

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EVOLUTION WELL SERVICES, LLC,
Petitioner,

v.

BJ ENERGY SOLUTIONS, LLC,
Patent Owner.

IPR2022-00399
Patent 9,395,049 B2

Before PATRICK R. SCANLON, JASON W. MELVIN, and
SEAN P. O'HANLON, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

Dismissing Patent Owner's Motion to Strike
37 C.F.R. § 42.23(b)

Dismissing Patent Owner's Motion to Exclude
37 C.F.R. § 42.64(c)

I. INTRODUCTION

A. Background

Evolution Well Services, LLC (“Petitioner”) filed a Petition for *inter partes* review of claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 (“the challenged claims”) of U.S. Patent No. 9,395,049 B2 (Ex. 1001, “the ’049 patent”). Paper 2 (“Pet.”), 1. BJ Energy Solutions, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6. On August 24, 2002, we instituted an *inter partes* review of the challenged claims on all grounds raised in the Petition. Paper 10 (“Inst. Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”), Petitioner filed a Reply to the Patent Owner Response (Paper 18, “Pet. Reply”), and Patent Owner filed a Sur-reply to Petitioner’s Reply (Paper 26, “PO Sur-reply”). An oral hearing was held on May 24, 2023. A transcript of the hearing has been entered into the record. Paper 33 (“Tr.”).

For the reasons that follow, we conclude that Petitioner has proven by a preponderance of the evidence that the challenged claims of the ’049 patent are unpatentable.

B. Real Parties in Interest

Petitioner identifies itself and Evolution Well Services Operating, LLC as real parties in interest. Pet. 83.

Patent Owner identifies itself as the sole real party in interest. Paper 3, 1.

C. Related Matters

The parties indicate that the '049 patent is the subject of the following district court proceeding:

BJ Energy Solutions, LLC v. Evolution Well Services, LLC,
Case No. 6:21-cv-00682 (W.D. Tex. filed June 29, 2021) (“the Texas litigation”).

Pet. 83; Paper 3, 2.

D. The Challenged Patent

The '049 patent discloses “apparatus and methods for delivering a high volume of fluid from a mobile pumping unit into an underground well bore.” Ex. 1001, 1:8–11. The fluid delivery system is illustrated in Figure 1, which is reproduced below.

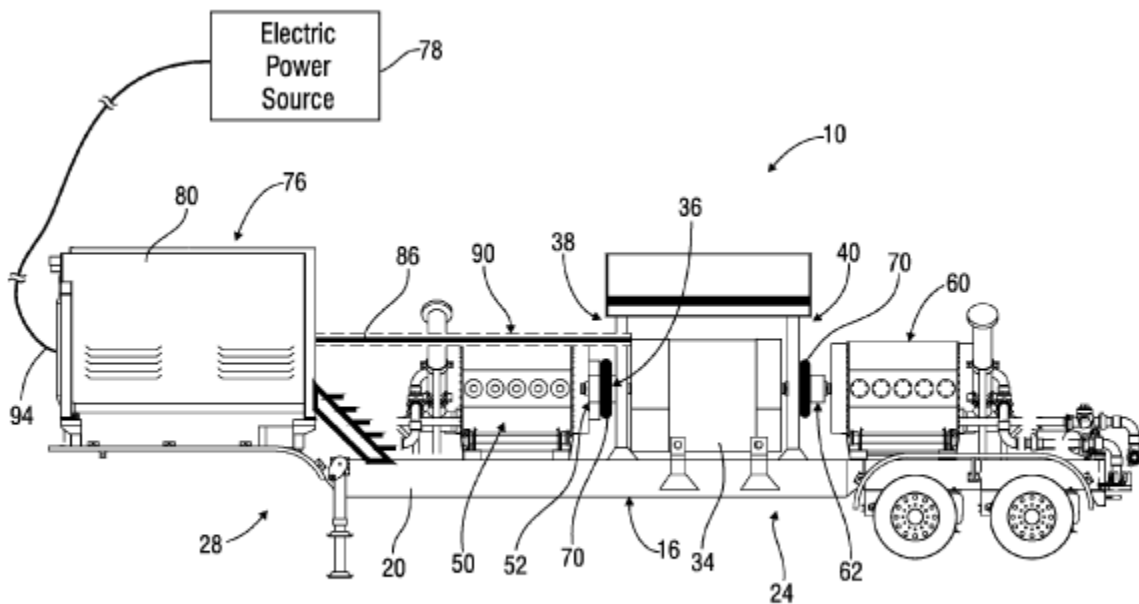


FIG. 1

Figure 1 shows a side view of the fluid delivery system 10. *Id.* at 3:22–24, 4:13–16. Chassis 16 is mounted on or integral with movable carrier 24,

allowing the fluid delivery system to be transportable between multiple well sites. *Id.* at 4:18–19, 4:29–31. Electric motor 34 and first and second pumps 50, 60 are mounted on the chassis in an axially aligned manner. *Id.* at 4:33–35, 4:49–51. The pumps are operationally connected to the motor at opposite ends of drive shaft 36. *Id.* at 4:45–49. Flex couplings 70 may be positioned between the motor drive shaft and the drive shaft of each pump to accommodate relative movement between the motor and pumps during operation. *Id.* at 5:54–58. The motor is controlled by variable frequency drive (“VFD”) 76. *Id.* at 6:20–22. The motor drives the pumps concurrently or individually to deliver pressurized fluid to the well bore. *Id.* at 4:35–39, 4:51–55.

E. The Challenged Claims

Petitioner challenges claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 of the ’049 patent. Pet. 1. Claims 1, 13, 18, and 19 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A mobile hydraulic fracturing fluid delivery system for pumping high pressure fracturing fluid into an underground well bore at a well site and being transportable between multiple well sites, the mobile hydraulic fracturing fluid delivery system comprising:
 - a chassis, said chassis being configured to be transportable between well sites;
 - an electric motor disposed upon said chassis, said electric motor being electrically coupled to an external electric power source and having first and second opposing ends, said electric motor further having a single drive shaft extending axially therethrough and outwardly therefrom at said first and second opposing ends thereof;

- a first fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said first end of said motor and configured to pump fracturing fluid into the well bore;
- a second fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said second end of said motor and configured to pump fracturing fluid into the well bore at the same time as said first fluid pump,
- wherein said first and second fluid pumps are axially aligned with said electric motor at said opposing ends thereof, further wherein said drive shaft of said electric motor is coupled to said first and second fluid pumps so that said electric motor is capable of concurrently driving both said fluid pumps;
- at least a first flex coupling engaged with and between said electric motor and said first fluid pump and configured to allow movement of said electric motor and said first fluid pump relative to one another during and without disturbing the operation thereof; and
- at least a second flex coupling engaged with and between said electric motor and said second fluid pump and configured to allow movement of said electric motor and said second fluid pump relative to one another during and without disturbing the operation thereof.

Ex. 1001, 8:5–42.

F. Instituted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Zhang	US 2015/0078924 A1, published March 19, 2015	1005
Stout	US 2010/0019626 A1, published January 28, 2010	1006

Name	Reference	Exhibit
API Standard 674	<i>Positive Displacement Pumps—Reciprocating</i> , American Petroleum Institute Standard 674 (3d ed. 2010)	1007
Coli	US 2012/0255734 A1, published October 11, 2012	1009
API Standard 671	<i>Special Purpose Couplings for Petroleum, Chemical and Gas Industry Services</i> , American Petroleum Institute Standard 671 (4th ed. 2007)	1010
Sanborn	US 2013/0306322 A1, published November 21, 2013	1011
Naets	US 7,563,413 B2, issued July 21, 2009	1012
Broussard	US 2014/0138079 A1, published May 22, 2014	1013

We instituted trial based on all asserted claims and grounds of unpatentability as follows:

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1–3, 18	103 ¹	Zhang, Stout, API Standard 674
6–8, 10, 12, 19, 20	103	Zhang, Stout, API Standard 674, Broussard
1–3, 6–8, 10, 12, 13, 15, 18–20	103	Zhang, Stout, API Standard 674, Broussard, API Standard 671
1–3, 6–8, 12, 13, 15, 18–20	103	Sanborn, Naets
10	103	Sanborn, Naets, Coli

¹ The application resulting in the '049 patent was filed on July 23, 2013 (Ex. 1001, code (22)), and is subject to the Leahy-Smith American Invents Act's ("AIA"), Pub. L. No. 112–29, 125 Stat. 284 (2011), revisions to 35 U.S.C. § 100 *et seq.* Thus, we refer to the AIA version of section 103.

Inst. Dec. 50; Pet. 1. Petitioner submits a declaration of William D. Marscher, P.E. (Ex. 1003, “Marscher Declaration”) in support of its contentions in the Petition. Petitioner also submits a supplemental declaration of Mr. Marscher. Ex. 1052. Patent Owner submits declarations of Randall K. King, Ph.D., P.E. (Ex. 2014) and Hamid A. Toliyat, Ph.D. (Ex. 2015) in support of its contentions.

II. ANALYSIS

A. Principles of Law

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). Petitioner bears the burden of persuasion to prove unpatentability of each challenged claim by a preponderance of the evidence. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious before the effective filing date to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject

matter and the prior art, (3) the level of skill in the art, and (4) when in evidence, any objective evidence of nonobviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (citations omitted). “The patent’s purpose can also be informative.” *Id.*

Petitioner contends that a person having ordinary skill in the art at the time of the invention (“POSITA”) would have a “range of qualifications” including “a bachelor’s degree in mechanical or chemical engineering and five years of work experience in the field of mechanical systems, motors, pumps, and/or oil field services.” Pet. 7 (citing Ex. 1003 ¶¶ 22–23).

Patent Owner contends that a person having ordinary skill in the art at the time of the invention “would have had a bachelor’s degree in mechanical

² The parties have not directed us to any such objective evidence.

or petroleum engineering and at least five years of real-world work experience in the field of [hydraulic fracturing] operations.” PO Resp. 6 (citing Ex. 2014 ¶¶ 22–23). Patent Owner argues that Petitioner’s definition of the ordinary level of skill “is overly broad, as it fails to identify the specialized knowledge of pumping units for [hydraulic fracturing] at the heart of the claimed invention.” *Id.* at 7.

Petitioner replies that Patent Owner’s definition of the ordinary level of skill is inconsistent with Patent Owner’s definition as set forth in the Texas litigation. Pet. Reply 2. Petitioner asserts that, in the Texas litigation, Patent Owner defined the level of skill as Petitioner did in the Petition. *Id.* (citing Ex. 2010, 4).³ Petitioner argues that an ordinarily skilled artisan with work experience in oilfield services “would have direct knowledge of the design trends, constraints, and parameters specific to hydraulic fracturing equipment” (*id.* (citing Ex. 1052 ¶¶ 11–12)) and that “[l]arge pumps, motors, and other machines used for pumping hydraulic fracturing fluid are similar to machines employed in other applications” (*id.* at 3 (citing Ex. 1016, 20; Ex. 1045, 17:17–18:8; Ex. 1052 ¶¶ 18–19)). Petitioner argues that Mr. Marscher qualifies as an ordinarily skilled artisan even using Patent Owner’s definition. *Id.* at 4 (citing Ex. 1003 ¶ 23; Ex. 1052 ¶¶ 10–20).

During the hearing, Patent Owner conceded that the differences between its and Petitioner’s proposed definitions do not affect this proceeding. Tr. 40–41.

Based on the arguments presented and the cited references, we find Petitioner’s definition of the level of ordinary skill reasonable and for

³ For Exhibit 2010, Patent Owner cites to reference pagination rather than the exhibit pagination. For consistency, we cite to the same pagination.

purposes of this Decision, adopt it as our own. Also, we note that we would reach the same conclusions herein under Patent Owner’s proposed definition.

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention” and “after reading the entire patent.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315. We also consider “[a]ny prior claim construction determination concerning a term of the claim in a civil action . . . that is timely made of record” in this proceeding. 37 C.F.R. § 42.100(b).

“The Board is required to construe ‘only those terms that . . . are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019)

(alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Neither party proffers a definition for any claim term. Pet. 2; *generally* PO Resp. For purposes of this Decision, and based on the record before us, we determine that no construction of any term is necessary.

D. Overview of the Asserted Prior Art

1. Zhang

Zhang “relates to an oil-field fracturing apparatus, particularly to a fracturing pump.” Ex. 1005 ¶ 1. Zhang recognizes that certain problems exist with typical fracturing sets that use a diesel engine, including a crowded field area, complicated pump manifold layout, high cost, and difficult control. *Id.* ¶¶ 2–3. By instead using a motor to drive the fracturing pump directly, Zhang purports to provide improvements including eliminating the need for a transmission structure, thereby reducing and simplifying the apparatus mounted on the fracturing car and improving safety and reliability. *Id.* ¶ 17. The space savings gained by using the motor in place of a diesel engine allows two pumps to be positioned on the same fracturing car. *Id.* ¶ 18.

Zhang’s fracturing pump includes a motor coupled to the pump shaft, a control device, an air-cooled device for cooling the motor rotor, and a water-cooled device for cooling the motor stator. Ex. 1005 ¶ 6. Figure 2 illustrates an air-cooled device of the fracturing pump and is reproduced below.⁴

⁴ We reproduce the version of Figure 2 from the cover page of the Zhang publication.

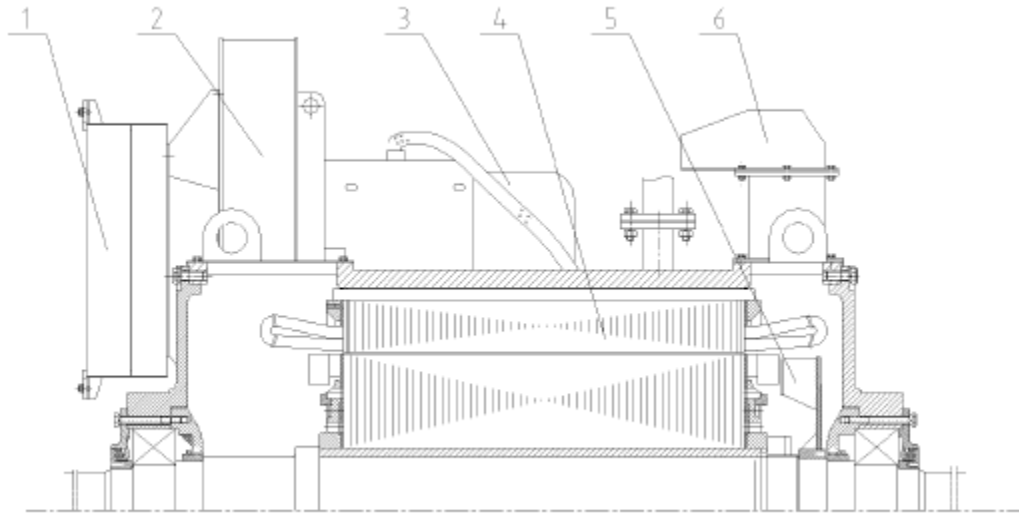


Figure 2 shows a fracturing pump air-cooled device. *Id.* ¶ 33. In operation, cool air enters through inlet 1 and is compressed by fan 2. *Id.* The compressed air flows into pump motor core 4 and removes heat therefrom. *Id.* Fan 5 draws the air out through outlet 6. *Id.*

Zhang's pump also includes a water-cooled device, illustrated in Figure 3. Ex. 1005 ¶ 34. In operation, cooled water in tank 11 is pressurized by water pump 12 (*see id.* at Fig. 4) and enters pump motor water jacket 7 via inlet 8. *Id.* ¶ 34, Fig. 3. The water passes through an S-shaped passage within the water jacket and removes heat therefrom. *Id.* ¶ 34. The water flows out through outlet 9, passes through heat sink 10 where its temperature is reduced, and flows back into tank 11. *Id.* ¶ 34, Fig. 3.

2. Stout

Stout relates to electric machines that convert mechanical movement into electrical power (i.e., generators) and convert electrical power into

mechanical movement (i.e., motors). Ex. 1006 ¶ 2. Figure 1A is a schematic of an example electric machine system and is reproduced below.

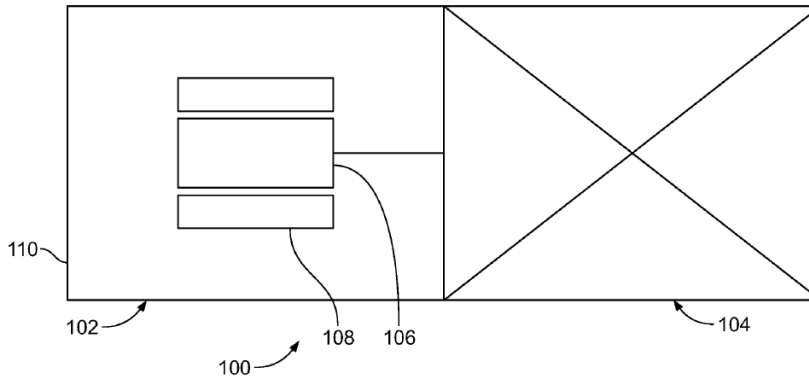


FIG. 1A

Figure 1A depicts electric machine system 100 comprising electric machine 102 coupled to companion device 104. *Id.* ¶ 87. Electric machine 102 can operate as a motor to output mechanical movement and drive the companion device. *Id.* The companion device may be a pump. *Id.* ¶ 90. Stout also discloses that the electric machine can be coupled to two or more companion devices (e.g., pumps) at the same time. *Id.* For example, companion devices may be provided at opposing ends of the electric machine. *Id.* ¶ 91.

Figure 1C illustrates a cross section of an example electric machine system with two companion devices and is reproduced below.

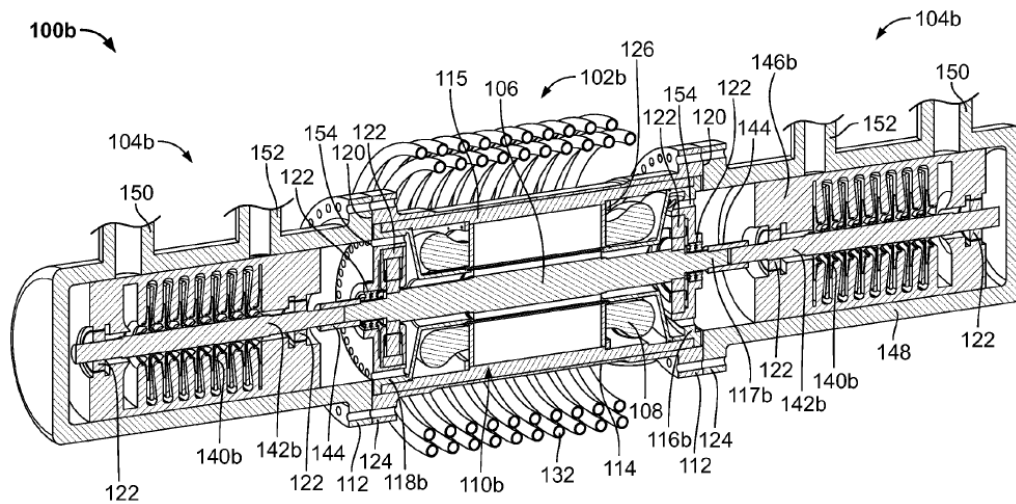


FIG. 1C

Figure 1C depicts an example electric machine system 100b including two compressor companion devices 104b arranged at opposite ends of electric machine 102b. Ex. 1006 ¶ 101. Although the companion devices are illustrated as compressors in Figure 1C (*id.*), pump companion devices 104a can be positioned in the same manner (*id.* ¶ 92).

3. API Standard 674

API Standard 674 is a publication by the American Petroleum Institute (“API”) that “covers the minimum requirements for reciprocating positive displacement pumps and pump units for use in the petroleum, petrochemical, and gas industry services.” Ex. 1007, 9. API Standard 674 specifies the use of flexible couplings between drivers and driven equipment. *Id.* at 42; *see also id.* at 40 (discussing electric motor drivers).

4. Coli

Coli relates to hydraulic fracturing in hydrocarbon-bearing wells. Ex. 1009 ¶ 3. Coli recognizes drawbacks of the diesel motors typically used in such drilling. *Id.* ¶¶ 5, 8. Coli purports to improve upon known

fracturing systems by using electric motors and generators powered by natural gas to drive the pumps. *Id.* ¶¶ 9–11, 38. Coli purports that this use of electric components beneficially reduces the amount of infrastructure, is safer and easier to control than known diesel systems, facilitates syncing the equipment within the system, and reduces costs. *Id.* ¶¶ 39, 66–71, 73.

Figure 3 is a schematic plan view of Coli’s fracturing trailer and is reproduced below.

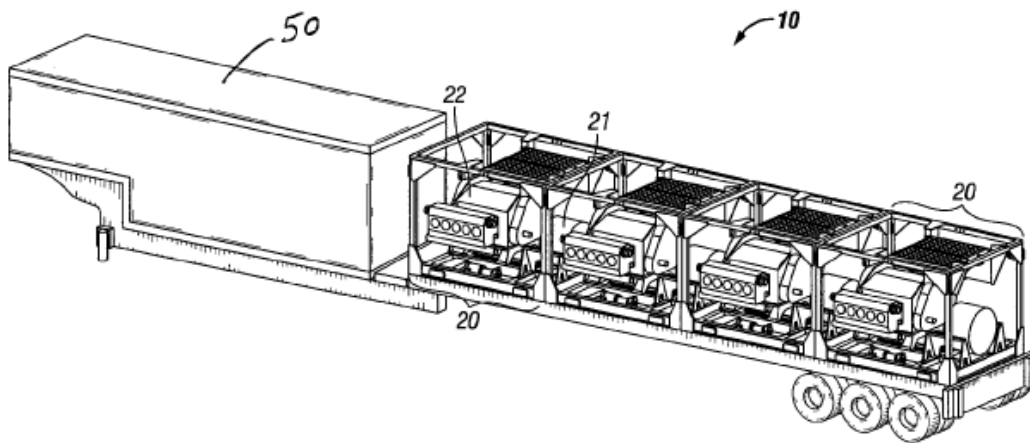


FIG. 3

Figure 3 is a schematic diagram of trailer 10 housing four fracturing modules 20. Ex. 1009 ¶ 40. Each fracturing module 20 includes electric motor 21 coupled directly to fluid pump 22. *Id.* ¶¶ 40, 52. The trailer housing also includes electrical transformer and drive unit 50 to step down the power voltage from turbine generator 30 (not shown) to electric motor 21. *Id.* ¶ 47. The “[f]racturing modules 20 utilize electric power from turbine generator 30 to pump the fracturing fluid directly to the wellbore.” *Id.* ¶ 40. Multiple natural gas-powered turbine generators may provide a dedicated source of electric power on-site. *Id.* ¶ 38.

5. API Standard 671

API Standard 671 is an API publication that “specifies the requirements for couplings for the transmission of power between the rotating shafts of two machines in special-purpose applications in the petroleum, petrochemical and natural gas industries.” Ex. 1010, 8. The couplings covered by API Standard 671 are designed to accommodate offset, angular misalignment, and axial displacement of coupled shafts without unacceptable mechanical loading. *Id.* For example, API Standard 671 applies to “gear, metallic flexible element, quill shaft and torsionally resilient type couplings.” *Id.*

6. Sanborn

Sanborn discloses a system for hydraulically fracturing a rock formation to extract hydrocarbons. Ex. 1011 ¶ 2. Sanborn recognizes that traditional hydraulic fracturing systems comprising diesel engines to power fracturing pumps can be inefficient, can require extra safeguards to address potential safety, noise, and environmental issues, and can have an undesirably large footprint. *Id.* ¶¶ 4–7. Sanborn purports to improve upon such known systems by using electric motors to power the pumps. *Id.* ¶¶ 10–11. Figure 1 is a schematic representation of the hydraulic fracturing system and is reproduced below.

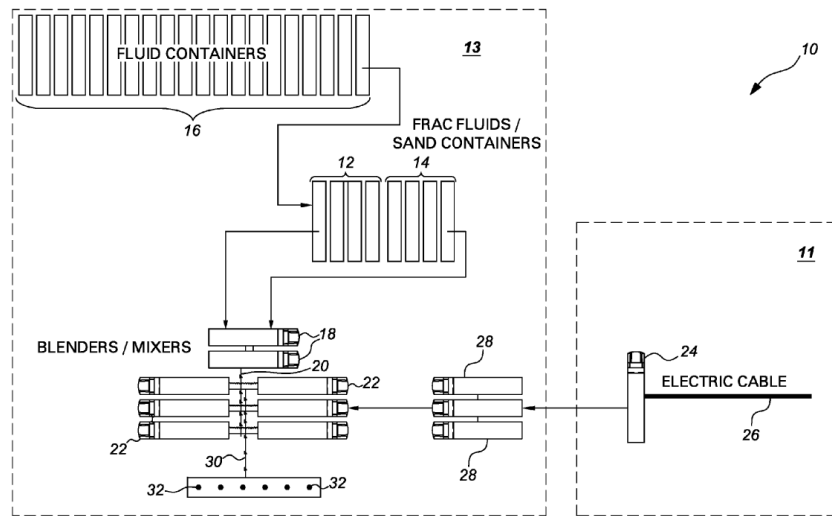


Fig. 1

Figure 1 is a schematic representation of the hydraulic fracturing system, including pumping sub-system 13 and power sub-system 11 that provides energy to the pumping sub-system. *Id.* ¶¶ 17, 33. The power sub-system includes electrical feed source 24, which may include a natural gas turbine engine and which may “be situated in a location remote from the pumping system.” *Id.* ¶¶ 19, 39. The feed source includes a power distribution unit that may use a transformer to reduce the supplied voltage. *Id.* ¶ 39.

Switchgears may be provided to “control multiple lines of power flow, such that faults or failures in individual components or units do not cause secondary damage to other components or units.” *Id.* ¶ 32. The pumping sub-system includes a plurality of pumps 22, each pumper including at least one pump and one or more electric motors to drive the pump(s). *Id.* ¶¶ 21, 38. The pumping sub-system includes variable frequency drives 28 to control the current supplied to the pumps. *Id.* ¶¶ 40–41.

7. *Naets*

Naets “relates to a compressor for use in a polyethylene high pressure reactor system, to a production plant including the compressor and to a process of making polyethylene homopolymers and copolymers.” Ex. 1012, 1:13–16. Ethylene is polymerized in high pressure reactors that typically employ a primary compressor to perform a first compression of the ethylene feedstock and a secondary compressor to perform a second compression. *Id.* at 1:20–30. Naets describes a recognized need in the industry to increase throughput of such secondary compressors (*id.* at 1:44–46), and describes one prior attempt as providing two compressor frames on opposite sides of an electric motor. *Id.* at 2:6–9; *see also id.* at 1:53–58 (describing typical secondary compressors as being reciprocating compressors driven by an electric motor positioned at one end of the compressor frame). Naets purports to improve upon such a design by providing a system comprising “a motor and at least two compressor frames, with at least one of the compressor frames being coupled to the motor by means of a contoured diaphragm flexible coupling.” *Id.* at 2:34–38. Such couplings “accommodate[] misalignment of the motor driveshaft and the compressor frame crankshaft” by flexing. *Id.* at 2:39–44. Figure 3 is a schematic drawing of a compressor and is reproduced below.

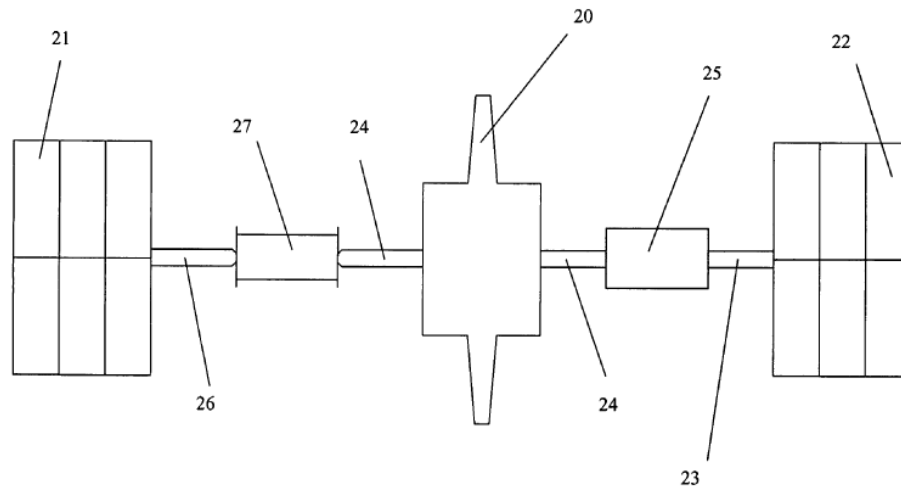


Fig. 3

Figure 3 illustrates a compressor comprising electric motor 20 arranged between compressor frames 21, 22. *Id.* at 6:45–48. Crankshaft 26 of compressor frame 21 is coupled to motor driveshaft 24 via contoured diaphragm flexible coupling 27. *Id.* at 6:51–54. Crankshaft 23 of compressor frame 22 is coupled to driveshaft 24 via rigid coupling 25, but a second contoured diaphragm flexible coupling could be used. *Id.* at 3:14–16, 6:48–51. The flexible coupling accommodates misalignment of the motor shaft and compressor frame crankshaft. *Id.* at 7:3–6.

8. Broussard

Broussard relates to hydraulic fracturing in oil and gas wells.

Ex. 1013 ¶ 2. The system includes pumps powered by electric motors. *Id.* ¶ 18. Generators, such as natural gas turbine generators, are used to power the motors. *Id.* ¶ 24. A control system controls the speed of the motor via a variable frequency drive. *Id.* ¶ 27. The variable frequency drive also provides protection by frequently performing motor diagnostics to prevent damage to a grounded or shorted motor. *Id.* ¶ 21. Broussard purports that its system provides several advantages over systems that use diesel-powered

pumps, including lighter weight, increased efficiency, lower cost, and reduced emissions. *Id.* ¶¶ 33–34.

E. Petitioner’s Witness

Patent Owner argues that the testimony of Petitioner’s witness, Mr. Marscher, is not credible because his testimony in this proceeding is inconsistent with his testimony in other Board proceedings and because he lacks relevant experience. PO Resp. 7–10. Patent Owner argues that Mr. Marscher’s testimony regarding the state of the art for hydraulic fracturing as being advanced, whether an ordinarily skilled artisan would have considered Coli’s motors to be appropriate for powering fracturing fluid pumps, and whether hydraulic fracturing requires high-pressure pumps is inconsistent with his testimony provided in other Board proceedings. *Id.* Patent Owner argues that Mr. Marscher’s testimony regarding the presence of spare pumps on-site at a fracturing operation is inconsistent with “objective documentary evidence.” *Id.* at 10 (citing Ex. 2016, 120:3–16; Ex. 2025, 2:11–19).⁵ Patent Owner criticizes Mr. Marscher for failing to have experience “with overseeing or designing parameters for a particular [hydraulic fracturing] job.” *Id.*

Petitioner replies that Mr. Marscher’s testimony in this proceeding is not inconsistent with his testimony in other Board proceedings. Pet. Reply 4–5. Petitioner argues that, rather than opining that “the state of the electric [fracturing] pump art was not advanced,” as asserted by Patent Owner (*see* PO Resp. 8), Mr. Marscher’s other testimony was directed to the

⁵ For Exhibit 2016, Patent Owner cites to reference pagination rather than the exhibit pagination. For consistency, we cite to the same pagination.

use of variable frequency drives with large motors. Pet. Reply 4 (citing Ex. 2017, 181:7–9). Petitioner argues that Patent Owner’s asserted “objective documentary evidence” supports Mr. Marscher’s opinion that one would operate with spare capacity rather than having spare trailers at a fracturing site. *Id.* at 5 (citing Ex. 2016, 119:8–23; Ex. 2025, 2:11–19).⁶ Petitioner argues that Patent Owner’s criticism of Mr. Marscher as lacking experience with overseeing or designing parameters for a particular hydraulic fracturing job applies equally to Patent Owner’s declarant, Dr. King, and, in any event, is immaterial because “the ’049 patent is not about overseeing or designing parameters for hydraulic fracturing sites.” *Id.* at 6. Rather, Petitioner contends, “[t]he ’049 patent claims the pumps, motors, and couplings used at fracturing sites, and Mr. Marscher is amply experienced in that department.” *Id.* (citing Ex. 2016, 17:18–21, 29:8–30:2; 122:15–19; Ex. 1052 ¶¶ 11–16).

Patent Owner replies that Petitioner’s interpretation of Mr. Marscher’s deposition testimony is inconsistent with Mr. Marscher’s description of the state of the art for variable frequency drives. PO Sur-reply 28–29 (citing Ex. 2017, 26:21–28:14, 64:24–65:16; 66:19–23, 69:15–71:24, 170:1–171:14, 181:10–17).⁷

We agree that Mr. Marscher’s cited testimony from another Board proceeding was in regard to variable frequency drives rather than electric fracturing. There, Mr. Marscher testifies that variable frequency drives

⁶ For Exhibit 2016, Petitioner sometimes cites to exhibit pagination rather than the reference pagination. For consistency, we convert those citations to the reference pagination.

⁷ Although Patent Owner cites to “EX1027, 181:10-17” (PO Sur-reply 28), the quoted language is in Exhibit 2017.

capable of working with large motors were known in the hydraulic fracturing community. *See, e.g.*, Ex. 2017, 181:10–17.

Regarding Mr. Marscher’s experience with particular fracturing jobs, the questions posed to Mr. Marscher were whether Mr. Marscher had overseen any fracking operations (Ex. 2016, 120:18) and whether he had designed operating parameters for a drilling job (*id.* at 125:9–12). The fact that Mr. Marscher has designed equipment for use in fracking operations (*see, e.g.*, Ex. 1003 ¶¶ 5–7), despite not “overseeing” any fracking operations, qualifies him as an expert in this proceeding. Mr. Marscher’s experience is also within Patent Owner’s proffered definition of a person having ordinary skill in the art. *See* PO Resp. 6–7. We also agree that Patent Owner’s criticism regarding Mr. Marscher’s lack of experience overseeing or designing parameters for a particular hydraulic fracturing job is not germane to the ’049 patent, which does not address such particulars.

Similarly, Patent Owner fails to explain persuasively how Mr. Marscher’s opinion regarding the desirability of having spare pumps on-site at a fracturing operation is relevant to his testimony or the ordinary level of skill in the art. Moreover, as correctly noted by Petitioner, the two references relied upon by Patent Owner as “objective documentary evidence” both refer to spare *capacity* rather than spare fracturing trailers as asserted by Patent Owner. *See* PO Resp. 2 (citing Ex. 2025, 2:11–19; Ex. 2026, 3), 10 (citing Ex. 2025, 2:11–19); *see also* Ex. 2016, 119:11–23 (discussing operating with spare pump capacity).

Finally, Petitioner does not address Patent Owner’s contentions that Mr. Marscher’s testimony in this proceeding regarding pressure levels required for hydraulic fracturing is inconsistent with his testimony in other

Board proceedings. *See* PO Resp. 9–10 (citing Ex. 1003 ¶ 42; Ex. 2017, 133:14–136:14, 137:21–138:20). However, Mr. Marscher’s testimony in the other proceeding appears to be specific to a hypothetical situation where the drilling is “not that deep” (*see* Ex. 2017, 134, 21–25), whereas Mr. Marscher’s testimony in this proceeding appears to be specific to Zhang’s system (Ex. 1003 ¶ 42 (discussing Zhang’s description of “the recovery of oil and gas through large-scale hydraulic fracturing operation” and opining that, “*in this context*,” how an ordinarily skilled artisan would understand “the term ‘*fracturing*’” (first emphasis added))).

Accordingly, we are not persuaded that the testimony of Mr. Marscher is not credible.

F. Asserted Obviousness Based on Zhang, Stout, and API Standard 674

Petitioner argues that claims 1–3 and 18 would have been obvious over Zhang, Stout, and API Standard 674. Pet. 8–38. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties’ briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that these claims would have been obvious in view of Zhang, Stout, and API Standard 674.

1. Independent Claims 1 and 18

Petitioner relies on Zhang to disclose a mobile hydraulic fracturing fluid delivery system substantially as recited in independent claim 1, relies on Stout to teach an electric motor that drives two reciprocating machines mounted at opposing ends of a single drive shaft, and relies on API Standard 674 to teach the use of flexible couplings between drivers and

driven equipment. Pet. 13–35. Claim 18 contains recitations that are substantially the same as those of claim 1. *Compare* Ex. 1001, 8:5–42, *with id.* at 10:11–41. Petitioner addresses claim 18 by relying on its arguments advanced for claim 1 (Pet. 37–38), and Patent Owner addresses claims 1 and 18 collectively (PO Resp. 11–36). Our analysis below focuses on claim 1 but applies equally to claim 18.

a. The Preamble

Claim 1 recites “[a] mobile hydraulic fracturing fluid delivery system for pumping high pressure fracturing fluid into an underground well bore at a well site and being transportable between multiple well sites.” Ex. 1001, 8:5–9. Petitioner argues that Zhang discloses such a system. Pet. 13–14.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Zhang discloses an oil-field fracturing apparatus including a fracturing pump and motor positioned on a fracturing car. Ex. 1005 ¶¶ 1, 26.

Accordingly, for the foregoing reasons and on this record, to the extent the preamble is limiting, Zhang supports Petitioner’s contentions.

b. The Chassis Recitation

Claim 1 recites “a chassis, said chassis being configured to be transportable between well sites.” Ex. 1001, 8:10–11. Petitioner maps Zhang’s fracturing car to the recited chassis. Pet. 14.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

As noted above, Zhang discloses an oil-field fracturing apparatus including a fracturing pump and motor positioned on a fracturing car. Ex. 1005 ¶¶ 1, 26.

Accordingly, for the foregoing reasons and on this record, Zhang supports Petitioner's contentions.

c. The Motor Recitation

Claim 1 recites “an electric motor disposed upon said chassis, said electric motor being electrically coupled to an external electric power source and having first and second opposing ends, said electric motor further having a single drive shaft extending axially therethrough and outwardly therefrom at said first and second opposing ends thereof.” Ex. 1001, 8:12–17. Petitioner maps Zhang's motor to the recited motor. Pet. 15–16. Petitioner argues that it would have been obvious to power Zhang's motor using an external electric power source for a number of reasons. *Id.* at 22. Petitioner argues that Zhang's motor includes two opposing ends (*id.* at 20) and a drive shaft that extends through the motor and outwardly from the opposing ends (*id.* at 23).

Petitioner alternatively relies on Stout to teach the use of an electric motor having two opposing ends. Pet. 16–21. Petitioner argues that Stout teaches a drive shaft that extends through the motor and outwardly from the opposing ends. *Id.* at 23–24.

Patent Owner does not contest these aspects of the Petition. *See generally* PO Resp.

Zhang discloses a fracturing pump that is driven by a motor rather than a diesel engine as used in conventional fracturing systems. Ex. 1005

¶ 17. The motor is mounted on a car. *Id.* ¶¶ 17–18. The motor appears to have a single drive shaft extending therethrough and outwardly from opposing ends. *See, e.g., id.* at Figs. 2, 3.

Stout discloses an electric machine that can operate as a motor. Ex. 1006 ¶ 87. The motor includes a rotor that extends therethrough and, in certain embodiments, outwardly from two opposing ends of the motor. *Id.* ¶¶ 88, 101, 105–106, Fig. 1C.

Accordingly, for the foregoing reasons and on this record, Zhang and Stout support Petitioner’s contentions.

d. The Pump Recitations

Claim 1 recites,

a first fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said first end of said motor and configured to pump fracturing fluid into the well bore;

a second fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said second end of said motor and configured to pump fracturing fluid into the well bore at the same time as said first fluid pump,

wherein said first and second fluid pumps are axially aligned with said electric motor at said opposing ends thereof, further wherein said drive shaft of said electric motor is coupled to said first and second fluid pumps so that said electric motor is capable of concurrently driving both said fluid pumps.

Ex. 1001, 8:18–32. Petitioner asserts that “Zhang describes an embodiment where two fracturing pumps are ‘provided on’ (disposed upon) a fracturing car.” Pet. 24 (emphasis omitted) (citing Ex. 1005 ¶¶ 6–7, 18, 31; Ex. 1003 ¶¶ 43–45). Petitioner argues that “Zhang teaches and illustrates an electric

motor that drives two (first and second) fracturing pumps.” *Id.* at 25 (emphases omitted) (citing Ex. 1005 ¶¶ 6–8, 17–18, 26, 31).

Patent Owner argues that Zhang does not disclose two pumps driven by a single electric motor. PO Resp. 11–16. Patent Owner argues that Zhang describes the prior art as using “a single pump paired with a single engine” and does not deviate from that “1:1 ratio of one pump to one engine/motor” when disclosing its improvement. *Id.* at 11–12 (citing Ex. 1005 ¶¶ 2–3). Patent Owner contends that Zhang discloses driving pumps with electric motors rather than diesel engines (*id.* at 12 (citing Ex. 1005, code (57))) and this substitution provides the benefits of simplifying the fracturing pump structure, reducing the apparatus mounted on the car, decreasing the failure rate, and increasing safety and reliability (*id.* at 13–14 (citing Ex. 1005 ¶ 17)). Patent Owner argues, however, “[n]owhere does Zhang state that two pumps are driven by a single motor.” *Id.* at 14; *see also* PO Sur-reply 11–14 (presenting similar arguments).

Petitioner replies by conceding that “Zhang does not expressly ‘state that two pumps are driven by a single motor.’” Pet. Reply 10. However, Petitioner argues, “when Zhang says Example 2 is ‘*the same*’ as Example 1 besides the ‘two fracturing pumps,’ the most natural conclusion is that the ‘same’ motor as Example 1 is driving both pumps.” *Id.* at 10–11.

We agree that Petitioner has not shown persuasively that Zhang discloses or suggests two pumps driven by a single motor. Zhang discloses a fracturing pump that is driven by a motor rather than a diesel engine. Ex. 1005 ¶ 17. Zhang explains that, among other benefits, eliminating the diesel engine and its related equipment “reduc[es] the apparatus mounted on a fracturing car,” which allows two pumps to be placed on a car. *Id.*

¶¶ 17–18. Nowhere, however, does Zhang disclose that two pumps are driven by a single motor. To the contrary, when discussing motor-pump connections, Zhang discloses only that *a* motor is coupled to the shaft of *a* fracturing pump. *See, e.g., id.* ¶¶ 6, 17, 26. Nor does Petitioner explain adequately how Zhang’s disclosure of mounting its cooling device between two fracturing pumps positioned on the same car translates to driving the two pumps with a single motor. *See id.* ¶ 31; *see also* Pet. 25 (citing same).

Regarding its first embodiment, Zhang discloses that “[t]he fracturing pump comprises a cooling device and a control device” and “[a] motor is coupled on a shaft of the fracturing pump.” Ex. 1005 ¶ 26; *see also* Pet. 25 (citing same). Thus, when Zhang states that Example 2 is “the same [as] example 1” but “two fracturing pumps are provided on a fracturing car” (Ex. 1005 ¶ 31), the implication is that two fracturing pumps, including two cooling devices and two control devices, and two motors are provided on the fracturing car. *See* Ex. 1045, 60:14–61:17 (Dr. King interpreting Zhang’s use of “the term ‘fracturing pump’ to mean a set of a pump directly coupled to a motor and including a cooling device and a control device”); PO Sur-reply 13 (“Zhang’s ‘fracturing pump’ has its own motor and, therefore, Zhang’s disclosure of ‘two fracturing pumps’ would include two motors.”).

Alternatively, Petitioner relies on Stout to teach two pumps driven by a single motor. Pet. 25–26 (citing Ex. 1006 ¶¶ 90, 92, 107–108); *see also id.* at 16 (citing Ex. 1006 ¶¶ 2, 87–88, 90, 92, 100).

Patent Owner argues that Stout’s “inventive concept” is “the inclusion of wedges in the stator slots to provide a fluid flow path” and that “Stout describes a variety of electric machines to illustrate the breadth of its inventive concept.” PO Resp. 16–17 (citing Ex. 1006 ¶¶ 88–89). According

to Patent Owner, however, Stout “does not suggest a preference for any particular configuration of a motor with one pump or a motor with two pumps.” *Id.*

Stout discloses that electric machine 102 can “operate as a motor producing mechanical movement from electricity” and “can drive the companion device 104.” Ex. 1006 ¶ 87. “[T]he companion device 104 can include . . . a rotating and/or reciprocating pump” *Id.* ¶ 90. “[T]he electric machine 102 can also be coupled to two or more companion devices 104 (to drive . . . the devices 104).” *Id.* ¶ 91. Stout also discloses that the “one or more companion devices 104 can be provided at each end of the electric machine 102” such that “one [companion device] may be provided at one end of the electric machine 102 and another provided at an opposing end of the electric machine.” *Id.*; *see also id.* at Fig. 1C (illustrating two companion devices 104b coupled to either end of rotor 106). Thus, Stout supports Petitioner’s contentions.

Petitioner argues that it would have been obvious to an ordinarily skilled artisan to incorporate Stout’s pump-motor-pump configuration into Zhang’s system for a number of reasons (Pet. 17–20), each of which Patent Owner contends is improper (PO Resp. 18–36). We discuss select ones of Petitioner’s proffered rationales below.

Petitioner argues that “Zhang touts the beneficial effects of ‘simplifying the structure of the entire fracturing pump, reducing the apparatus mounted on a fracturing car, [and] decreasing failure rate of the apparatus,’” and that “[i]t would have been apparent to [an ordinarily skilled artisan] that the pump-motor-pump configuration that Stout disclosed

promotes these same benefits.” Pet. 18–19 (first alteration in original) (emphases omitted) (quoting Ex. 1005 ¶ 17) (citing Ex. 1003 ¶ 54).

Patent Owner argues that Petitioner’s modification of driving two of Zhang’s pumps with one motor would require Zhang’s motor to be replaced with a larger motor. PO Resp. 23 (citing Ex. 2014 ¶ 69). According to Patent Owner, “[i]n Petitioner’s modification, a 5,750 horsepower (hp) motor would be required to operate both of Zhang’s ‘2500hp fracturing pump[s]’ without reducing capacity relative two of Zhang’s 2500hp pump-motor assemblies,” but Petitioner has produced “no evidence that utilizing one 5,750 hp motor to drive two pumps would simplify the pump system or achieve any actual benefits.” *Id.* at 24 (second alteration in original) (emphasis omitted) (citing Ex. 1005 ¶ 2). Patent Owner argues that, because neither Petitioner nor its declarant account for the impact of the required larger motor, Petitioner’s proffered reasoning for modifying Zhang’s system is unsupported. *Id.* at 23. Continuing, Patent Owner argues that “this larger motor would have been expected to suffer a significantly higher failure rate than one of Zhang’s original motors” (*id.* at 24 (citing Ex. 2015 ¶ 25; Ex. 2024, 4)) and “Petitioner’s modification would eliminate redundancy in the system, creating a single point of failure for both pumps” (*id.* at 25 (citing Ex. 2014 ¶ 72; Ex. 2015 ¶ 24)).

Petitioner replies that “any ‘given course of action often has simultaneous advantages and disadvantages.’” Pet. Reply 14–15 (quoting *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016)). Continuing, Petitioner argues that Patent Owner’s failure rate argument is “limited to the 5,001–10,000 horsepower class” of motors, but replacing two of Zhang’s 2000-horsepower motors

would only require a 4600-horsepower motor. *Id.* at 18–19 (citing Ex. 1005 ¶ 2). Petitioner also argues that the evidence relied upon by Patent Owner is unreliable and Patent Owner has not shown that it applies to modern motors. *Id.* at 19–20 (citing Ex. 2024, 3–5; Ex. 1052 ¶ 165). Petitioner asserts that Patent Owner’s evidence “is a secondhand account of a motor study performed in 1985” and both of Patent Owner’s witnesses admitted they did not analyze the study. *Id.* at 19 (citing Ex. 1044, 57:12–14; Ex. 1045, 64:20–24). Regarding Patent Owner’s redundancy arguments, Petitioner replies that “hydraulic fracturing sites have built-in fault tolerance in the form of substantial excess pumping capacity.” *Id.* at 21 (citing PO Resp. 10; Ex. 1015 ¶¶ 22–25; Ex. 1052 ¶¶ 179–180; Ex. 2016, 119:8–120:23).

Patent Owner replies that “Petitioner’s reliance on Zhang’s 2,000-horsepower pump . . . cannot coexist with the . . . ‘larger fracturing pumps’ theory.” PO Sur-reply 8 (citing Pet. Reply 15). Patent Owner argues that its “high-failure-rate theory is not limited to the 5,001–10,000 horsepower class; instead, it relies on the evidence-backed trend that larger motors have higher failure rates.” *Id.* at 9 (citing Ex. 2015 ¶ 25). Patent Owner argues that Petitioner fails to explain why an ordinarily skilled artisan “would have chosen to utilize a less-reliable motor to allegedly save on space and costs, when doing so would require expanding space and cost for redundant trailers.” *Id.* at 10–11.

Although Zhang discloses that the benefits noted by Petitioner (*see* Pet. 18–19) result from the use of an electric motor rather than a diesel engine (*see* Ex. 1005 ¶ 17), we understand Petitioner to argue that adoption of Stout’s pump-motor-pump configuration would provide similar benefits by simplifying the structure and reducing the number of components that

would otherwise be needed for two pump-motor sets or to allow one motor to drive two pumps. Petitioner's declarant provides examples of such additional equipment that would not be needed, including an additional prime mover (presumably a second motor to drive the second pump) and a transfer case (presumably to split power from a single motor into two pumps). Ex. 1003 ¶ 54. We find this argument a persuasive explanation for why an ordinarily skilled artisan would have adopted the pump-motor-pump configuration disclosed by Stout.

Patent Owner appears to agree that using a single motor to power two of Zhang's pumps provides some benefits. PO Resp. 23 ("Of course, one motor replacing two theoretically 'consolidates' the driveline by requiring one less piece of machinery."). Patent Owner's arguments, summarized above, asserting drawbacks associated with Petitioner's proposed modification are unavailing, as "a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006). "The fact that [Petitioner's asserted] motivating benefit comes at the expense of another benefit . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000). As summarized above, Petitioner persuasively responds to Patent Owner's assertions of such lost benefits. Although modifying Zhang to power two pumps with one motor may result in some drawbacks as asserted by Patent Owner, nonetheless, the modification provides other benefits, including reducing the apparatus

mounted on a fracturing car. *See* Pet. 18–19; Ex. 1003 ¶ 54; Ex. 1005 ¶ 17. Furthermore, “[i]t’s not necessary to show that a combination is ‘the *best* option, only that it be a *suitable* option.’” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (quoting *PAR Pharm., Inc. v. TWI Pharm., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014)). And Patent Owner’s declarant, Dr. King, acknowledges that the pump-motor-pump configuration proposed by Petitioner is a suitable option. *See* Ex. 1045, 41:1–15.

Petitioner also argues that using Stout’s pump-motor-pump configuration in Zhang’s system “would have yielded a predictable result from combining known prior art elements according to known methods.” Pet. 19 (citing Ex. 1003 ¶¶ 56–57; *KSR*, 550 U.S. at 416). According to Petitioner, “[e]ach element in combination merely performs the same function as it does separately.” *Id.* at 20 (citing Ex. 1003 ¶ 56).

Patent Owner argues that, “[b]ecause Petitioner fails to show that any of the alleged benefits are present in the proposed modification, Petitioner cannot now hide behind a single sentence of case law to fulfil its burden.” PO Resp. 34 (emphasis omitted). Patent Owner argues that the Petition does not explain adequately why an ordinarily skilled artisan would have understood “Zhang’s reciprocating ‘fracturing pump’ (which is placed on a trailer and pump[s] fracturing fluid into a wellbore at pressures high enough to fracture rock) and Stout’s subsea, centrifugal pump (which is submerged in the open sea and assists with oil production) to perform the same functions.” *Id.* (citing Ex. 2014 ¶ 87). Patent Owner argues that the testimony of Petitioner’s declarant in this proceeding is inconsistent with his testimony in prior proceedings. *Id.* at 35. Patent Owner notes that Mr. Marscher relies on several prior art references and argues that “the

Petition and Mr. Marscher's Declaration are entirely devoid of analysis of why any of the cited references are relevant to its motivation." *Id.* at 35.

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416. Here, Petitioner identifies prior art showing an electric motor powering two pumps attached to either end of the motor's drive shaft. Ex. 1006 ¶¶ 90–91, Fig. 1C. Mr. Marscher identifies additional prior art disclosing a hydraulic fracturing system having an electric motor powering two pumps attached to either end of the motor's drive shaft. *See* Ex. 1026 ¶¶ 54 (describing a hydraulic fracturing system having a "tandem pump system 600" including "two pumps 602a and 602b" and "a dual shaft motor [604] having a first shaft 606a coupled to the pump 602a and a second shaft 606b coupled to the pump 602b"), 72 (describing a hydraulic fracturing system having pump system 1100 wherein "both pumps 1002a and 1002b . . . [are] driven by a single shaft that is mechanically coupled to a single motor"), Fig. 6); *see also* Ex. 1003 ¶ 57 (citing Ex. 1026 ¶¶ 54, 72, Fig. 6, 11–13).⁸ Patent Owner acknowledges that it is known for hydraulic fracturing systems to use an electric motor to power two pumps. PO Resp. 4 (citing Ex. 1008 ¶ 27; Ex. 1019 ¶ 17; Ex. 1028, 5:25–28; Ex. 1024, 5:8–20; Ex. 1025, 3:2–12). And, as noted above, Dr. King, acknowledges that the pump-motor-pump configuration proposed by Petitioner is a suitable option for hydraulic fracturing. *See* Ex. 1045, 41:1–15. Claim 1 couples two pumps to the drive shaft of a motor as in the prior art. Thus, we conclude that the claimed subject matter would have been obvious to an ordinarily

⁸ Although Mr. Marscher cites to Ex. 1026, 9:53–60, 15:23–27, the language quoted by Mr. Marscher appears in paragraphs 54 and 72.

skilled artisan. This conclusion is supported by substantial evidence of record. *See, e.g.*, Ex. 1003 ¶¶ 56–57.

e. The Flex Coupling Recitations

Claim 1 recites,

at least a first flex coupling engaged with and between said electric motor and said first fluid pump and configured to allow movement of said electric motor and said first fluid pump relative to one another during and without disturbing the operation thereof; and

at least a second flex coupling engaged with and between said electric motor and said second fluid pump and configured to allow movement of said electric motor and said second fluid pump relative to one another during and without disturbing the operation thereof.

Ex. 1001, 8:33–42. Petitioner argues that the '049 patent concedes that the recited flex couplings were known and are used in a typical manner.

Pet. 30–32 (citing, *inter alia*, Ex. 1001, 5:58–67, 6:1–8). Petitioner also argues that API Standard 674 teaches the use of flexible couplings between drivers and driven equipment. Pet. 32–33 (citing Ex. 1007, 9, 42).

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

We agree that the '049 patent appears to concede that the recited flex couplings and the uses thereof were well known prior to the critical date of the '049 patent. For example, the '049 patent relies on an article published in 1989 to provide a description of the recited flex couplings. Ex. 1001, 5:58–67. The '049 patent also indicates that the recited flex couplings were commercially available prior to the filing date of the application resulting in the '049 patent. *Id.* at 6:1–8.

API Standard 674 is an API publication that sets forth “the minimum requirements for reciprocating positive displacement pumps and pump units for use in the petroleum, petrochemical, and gas industry services.”

Ex. 1007, 9. This standard provides for the use of “flexible couplings and guards between drivers and driven equipment.” *Id.* at 42.

Accordingly, for the foregoing reasons and on this record, API Standard 674 supports Petitioner’s contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included flex couplings in Zhang’s system (as modified by Stout).

f. Conclusion

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1 and 18 would have been obvious over the combination of Zhang, Stout, and API Standard 674.

2. *Dependent Claims 2 and 3*

Claims 2 and 3 each depend directly from claim 1. Ex. 1001, 8:43–50. Petitioner contends that Zhang teaches or suggests the recitations of these claims and supports these contentions with declaration testimony. Pet. 35–37 (citing Ex. 1003). Patent Owner does not contest Petitioner’s challenges to these claims apart from its contentions regarding parent claim 1. *See generally* PO Resp.

We determine that Petitioner’s contentions regarding these dependent claims are fully supported by the record. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that claims 2 and 3 would have been obvious in view of the combination of Zhang, Stout,

and API Standard 674. *See In re NuVasive*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“The Board, having found the only disputed limitations together in one reference, was not required to address undisputed matters.”); Paper 11, 9 (emphasizing that “arguments for patentability not raised in the response may be deemed waived”).

G. Asserted Obviousness Based on Zhang, Stout, API Standard 674, and Broussard

Petitioner argues that claims 6–8, 10, 12, 19, and 20 would have been obvious over Zhang, Stout, API Standard 674, and Broussard. Pet. 38–47. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties’ briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that these claims would have been obvious in view of Zhang, Stout, API Standard 674, and Broussard.

1. Dependent Claims 6–8, 10, and 12

Claims 6–8, 10, and 12 depend, directly or indirectly, from claim 1. Ex. 1001, 8:61–9:7, 9:13–15, 9:19–21. Petitioner contends that Broussard teaches or suggests the recitations of these claims and supports these contentions with declaration testimony. Pet. 42–46 (citing Ex. 1003). Patent Owner does not contest Petitioner’s challenges to these claims apart from its contentions regarding parent claim 1. *See generally* PO Resp.

We determine that Petitioner’s contentions regarding these dependent claims are fully supported by the record. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that claims 6–8, 10, and 12 would have been obvious in view of the combination

of Zhang, Stout, API Standard 674, and Broussard. *See In re NuVasive*, 841 at 974; Paper 11, 9.

2. Independent Claim 19

Independent claim 19 recites a method of providing a high volume of pressurized fluid from a single mobile high pressure fluid delivery system into an underground well bore containing recitations that are substantially the same as those of claim 1 and additional recitations regarding a variable frequency drive. Ex. 1001, 10:42–11:7. Petitioner relies on Zhang, Stout, and API Standard 674 as set forth in § II.F above regarding claim 1 and relies on Broussard to teach a variable frequency drive to power the motor. Pet. 42–44, 47. We rely on our discussion above regarding the similar recitations and the additional comments below regarding the variable frequency drive recitations.

Claim 19 recites “electrically connecting a remotely controllable variable frequency drive disposed on the chassis to the electric motor and an external electric power source” and “the variable frequency drive providing electric power to the electric motor from the external electric power source and allowing the speed of the electric motor to be remotely controlled.” Ex. 1001, 11:1–7. Petitioner notes that Zhang discloses controlling the motor using a middle-voltage numerical control frequency converter and argues that an ordinarily skilled artisan “would have understood Zhang’s use of the term ‘frequency converter’ in this context as referencing a VFD.” Pet. 39. Thus, Petitioner argues, the skilled artisan would look to the teachings of Broussard. *Id.* at 39, 42.

Patent Owner does not contest Petitioner's challenge to claim 19 other than by relying on its arguments presented for claim 1 and discussed above. *See* PO Resp 36.

Broussard discloses a fracturing system including pumps powered by electric motors. Ex. 1013 ¶¶ 2, 8. A control system, remote from the variable frequency drive, controls the speed of the motor via a variable frequency drive. *Id.* ¶ 27. The variable frequency drive also provides protection by frequently performing motor diagnostics to prevent damage to a grounded or shorted motor. *Id.* ¶ 21.

Accordingly, for the foregoing reasons and those set forth in § II.F above, Broussard supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included a variable frequency drive in Zhang's system (as modified by Stout and API Standard 674). *See* Pet. 39–41.

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 19 would have been obvious over the combination of Zhang, Stout, API Standard 674, and Broussard.

3. Dependent Claim 20

Claim 20 depends directly from claim 19. Ex. 1001, 8–12. Petitioner contends that Broussard teaches or suggests the recitations of this claim and supports these contentions with declaration testimony. Pet. 47 (citing *id.* at 42–44; Ex. 1003). Patent Owner does not contest Petitioner's challenges to these claims apart from its contentions regarding parent claim 1. *See generally* PO Resp.

We determine that Petitioner’s contentions regarding this dependent claim are fully supported by the record. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that claim 20 would have been obvious in view of the combination of Zhang, Stout, API Standard 674, and Broussard. *See In re NuVasive*, 841 at 974; Paper 11, 9.

H. Asserted Obviousness Based on Zhang, Stout, API Standard 674, Broussard, and API Standard 671

Petitioner argues that claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 would have been obvious over Zhang, Stout, API Standard 674, Broussard, and API Standard 671. Pet. 47–52. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties’ briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that these claims would have been obvious in view of Zhang, Stout, API Standard 674, Broussard, and API Standard 671.

Petitioner relies on Zhang, Stout, API Standard 674, and Broussard as set forth in §§ II.F and II.G above. Pet. 51. Petitioner relies on API Standard 671 “to address any interpretation that the claimed flex couplings of [claims 1, 18, and 19] must accommodate inadvertent misalignment by deformation through material flexure.” *Id.* (emphasis omitted). Petitioner addresses independent claim 13 in substantially the same manner as claim 19 discussed in § II.G above. *Id.* at 52.

Petitioner argues that “[t]he ‘metallic flexible-element coupling’ endorsed by API Standard 671 is a ‘coupling type that obtains its flexibility from the flexing of thin metallic discs, diaphragms or links.’” Pet. 50 (emphasis omitted) (quoting Ex. 1010, 11). Petitioner argues that an

ordinarily skilled artisan would have used such couplings as the flexible couplings disclosed by API Standard 674. *Id.* at 48–50.

Patent Owner does not contest Petitioner’s challenge other than by relying on its arguments presented for claim 1 and discussed above. *See* PO Resp 36.

The cited portions of API Standard 671 support Petitioner’s contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have combined the teachings of Zhang, Stout, API Standard 674, Broussard, and API Standard 671. *See* Pet. 48–50.

Accordingly, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 would have been obvious over Zhang, Stout, API Standard 674, Broussard, and API Standard 671.

I. Asserted Obviousness Based on Sanborn and Naets

Petitioner argues that claims 1–3, 6–8, 12, 13, 15, and 18–20 would have been obvious over Sanborn and Naets. Pet. 53–76. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties’ briefs and the evidence of record and determine that, for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that these claims would have been obvious in view of Sanborn and Naets.

1. Patent Owner's Non-Analogous Art Argument as to Naets

Patent Owner argues that the Petition's reliance on Naets is improper because the reference is not analogous to the invention claimed in the '049 patent. PO Resp. 60–65.

A reference qualifies as prior art for a determination under § 103 when it is analogous to the claimed invention. *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992).

Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

In re Bigio, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (citing *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986)).

The Supreme Court's decision in [*KSR*] directs us to construe the scope of analogous art broadly, stating that “*familiar items may have obvious uses beyond their primary purposes*, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle.” [*KSR*, 550 U.S.] at 402 (emphasis added).

Wyers v. Master Lock Co., 616 F.3d 1231, 1238 (Fed. Cir. 2010).

a. Field of Endeavor

Patent Owner argues that “[t]he '049 patent is in the field of hydraulic fracturing” (PO Resp. 60 (quoting Inst. Dec. 38)) and “Naets is in the field of ethylene polymerization tubular reactors” (*id.* (citing Inst. Dec. 38)).

Petitioner argues that “the '049 patent pertains to ‘operations . . . for delivering a high volume of fluid’” and “Naets's disclosure on compressors

and pumps for delivering high-pressure ethylene falls within the '049 patent's field." Pet. 35.

The '049 patent is in the field of hydraulic fracturing. *E.g.*, Ex. 1001, 1:8–11. Naets is in the field of ethylene polymerization tubular reactors. *E.g.*, Ex. 1012, 1:13–16. Thus, we determine that Naets is not in the same field of endeavor as the '049 patent.

b. Reasonable Pertinence to Inventors' Problem

Petitioner argues that both the '049 patent and Naets address "the problem of coupling a prime mover to driven machinery." Pet. 55.

Patent Owner argues that "the '049 Patent discloses a system that addresses problems of reducing weight of fracturing equipment on a chassis and providing a better flow into the well bore, at a constant target pressure without pressure spikes." PO Resp. 62. Patent Owner argues that Naets addresses the use of flexible couplings that are specific to secondary compressors that experience enormous mechanical forces. *Id.* at 62–63 (citing Ex. 1012, 1:30–35, 2:8–28, Fig. 4). Patent Owner criticizes Petitioner's definition of a problem addressed by Naets as being too generic and not "specifically tied to couplings for hyper-compressors." *Id.* at 63. Continuing, Patent Owner argues that "Petitioner's modification is not limited to the flexible couplings, but also requires implementing [Naets's] compressor layout." *Id.* at 65.

Petitioner replies that Patent Owner's definitions of problems faced by the inventors of the '049 patent and Naets are too narrow. Pet. Reply 22–23.

Patent Owner replies that Petitioner's definition of a problem faced by the inventors of the '049 patent is too broad. Pet. Sur-reply 23–24.

Our reviewing court has cautioned against defining the problems faced by an inventor too narrowly. *Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1360 (Fed. Cir. 2020) (“[T]he reasonable-pertinence analysis must be carried out through the lens of a [person having ordinary skill in the art] who is considering turning to art outside her field of endeavor.”; “Such a[n artisan]—resigned to considering art outside her field of endeavor—would thus not identify the problems so narrowly so as to rule out all such art.”). We agree that Patent Owner’s definitions of the inventors’ problem improperly focus on the specific components of hydraulic fracturing equipment (regarding the ’049 patent) and hyper-compressors (regarding Naets), effectively precluding consideration of references outside the ’049 patent’s field of endeavor.

The ’049 patent discloses the use of flex couplings between its motor and pumps to accommodate relative movement between the motor and pumps during operation. Ex. 1001, 5:52–58. Naets also discloses the use of flexible couplings between its motor and compressors to accommodate misalignments therebetween. Ex. 1012, 2:39–44. Thus, Naets is analogous to the ’049 patent because it addresses a problem addressed by the inventors of the ’049 patent. *See Donner Tech.*, 979 F.3d at 1361 (“[I]f the two references have ‘pertinent similarities’ such that [the asserted reference] is reasonably pertinent to one or more of the problems to which the [challenged] patent pertains, then [the asserted reference] is analogous art.”).

Even considering Patent Owner’s narrow definition of the problem faced by the inventors of Naets, we are not persuaded that the inventors of the ’049 patent, faced with the problem of accommodating relative movement between the motor and pumps during operation (*see* Ex. 1001,

5:52–58; Pet. 55), would not have considered Naets’s disclosure of a solution to that problem (*see* Ex. 1012, 2:39–44). That the flexible coupling of the ’049 patent might not be appropriate for use in Naets’s system, as asserted by Patent Owner (*see* PO Resp. 64), does not explain why Naets’s flexible coupling would not be appropriate for use in the system of the ’049 patent. “The relevant question is whether a [person having ordinary skill in the art] ‘would reasonably have consulted’ the reference in solving the relevant problem.” *Donner*, 979 F.3d at 1361.

Regarding Patent Owner’s suggestion that, because Petitioner relies on the problem of coupling a prime mover to driven machinery, Petitioner may not rely on other parts of Naets, namely its compressor layout (*see* PO Resp. 65), Patent Owner’s position is not supported by case law. To the contrary, our reviewing court has explained that a reference (not just a portion of a reference) is analogous art if it addresses at least one problem faced by the inventors of the challenged patent. *See Donner*, 979 F.3d at 1361 (“[I]f the two references have ‘pertinent similarities’ such that [the asserted reference] is reasonably pertinent to *one or more of the problems* to which the [challenged] patent pertains, then [the asserted reference] is analogous art.” (emphasis added)).

c. Conclusion

Accordingly, because we determine that Naets is reasonably pertinent to a particular problem faced by the inventors of the ’049 patent, Naets is analogous art.

2. Independent Claims 1 and 18

Petitioner relies on Sanborn to disclose a mobile hydraulic fracturing fluid delivery system substantially as recited in claim 1 and relies on Naets to teach mounting two driven pumps on opposing ends of a single drive shaft via flexible couplings. Pet. 58–68. Petitioner addresses independent claim 18 by relying on its arguments advanced for claim 1 (*id.* at 75), and Patent Owner addresses claims 1 and 18 collectively (PO Resp. 36–65). Our analysis below focuses on claim 1 but applies equally to claim 18.

a. The Preamble⁹

Petitioner argues that Sanborn discloses a mobile fracturing fluid delivery system. Pet. 58–59.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Sanborn discloses a portable, modular system for hydraulically fracturing a rock formation to extract hydrocarbons. Ex. 1011 ¶ 2.

Accordingly, for the foregoing reasons and on this record, to the extent the preamble is limiting, Sanborn supports Petitioner’s contentions.

b. The Chassis Recitation

Petitioner maps Sanborn’s mobile platforms to the recited chassis. Pet. 59.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

⁹ The claim language is reproduced in § II.F.1.

Sanborn's system includes mobile platforms on which pumping units, referred to as "pumpers," comprising one or more pumps and one or more electric motors are positioned. Ex. 1011 ¶ 21.

Accordingly, for the foregoing reasons and on this record, Sanborn supports Petitioner's contentions.

c. The Motor Recitation

Petitioner maps Sanborn's motor to the recited motor. Pet. 60. Petitioner argues that all of Sanborn's motors are powered by a single electrical feed source that is external to the pumpers. *Id.* Petitioner relies on Naets to teach a motor having a single drive shaft that extends therethrough and outwardly from opposing ends of the motor. *Id.* at 61–62.

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Sanborn's power sub-system 11 provides energy to the pumping sub-system. Ex. 1011 ¶¶ 17, 33. The power sub-system includes an electrical feed source, which may include a natural gas turbine engine and which may "be situated in a location remote from the pumping system." *Id.* ¶ 19; *see also id.* ¶ 39 (discussing a power distribution unit).

Naets discloses a motor positioned between two compressor frames and having a drive shaft that extends through and outwardly therefrom. Ex. 1012, 6:45–54, Fig. 3.

Accordingly, for the foregoing reasons and on this record, Sanborn and Naets support Petitioner's contentions.

d. The Pump Recitations

Petitioner argues that Sanborn discloses that its motor can power multiple pumps concurrently. Pet. 63–64. Petitioner relies on Naets to teach positioning two concurrently driven components on opposing ends of the motor that drives the components. *Id.*; *see also id.* at 56–58 (presenting rationale for combining the teachings of Sanborn and Naets).

Patent Owner acknowledges that Naets discloses that an initial reciprocating pump can be used instead of a primary compressor, but argues that Naets does not suggest using pumps in place of the secondary compressor frames. PO Resp. 41–42.

Patent Owner’s argument does not address Petitioner’s proposed modification of Sanborn’s system. Rather than replacing Naets’s compressor frames with pumps, Petition argues that it would have been obvious to position Sanborn’s two pumps on either side of its motor in the same manner that Naets positions its reciprocating machines on either side of its motor. *See* Pet. 56, 63–64.

Sanborn discloses driving two pumps with a single motor. *See* Ex. 1011 ¶ 21 (“An electrical motor could power multiple pumps.”). Naets discloses a motor positioned between and driving two compressor frames via the drive shaft. Ex. 1012, 6:45–54, Fig. 3.

Accordingly, for the foregoing reasons and on this record, Sanborn and Naets support Petitioner’s contentions.

Petitioner argues that it would have been obvious to an ordinarily skilled artisan to arrange Sanborn’s pumps on either side of its motor in the same manner that Naets positions its reciprocating machines on either side of its motor. Pet. 56–58. Patent Owner contests each of Petitioner’s stated

rationales for modifying Sanborn's system. PO Resp. 47–60. We discuss select ones of Petitioner's proffered rationales below.

Petitioner relies on Sanborn to provide a teaching-suggestion-motivation rationale to drive two pumps with a single motor. Pet. 56–57 (citing Ex. 1011 ¶ 21; Ex. 1003 ¶ 147). Petitioner argues that it would have been obvious to use the design options taught by Naets.

Patent Owner acknowledges that Sanborn “states that ‘[a]n electrical motor could power multiple pumps,’” but argues that “Sanborn explicitly states its ‘preferred embodiments . . . comprises two pump-motor sets.’” PO Resp. 48 (alterations in original) (emphasis omitted) (citing Ex. 1011 ¶ 38); *see also id.* at 56–57 (presenting similar arguments). Continuing, Patent Owner argues that “Sanborn only suggests using connections that are ‘known in the [hydraulic fracturing] art,’” but “Petitioner does not establish that pump-motor-pump configurations were such known connections in the [hydraulic fracturing] art.” *Id.* at 49 (first alteration in original) (citing Pet. 56; Inst. Dec. 38). Patent Owner argues that an ordinarily skilled artisan would not rely on the teachings of Naets to modify Sanborn's system because the references “are related to driving distinct, reciprocating machinery, which are known (explicitly, in technical text addressing both) to share ‘very little design criteria or construction details.’” *Id.* at 49–50 (citing Ex. 2020, 3.21); *see also id.* at 42–43 (presenting similar arguments).

We disagree with Patent Owner's interpretation of Sanborn's disclosure in paragraph 38. Here, Sanborn states that, “[i]n *some* preferred embodiments . . . each pumper comprises two pump-motor sets” (emphasis added); *see* Pet. Reply 25. This paragraph also discloses that “each pumper 22 *typically (though not always)* includes at least one pump, and an

electric motor to drive that pump” (emphasis added). We fail to see such an explicit statement as asserted by Patent Owner. Moreover, Sanborn discloses an embodiment in which one motor powers multiple pumps (Ex. 1011 ¶ 21), and it is this embodiment upon which Petitioner relies. Pet. 56 (citing Ex. 1011 ¶ 21), 63 (citing same).

Petitioner relies on Sanborn’s disclosure in paragraph 21 to provide teaching-suggestion-motivation rationale for relying on the teachings of Naets. Pet. 56–57. Here, Sanborn states, “Techniques for providing the physical and electrical connections between the pumps and the motors are known in the art.” As explained above, Naets discloses a motor positioned between and driving two components via opposite ends of a single drive shaft. Ex. 1012, 6:45–54, Fig. 3. And, as also explained above, Naets is analogous art. Petitioner’s arguments are supported by declaration testimony. *See* Ex. 1003 ¶ 147; Pet. 56–57 (citing same). We find this argument persuasive to explain why an ordinarily skilled artisan would arrange Sanborn’s pumps on either side of its motor.

Petitioner also argues that “utilizing one electric motor to directly drive two pumps simplifies and consolidates the driveline by foregoing additional components such as prime movers, transmissions, transfer cases, etc.” Pet. 57. Continuing, Petitioner argues that “avoiding additional components—each of which carries its own set of failure modes—bolsters system reliability.” *Id.*

Patent Owner argues that “by ‘avoiding’ an additional motor, Petitioner’s modification strips Sanborn’s system of its redundancy and creates a single point of failure.” PO Resp. 52. Petitioner argues that Naets’s two-frame secondary compressor includes more components than its

single-frame compressor. *Id.* Patent Owner argues that, “starting with Sanborn’s preferred arrangement—‘two pump-motor sets’ (EX1011, ¶[0038]),” Petitioner’s asserted advantages are unpersuasive. *Id.* at 53–54.

Patent Owner’s arguments are unavailing for the reasons set forth above regarding Patent Owner’s similar arguments contesting the Zhang-Stout combination. *Medichem*, 437 F.3d at 1165; *Winner*, 202 F.3d at 1349 n.8; *Intel*, 21 F.4th at 800.

We understand Petitioner to argue that *directly* driving each of the two pumps with the motor, rather than driving the pumps in another manner (such as serially), would eliminate the need for additional equipment that would otherwise be needed to allow the motor to drive the two pumps. Petitioner provides examples of such additional equipment that would not be needed, including a transfer case (presumably to split power from a single motor into two pumps). Pet. 57; *see also* Ex. 1003 ¶ 149. We find this argument persuasive to explain why an ordinarily skilled artisan would adopt the pump-motor-pump configuration disclosed by Naets.

Additionally, the “bolster[ing] system reliability” reasoning is supported by Petitioner’s expert, who testifies,

in the serial arrangement of motors and pumps, the shaft of the pump closest to the motor would need to be much larger in order to carry the torque to drive both pumps in series, requiring the pump closest to the motor to be a special – and much more expensive – pump which would be heavier in weight and less reliable.

Ex. 1003 ¶ 150.

Finally, Patent Owner criticizes the Petition as failing to set forth a “logical connection” between Sanborn and Naets. PO Resp. 43–47. Patent Owner argues that, instead, Petitioner relies on “the commonality of

‘reciprocating machine[ry].’” *Id.* at 45 (alteration in original) (quoting Pet. 56).

Petitioner replies that the Petition sets forth such a logical connection in its stated rationales to combine the teachings of Sanborn and Naets. Pet. Reply 23–24.

Patent Owner replies that Petitioner changed its reliance on Naets in the Reply. PO Sur-reply 24–25. According to Patent Owner, Petitioner’s modification of Sanborn in the Petition is “arranging Sanborn’s pumps and electric motor in the configuration described by Naets,” and the Reply recharacterizes the modification as “[t]he Petition’s combination is to couple Sanborn’s electric motor to two pumps in the manner Naets described for doing so with compressors.” *Id.* at 25 (citing Pet. 56; Pet. Reply 24).

Contrary to Patent Owner’s contentions, Petitioner does not rely on a “commonality” between Sanborn’s pumps and Naets’s compressors as rationale explaining why an ordinarily skilled artisan would arrange Sanborn’s pumps in the same manner as Naets’s compressors. As noted by Patent Owner (*see* PO Resp. 47–60) and addressed above, Petitioner presents five rationales for incorporating the teachings of Naets into Sanborn’s system.

Furthermore, we disagree with Patent Owner’s contention that Petitioner changed the Sanborn-Naets combination in the Reply. We understand Petitioner’s modification of “arranging Sanborn’s pumps and electric motor in the configuration described by Naets” (Pet. 56) to mean arranging Sanborn’s pumps in the way Naets arranges its compressors. The Petition confirms this is the intended interpretation. *See id.* at 63 (“the Sanborn-Naets combination incorporates Naets’s teaching of coupling two

(first and second) reciprocating machines—Sanborn’s fracturing fluid pumps—‘on the opposite side[s] of the motor’” (alteration in original) (emphases omitted)); *see also* Inst. Dec. 39 (“Petitioner relies on Naets to teach positioning driven components—reciprocating machines in Naets, pumps in Sanborn—on either side of a motor.” (citing Pet. 63–64)).

e. The Flex Coupling Recitations

Petitioner relies on Naets to teach the use of flexible couplings between the motor and pumps. Pet. 66–68. Petitioner argues that it would have been obvious to use such couplings in Sanborn’s system to accommodate misalignments between the motor and pumps during operation. *Id.*

Patent Owner does not contest this aspect of the Petition. *See generally* PO Resp.

Naets teaches the use of flexible couplings between its motor and compressor to accommodate misalignments therebetween. Ex. 1012, 2:39–44.

Accordingly, for the foregoing reasons and on this record, Naets supports Petitioner’s contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included flex couplings as taught by Naets in Sanborn’s system. *See* Pet. 66–68.

f. Conclusion

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1 and 18 would have been obvious over the combination of Sanborn and Naets.

3. Dependent Claims 2, 3, 6–8, and 12

Claims 2, 3, 6–8, and 12 directly or indirectly, from claim 1. Ex. 1001, 8:43–50, 8:61–9:7, 9:13–15, 9:19–21. Petitioner contends that Sanborn and Naets teach or suggest the recitations of these claims and supports these contentions with declaration testimony. Pet. 68–73 (citing Ex. 1003). Patent Owner does not contest Petitioner’s challenges to these claims apart from its contentions regarding parent claim 1. *See generally* PO Resp.

We determine that Petitioner’s contentions regarding these dependent claims are fully supported by the record. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that claims 2, 3, 6–8, and 12 would have been obvious in view of the combination of Sanborn and Naets. *See In re NuVasive*, 841 at 974; Paper 11, 9.

4. Independent Claims 13 and 19

Independent claim 13 recites a mobile high pressure fluid pumping unit for pumping high pressure fluid into an underground well bore at a well site and being transportable between multiple well sites containing recitations that are substantially the same as those of claim 1 and additional recitations regarding a variable frequency drive. Ex. 1001, 9:22–59. Claim 19 contains substantially the same recitations. *See id.* at 10:42–11:7. Additionally, rather than reciting “flex couplings” as in claims 1 and 19, claim 13 recites first and second “high horsepower elastic couplings.” *Id.* at 9:42–52. Petitioner relies on Sanborn and Naets as set forth in § II.I.2 above regarding claim 1 and relies on Sanborn to teach a variable frequency drive to power the motor and Naets to teach high horsepower elastic

couplings. Pet. 69–74. Patent Owner does not contest Petitioner’s challenge to claims 13 and 19 other than by relying on its arguments presented for claim 1 and discussed above. *See* PO Resp 60. We rely on our discussion above regarding the similar recitations and the additional comments below regarding the variable frequency drive and high horsepower elastic coupling recitations.

a. Variable Frequency Drive Recitations

Claim 13 recites,

a remotely controllable variable frequency drive disposed upon said chassis and electrically coupled to said electric motor and an external electric power source, said variable frequency drive being configured to provide electric power to said electric motor from said external electric power source and allow the speed of said electric motor to be remotely controlled.

Ex. 1001, 53–59. Claim 19 contains substantially the same recitations (*id.* at 11:1–7), and Petitioner addresses independent claim 19 by relying on the same arguments advanced for claim 13 (Pet. 73–76). Our analysis below focuses on claim 13 but applies equally to claim 19.

Petitioner maps Sanborn’s variable frequency drives to the recited variable frequency drive. Pet. 69–72.

Sanborn discloses variable frequency drives to control the electrical power supplied from the electrical feed source to the motors. Ex. 1011 ¶¶ 40–41, Fig. 1. The variable frequency drives are controlled via a control system that coordinates the power generation sub-system and the pumping sub-system. *Id.* ¶¶ 50–51. Sanborn discloses that the variable frequency drives are part of the pumping sub-system and are illustrated as being positioned on “trailers on which they might be situated.” *Id.* ¶ 40.

Petitioner's declarant testifies that it would have been obvious to position the variable frequency drives on the same trailer as the electrical motors that they control. Ex. 1003 ¶ 183.

Accordingly, for the foregoing reasons and on this record, Sanborn supports Petitioner's contentions.

b. High Horsepower Elastic Coupling Recitations

Claim 13 recites first and second "high horsepower elastic couplings." Ex. 1001, 9:42–52. Other than being "high horsepower elastic" couplings, the recitations are substantially the same as the "flex coupling" recitations of claim 1. *Compare id.*, with *id.* at 8:33–42. Petitioner relies on Naets to teach the use of flexible couplings between the motor and pumps. Pet. 74. Petitioner argues that an ordinarily skilled artisan would have tailored the flexible couplings to their use, including the high horsepower uses of Naets and Sanborn. *Id.*

Naets teaches the use of flexible couplings between its motor and compressor to accommodate misalignments therebetween. Ex. 1012, 2:39–44. Petitioner's declarant testifies that an ordinarily skilled artisan would understand Naets to describe high horsepower applications, and that such an artisan would select couplings rated for use with high horsepower components when selecting couplings for use in Sanborn's system. Ex. 1003 ¶ 137.

Accordingly, for the foregoing reasons and on this record, Naets supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary

skill in the art would have included flex couplings as taught by Naets in Sanborn's system. *See* Pet. 66–68.

c. Conclusion

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 13 and 19 would have been obvious over the combination of Sanborn and Naets.

5. *Dependent Claim 15 and 20*

Claim 15 depends directly from claim 13 (Ex. 1001, 9:64–67) and claim 20 depends directly from claim 19 (*id.* at 11:8–12). Petitioner contends that Sanborn and Naets teach or suggest the recitations of these claims and supports these contentions with declaration testimony. Pet. 73–76. Patent Owner does not contest Petitioner's challenges to these claims apart from its contentions regarding parent claim 1. *See generally* PO Resp.

We determine that Petitioner's contentions regarding these dependent claims are fully supported by the record. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that claims 15 and 20 would have been obvious in view of the combination of Sanborn and Naets. *See In re NuVasive*, 841 at 974; Paper 11, 9.

J. Asserted Obviousness Based on Sanborn, Naets, and Coli

Petitioner argues that claim 10 would have been obvious over Sanborn, Naets, and Coli. Pet. 76–80. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed the parties' briefs and the evidence of record and determine that,

for the reasons explained below, Petitioner has shown, by a preponderance of the evidence, that this claim would have been obvious in view of Sanborn, Naets, and Coli.

Claim 10 depends from claim 1 through claim 6 and further recites “wherein said electric motor is an AC permanent magnet motor having a power rating of 5,000 hp.” Ex. 1001, 9:12–14. Petitioner notes that Sanborn discloses an example pump as having a capacity in the range of about 2,000 hp to about 3,000 hp. Pet. 79 (citing Ex. 1011 ¶ 22). Petitioner argues that, because Sanborn discloses its motor powering multiple pumps, an ordinarily skilled artisan would have understood “that the motor should have a power rating sufficient to drive such a multi-pump load.” *Id.* (emphasis omitted) (citing Ex. 1011 ¶¶ 21–22; Ex. 1003 ¶ 200). Thus, Petitioner concludes, an ordinarily skilled artisan “would have understood Sanborn to provide an electric motor having a power rating within a range of 4,000hp to 6,000hp, as would have been appropriate for driving two 2,000hp to 3,000hp pumps at either end of the drive shaft.” *Id.* (emphases omitted) (citing Ex. 1003 ¶¶ 200–201; *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003)).

Petitioner relies on Coli to teach the use of a permanent magnet motor. Pet. 80. Coli discloses a fracturing system that includes permanent magnet motors to power its pumps. Ex. 1009 ¶¶ 9, 11. Petitioner’s expert testifies that permanent magnet motors were known to be compact, lightweight, highly efficient, and provide precise speed control. Ex. 1003 ¶¶ 194, 198. Accordingly, Coli supports Petitioner’s contentions.

Petitioner argues that it would have been obvious to an ordinarily skilled artisan to use a permanent magnet motor as disclosed by Coli in Sanborn’s system for a number of reasons (*id.* at 77–78), each of which

Patent Owner contends is improper (PO Resp. 65–67). We discuss each of Petitioner’s proffered rationales below.

First, Petitioner argues that an ordinarily skilled artisan, considering Sanborn’s “suggestion to select an appropriate electric motor capable of powering fracturing pumps with power ratings between 2,000 and 3,000hp, would have looked for references that describe relevant design options.” Pet. 77 (citing Ex. 1011 ¶¶ 21–22; Ex. 1003 ¶¶ 195–197). Petitioner argues that Coli is such a reference because it discloses “appropriate electric motors for powering fracturing fluid pumps.” *Id.* (citing Ex. 1003 ¶¶ 195–197).

Patent Owner argues that “the only example of an electric motor ‘suitable for [Coli’s] purpose’ is the ‘TeraTorq’ motor.” PO Resp. 66 (alteration in original) (citing Ex. 1009 ¶¶ 50–51).¹⁰ Patent Owner notes, however, that Mr. Marscher described this “as a ‘problematic motor’ and something that a[n ordinarily skilled artisan] would not have . . . used if properly examined.” *Id.* (citing Ex. 2016, 183:19–184:4).

Petitioner replies that “[t]he TeraTorq motor is not the basis of Mr. Marscher’s opinions.” Pet. Reply 26.

We do not read the Petition as narrowly as Patent Owner suggests. Rather than relying on the TeraTorq motor, Petitioner relies on “Coli’s disclosure o[f] appropriate electric motors for powering fracturing fluid pumps.” Pet. 77. As noted by Patent Owner, Mr. Marscher suggests that the TeraTorq motor disclosed by Coli might not be an appropriate motor. PO Resp. 66 (citing Ex. 2016, 183:19–184:4). However, Mr. Marscher explains that an ordinarily skilled artisan would be able to implement the teachings of

¹⁰ We note that Patent Owner appears to include quotations taken from paragraph 52 of Coli (Exhibit 1009).

Coli. Ex. 2016, 184:10–15 (“So I could see somebody, including myself, being concerned that [Coli] is referencing a motor [(the TeraTorq motor)] that in the end failed commercially, but the concept that [Coli] is providing at the time could have been implemented with this Chinese motor that was basically equivalent or better.”). And Patent Owner explicitly acknowledges this: “the ‘typical POSITA would have [known that the TeraTorq motor was not a good option].’” PO Resp. 66 (alteration in original) (citing Ex. 2016, 186:4–187:13). We find this argument persuasive to explain why an ordinarily skilled artisan would use a permanent magnet motor in Sanborn’s system.

Next, Petitioner argues that “permanent magnet motors were known to have desirable characteristics, such as relatively high efficiency, small size and light weight, and the ability to maintain high torque at low speed.” Pet. 78 (citing Ex. 1003 ¶ 198). We find this argument persuasive to explain why an ordinarily skilled artisan would use a permanent magnet motor in Sanborn’s system.

Patent Owner contests this rationale by repeating its arguments regarding the TeraTorq motor (PO Resp. 66–67), which are unavailing for the reasons explained above. We further disagree with Patent Owner’s characterization of Mr. Marscher’s testimony. Rather than saying that “Coli’s motor was problematic,” as asserted by Patent Owner (*id.* at 66), Mr. Marscher’s testimony was specific to the TeraTorq motor. *See, e.g.*, Ex. 2016, 183:20–21 (“the TeraTorq motor, which was the problematic motor”). And rather than saying that the manufacturer of the TeraTorq motor “had filed for bankruptcy by the filing date of the ’049 Patent” (PO Resp. 66), Mr. Marscher testified, “It was 2013 or ’14, I think, that the

company, Comprehensive Power - - I think they filed Chapter 11.”
Ex. 2016, 186:7–9.

Finally, Petitioner argues that an ordinarily skilled artisan “would have understood that implementing Coli’s teachings to use an AC permanent magnet motor in the context of Sanborn’s fracturing pump assembly (as configured according to Naets) would have yielded a predictable result from combining known prior art elements according to known methods.” Pet. 78 (citing Ex. 1003 ¶ 199; *KSR*, 550 U.S. at 416). We find this argument persuasive to explain why an ordinarily skilled artisan would use a permanent magnet motor in Sanborn’s system.

Patent Owner contests this rationale by repeating its arguments regarding the TeraTorq motor (PO Resp. 67), which are unavailing for the reasons explained above.

For the foregoing reasons, we determine that Petitioner has shown, by a preponderance of the evidence, that claim 10 would have been obvious over the combination of Sanborn, Naets, and Coli.

III. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner filed a Motion to Exclude Exhibits 1050, 1051, 1053, and 1054. Paper 27 (“Mot. Exc.”). Petitioner opposed the Motion. Paper 29 (“Opp. Exc.”). Patent Owner filed a Reply in support of the Motion. Paper 32 (“Reply Exc.”).

The party moving to exclude evidence bears the burden of proof to establish that it is entitled to the relief requested—namely, that the material sought to be excluded is inadmissible under the Federal Rules of Evidence

(“FRE”). *See* 37 C.F.R. §§ 42.20(c), 42.62(a). For the reasons discussed below, Patent Owner’s Motion to Exclude is *dismissed*.

Petitioner filed the subject exhibits simultaneously with its Reply and the supplemental declaration of Mr. Marscher. Patent Owner asserts that Mr. Marscher relies on the subject exhibits “to support his allegations about the state of the prior art.” Mot. Exc. 1. Patent Owner seeks to exclude Exhibits 1050, 1051, and 1053, arguing that Mr. Marscher’s reliance on dates set forth in these exhibits as publication dates constitutes inadmissible hearsay. *Id.* at 2–4; Reply Exc. 3. Patent Owner argues that, because Petitioner has “failed to establish that Exhibits 1050, 1051, 1053, and 1054 were published prior to the ’049 Patent’s priority date,” Petitioner’s reliance on statements within each of the subject exhibits constitutes hearsay. Mot. Ex. 4–5. Patent Owner argues that Petitioner has failed to authenticate all of the subject exhibits. *Id.* at 5–6 (citing FRE 901(a)); Reply Exc. 1–2.

Petitioner argues that the subject exhibits are admissible under the residual hearsay exception of FRE 807 and as the bases of an expert opinion under FRE 703. Opp. Exc. 3–7. Petitioner argues that the subject exhibits have been authenticated per FRE 901 through the testimony of Mr. Marscher and by their distinctive characteristics. *Id.* at 7–9.

We do not rely on the materials Patent Owner seeks to exclude in making our conclusions in this proceeding. Accordingly, we *dismiss* as moot Patent Owner’s Motion to Exclude.

IV. PATENT OWNER’S MOTION TO STRIKE

With our authorization (*see* Ex. 3002), Patent Owner filed a Motion to Strike sections IV, V.A, V.B, and VI.B.2 of Petitioner’s Reply and

paragraphs 22–48, 54–60, 68–163, and 168–178 of Mr. Marscher’s Supplemental Declaration (Ex. 1052). Paper 21 (“Mot. Stk.”). Petitioner filed an Opposition to the Motion. Paper 25 (“Opp. Stk.”). Patent Owner filed a Reply to Petitioner’s Opposition. Paper 28 (“Reply Stk.”). For the reasons discussed below, Patent Owner’s Motion to Strike is *dismissed*.

Patent Owner argues that, in sections IV, V.A, V.B, and VI.B.2 of the Reply and paragraphs 22–48, 54–60, 68–163, and 168–178 of Exhibit 1052, Petitioner improperly adds new arguments and evidence to bolster and gap-fill the Petition. Mot. Stk. 1–10; Reply Stk. 1–5. Patent Owner argues that, in sections IV, V.A, V.B, and VI.B.2 of the Reply, Petitioner relies only on the testimony of Mr. Marscher to discuss certain exhibits, amounting to improper incorporation by reference. Mot. Stk. 10–14.

Petitioner argues that its Reply is responsive to Patent Owner’s Response and does not add new arguments. Opp. Stk. 1–11. Petitioner argues that, rather than incorporating arguments by reference, its Reply relies on its declarant’s testimony to explain technical issues and provide contextual information. *Id.* at 13–15.

Although we agree that some of Patent Owner’s arguments have merit, we do not rely on the materials Patent Owner seeks to strike in making our conclusions in this proceeding. Accordingly, we *dismiss* as moot Patent Owner’s Motion to Strike.

V. CONCLUSION¹¹

Based on the evidence presented with the Petition, the evidence introduced during the trial, and the parties' respective arguments, Petitioner has shown, by a preponderance of the evidence, that claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 of the '049 patent are unpatentable. In summary,

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–3, 18	103	Zhang, Stout, API Standard 674	1–3, 18	
6–8, 10, 12, 19, 20	103	Zhang, Stout, API Standard 674, Broussard	6–8, 10, 12, 19, 20	
1–3, 6–8, 10, 12, 13, 15, 18–20	103	Zhang, Stout, API Standard 674, Broussard, API Standard 671	1–3, 6–8, 10, 12, 13, 15, 18–20	
1–3, 6–8, 12, 13, 15, 18–20	103	Sanborn, Naets	1–3, 6–8, 12, 13, 15, 18–20	

¹¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. §§ 42.8(a)(3), (b)(2).

Claims	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
10	103	Sanborn, Naets, Coli	10	
Overall Outcome			1–3, 6–8, 10, 12, 13, 15, 18–20	

VI. ORDER

Accordingly, it is

ORDERED that claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 of the '049 patent have been shown to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Strike is *dismissed*;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *dismissed*; 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.

IPR2022-00399
Patent 9,395,049 B2

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