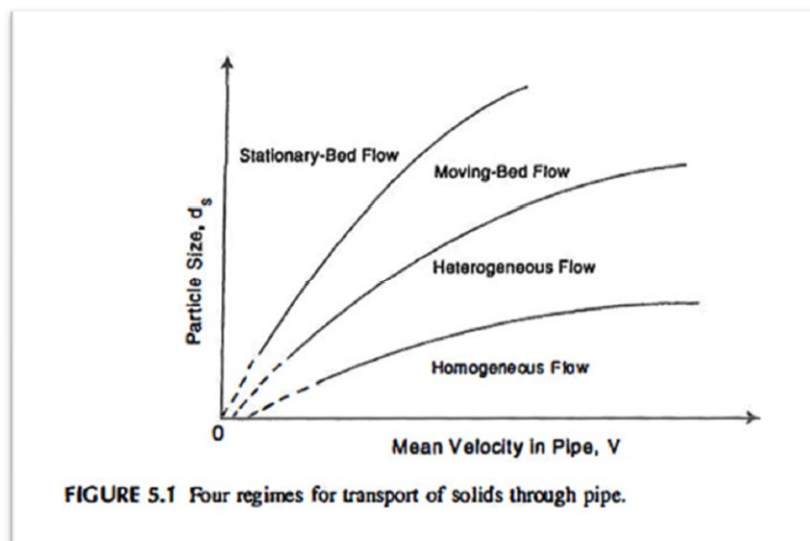
FIG. 4

Id., Fig. 4.

Indeed, the Proppant Fallout Point is the key motivating factor for the claimed “third diameter being less than both the first diameter and the second diameter,” without which a POSITA would be motivated to design the third diameter *equal to* the first diameter and second diameter (e.g., 6 inches) to provide even “greater volumes of fluid ... to fracturing pumps.” *Id.*, 5:49–53.

But the asserted art fails to disclose or render obvious the Proppant Fallout Point. Petitioners erroneously—as described below—rely on Liu, including Liu's Figure 5.1 (reproduced below), to allege that a POSITA would be motivated to “use a third diameter that is less than both the first and second diameters.” Pet., 38. Specifically, Petitioners allege:

Liu's Figure 5.1 shows a drop-out rate or a velocity (tied directly to a flow rate through Eq. 2.6) at which drop out of the slurry is avoided. EX1007, 133, Fig. 5.1; EX1002, ¶¶208-209.



EX1007, Fig. 5.1, 133.

A POSITA would have been motivated to avoid moving-bed or stationary flow regimes to avoid their negative consequences, including increased pressure drop, reduced flow, and cavitation. EX1002, ¶¶59-72, 210-213; EX1007, 133, 269.

Id., 36–7.

But Petitioners' reliance on Liu fails for multiple reasons. **First**, Figure 5.1 is a relational demonstrative illustrating how mean velocity and particle size can generally impact flow rate. It is devoid of any actual quantities or metrics for calculating a resulting regime for a given mean velocity and particle size, unlike the 420 Patent, which provides numerical metrics. *Compare* EX-1007, Fig. 5.1 (Liu), *with* EX-1001, 6:59–67 (420 Patent) (e.g., “**sand fall out** begins at 2.21 ft/sec, which equates to 3.2 BPM in a 5" hose”). Petitioners' reference to Liu's “Eq. 2.6” (i.e., $\text{Velocity} = \text{Flow} \div (\text{cross sectional area of pipe})$) (EX-1007, 23) likewise fails to account for particle size. Thus, Liu—and all other asserted references—fail to provide—or provide enough information to calculate—required factors (e.g., Proppant Fallout Point) that would have motivated a POSITA to arrive at the claimed hose/fitting solution, including the claimed “third diameter being less than both the first diameter and the second diameter.”

Second, Liu's Figure 5.1 fails to account for additional critical factors. Liu explains that Figure 5.1 only includes “mixture velocity in pipe and particle size,” but “the density of the solid particles has the same effect as the particle size, namely, a higher density causes the particle to settle more.” *Id.*, 79. Thus, Figure 5.1 ignores critical factors (e.g., particle density) that a POSITA would need to calculate a corresponding regime for a given mean velocity using a given particle of a given density. Indeed, Liu and all other asserted references fail to

provide the critical metrics (e.g., Proppant Fallout Point) or all the formulas and data (e.g., proppant particle size, proppant density) needed to calculate critical metrics (e.g., Proppant Fallout Point, thresholds), for a given pipe size that would have motivated a POSITA to arrive at the claimed hose/fitting solution. This failure to account for complexity and failure to account for the asserted references failing to provide a sufficient motivation to combine the asserted references demonstrates that Petitioners have not met their burden to show a reasonable likelihood the claims are invalid.

VII. CONCLUSION

For the above reasons, Patent Owner respectfully requests that the Director decline to institute *inter partes* review.

IPR2025-01539
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Patent Owner's Preliminary Response

Dated: January 9, 2026

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CERTIFICATE OF COMPLIANCE

The undersigned certifies that this response complies with the word-count limitations of 37 C.F.R. § 42.24(b)(1). This response contains 6,470 words as calculated by the word-count feature of Microsoft Word, the word-processing program used to create it.

The undersigned further certifies that this Petition complies with the typeface requirements of 37 C.F.R. § 42.6(a)(2)(ii) and typestyle requirements of 37 C.F.R. § 42.6(a)(2)(iii). This petition has been prepared in a proportionally spaced typeface using Microsoft Word in Times New Roman 14-point font.

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CERTIFICATE OF SERVICE

I hereby certify that on this 9th day of January, 2026, I caused to be served a true and correct copy of the foregoing "Patent Owner's Preliminary Response" by electronic mail on the following:

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