

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FPUSA, LLC,
Petitioner,

v.

M-I LLC,
Patent Owner.

Case IPR2016-00213 (Patent 9,004,288 B2)
Case IPR2016-00295 (Patent 9,074,440 B2)

Before JAMES A. TARTAL, CARL M. DEFRANCO, and
TIMOTHY J. GOODSON, *Administrative Patent Judges*.

GOODSON, *Administrative Patent Judge*.

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

I. INTRODUCTION

FPUSA, LLC (“Petitioner”) filed a Petition in IPR2016-00213 (“213 IPR”) requesting *inter partes* review of claims 1, 3–6, 8–12, and 14–18 of U.S. Patent No. 9,004,288 (“the ’288 patent”). See 213 IPR, Paper 6 (“213 Pet.”). Petitioner also filed a Petition in IPR2016-00295 (“295 IPR”) requesting *inter partes* review of claims 1, 3–6, 8–12, and 14–18 of U.S. Patent No. 9,074,440 (“the ’440 patent”). See 295 IPR, Paper 1 (“295 Pet.”). M-I LLC (“Patent Owner”) did not file a preliminary response in either proceeding. We instituted trial in both proceedings. See 213 IPR, Paper 14 (“213 Dec. on Inst.”); 295 IPR, Paper 9 (“295 Dec. on Inst.”).

After institution of trial, Patent Owner filed a Patent Owner Response in each proceeding. See 213 IPR, Paper 38 (“213 PO Resp.”); 295 IPR, Paper 30 (“295 PO Resp.”). Thereafter, Petitioner filed a Reply in each proceeding. See 213 IPR, Paper 41 (“213 Pet. Reply”); 295 IPR, Paper 33 (“295 Pet. Reply”). The parties presented oral argument in both the 213 IPR and the 295 IPR at a hearing held on April 24, 2017. 213 IPR, Paper 46 (“Tr.”).

We have jurisdiction over these proceedings under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. Because of the significant overlap in issues, arguments, and evidence between these proceedings, we address both proceedings in this single Final Written Decision. Unless indicated otherwise, citations to the record in this Decision refer to the papers and exhibits in the 213 IPR.

For the reasons explained below, after consideration of the evidence and arguments of the parties, we determine that Petitioner has shown by a preponderance of the evidence that claims 1, 3–6, 8–10, 14, and 15 of the

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'288 patent and claims 1, 3–6, 8–10, and 14–18 of the '440 patent are unpatentable. *See* 35 U.S.C. § 316(e). We further determine that Petitioner has not shown by a preponderance of the evidence that any of claims 11, 12, and 16–18 of the '288 patent or either of claims 11 and 12 of the '440 patent are unpatentable. *See id.*

A. Related Matters

Patent Owner is asserting the '288 and '440 patents against Petitioner in a civil action in the U.S. District Court for the Western District of Texas, *M-I LLC v. FPUSA, LLC*, Case No. 5:15-cv-00406 (DAE) (“Parallel District Court Litigation”). *See* 295 IPR, Ex. 1028. In the Parallel District Court Litigation, the District Court granted M-I’s motion for a preliminary injunction. *See* Ex. 1018. In FPUSA’s appeal of that preliminary injunction ruling, the Federal Circuit affirmed in part, vacated in part, and remanded. *See M-I LLC v. FPUSA, LLC*, 626 Fed. Appx. 995, 996–97 (Fed. Cir. 2015).

B. Summary of the Challenged Patents

1. The '288 Patent

The '288 patent describes a system and method for separating components in a slurry of drilling fluid and drill cuttings using pulse-vacuum assisted screening. Ex. 1001, at [57], 1:17–19.

In the Background section, the '288 patent explains that drilling fluid serves several purposes in oilfield applications, including lubricating drill bits, carrying cuttings away from the drill bit, and preventing blowouts by maintaining hydrostatic pressure within the well. *Id.* at 1:22–25, 31–33, 52–53. The drilling fluid is pumped from the surface downhole to the drill bit, and the spent drilling fluid then returns back to the surface. *Id.* at 1:25–30. The fluid exiting the borehole includes cuttings, which must be removed

before the fluid can be recycled. *Id.* at 1:59–61. Recycling the drilling fluid is desirable because it is expensive and time consuming to mix, as it must be formulated specifically for the characteristics of the formation being drilled. *Id.* at 1:40–51.

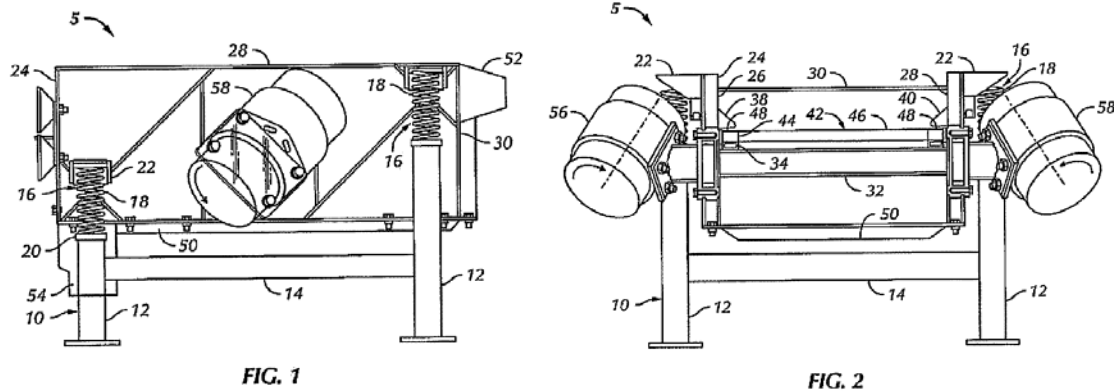
The Background section further explains that a “shale shaker, also known as a vibratory separator,” was a known apparatus for removing cuttings from drilling fluid. *Id.* at 1:62–65. This device included an angled table with a screen bottom, and the slurry is deposited at the top of the incline. *Id.* at 1:65–2:3. The Background explains the operation of known shale shakers as follows:

As the drilling mud travels down the incline toward the lower end, the fluid falls through the perforations to a reservoir below thereby leaving the solid particulate material behind. The combination of the angle of inclination with the vibrating action of the shale shaker table enables the solid particles left behind to flow until they fall off the lower end of the shaker table.

Id. at 2:3–9. A drawback of known shale shakers, according to the ’288 patent, is that the separation of drilling fluid from drill cuttings is often incomplete, necessitating additional equipment and processes to further dry the cuttings and recover drilling fluid. *Id.* at 3:7–15. The ’288 patent seeks to “improve the rate and efficiency at which shakers remove liquid from cuttings or other solids.” *Id.* at 3:23–24.

One additional known system described in the Background of the ’288 patent is a shaker that includes an air pump to develop a vacuum beneath the screens, thereby increasing the flow rate of drilling mud through the screens. *Id.* at 3:30–37. “However, applying a continuous vacuum beneath a screen to draw fluid through the screen may result in solids sticking to the screen.” *Id.* at 3:37–39.

Figures 1 and 2 of the '288 patent are reproduced below:



Figures 1 and 2 are side and cross-sectional views, respectively, of vibratory screen separator 5. *Id.* at 4:61–64. Separator 5 includes “separator frame or basket 24,” which has sidewalls 26 and 28 and back wall 30. *Id.* at 5:36–38. The separator also includes screen 42 and sump 50 to receive material that passes through screen 42. *Id.* at 5:49–51, 55–56. Inlet 52 is positioned at back wall 30 and outlet 54 receives material from sump 50 for discharge. *Id.* at 5:56–59. Rotary eccentric vibrators 56 and 58 are attached to sidewalls 26 and 28. *Id.* at 5:63–65.

The '288 patent describes that “[a] pressure differential device (not shown) may be provided to create a pressure differential between the vapor space above screen 42 and the vapor space between screen 42 and sump 50.” *Id.* at 6:3–6. The pressure differential may be pulsed or toggled, which avoids solids accumulating or sticking on the screen. *Id.* at 6:34–35, 54–58.

The '288 patent also describes that in some embodiments, the separator may include two or more screens, and “[o]ne or more sumps may be located under the screens such that a pressure differential may be provided across less than all of the two or more shaker screens.” *Id.* at 7:8–13.

Figure 4 is reproduced below.

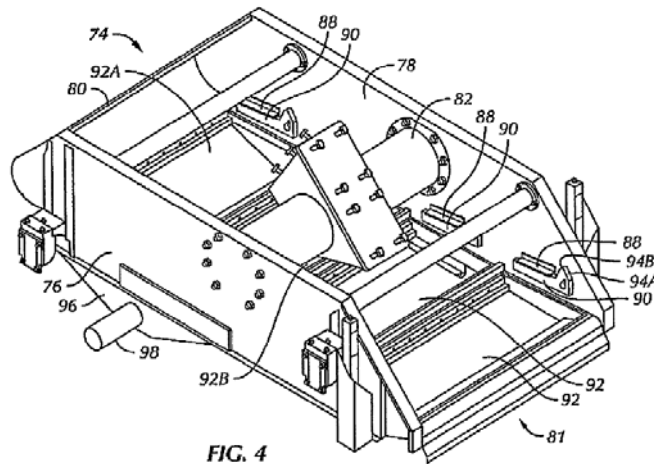


Figure 4 shows a separator having four screens 92. *Id.* at 8:26. An inlet proximate back wall 80 deposits drilling mud on the first screen 92A. *Id.* at 8:24–27. Sump 96 is provided under the first two screens 92A, 92B. “One or more pressure differential devices . . . may be provided to generate a pressure differential across screens 92A, 92B.” *Id.* at 8:30–32.

The instituted grounds in the 213 IPR include challenges to claims 1, 3–6, 8–12, and 14–18. Of those, claims 1, 10, and 16 are independent. Each of these independent claims is reproduced below:

1. A method comprising:
 - introducing a slurry to a shaker having a first screen and a second screen;
 - flowing the slurry¹ over the first screen;
 - applying a first pressure differential to the first screen and not applying the first pressure differential across the second screen; and

¹ This word appears as “shiny” in the ’288 patent at column 11, line 46, but was corrected to “slurry” in a Certificate of Correction. Ex. 1001, 16. The same Certificate of Correction included various other corrections to the claims, which changes are reflected in the claims as reproduced herein. *Id.*

controlling air flow under at least a portion of the first screen to prevent stalling of the slurry on the first screen.

Id. at 11:43–51.

10. A method comprising:

delivering a slurry to a shaker to flow over a first screen and a second screen of the shaker, the slurry having a drilling fluid component and a solids component;

generating first pressure differential between an area above the first screen and an area below the first screen thereby pulling air or vapor and the drilling fluid component through the first screen wherein the pressure differential is created by a device external to the shaker;

applying a second pressure differential to the second screen wherein the first pressure differential is different than the second pressure differential;

conveying together all the air or vapor and all of the drilling fluid component pulled through the first screen due to the first pressure differential from the shaker to a chamber external to the shaker; and

separating the air or vapor from the drilling fluid component in the chamber external to the shaker.

Id. at 12:13–38.

16. A system comprising:

a first screen having an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker;

a pressure differential generator configured to pull air or vapor through the first screen to enhance the flow of drilling fluid through the first screen with respect to a second screen within the shaker in which the pressure differential generator does not create a pressure differential between an area above and an area below the second screen;

a sump located below the first screen and configured to collect the air or vapor and the drilling fluid that passes through the first screen; and

a degassing chamber in fluid communication with the pressure differential generator and the sump and located external to the shaker for collecting all of the air or vapor and the drilling fluid in the sump and removing air or vapor from the drilling fluid.

Id. at 12:47–65.

2. *The '440 Patent*

The '440 patent states that it is a continuation of the application that issued as the '288 patent. 295 IPR, Ex. 1001, at [63]. The disclosure of the '440 patent's specification is substantially the same as the '288 patent. The instituted grounds in the 295 IPR include challenges to claims 1, 3–6, 8–12, and 14–18. Of those, claims 1, 10, and 16 are independent. Each of these independent claims is reproduced below:

1. A method comprising:

introducing a slurry to a shaker having a first screen and a second screen;

flowing the slurry over the first screen;

applying a first pressure differential with a pressure differential device to at least a portion of the first screen to separate a solids component from a liquid component of the slurry; and

pulling the liquid component and air or vapor together through a flow line in fluid communication with the pressure differential device into a degassing chamber while maintaining the first pressure differential across the first screen.

Id. at 11:45–57.

10. A method comprising:

delivering a slurry to a shaker to flow over a first screen and a second screen of the shaker, the slurry having a drilling fluid component and a solids component;

- generating a first pressure differential between an area above a portion of the first screen and an area below the portion of the first screen inside the shaker, wherein the pressure differential is created by a device external to the shaker; and
- pulling air or vapor and substantially all of the drilling fluid component together from the area below the first screen inside the shaker into a degassing chamber external to the shaker while maintaining the first pressure differential.

Id. at 12:19–32.

16. A system comprising:

- a first screen having an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker;
- a pressure differential generator configured to pull air or vapor through at least a portion of the first screen to enhance a flow of drilling fluid through the first screen with respect to a second screen within the shaker in which the pressure differential generator does not create a pressure differential between an area above and an area below the second screen;
- a sump disposed below the first screen and configured to receive the flow of drilling fluid through the first screen; and
- a chamber in fluid communication with the pressure differential generator and located external to the shaker for collecting the air or vapor and the drilling fluid from the sump while the pressure differential generator is configured to apply a pressure differential across the first screen.

Id. at 12:48–67.

C. References Relied Upon

The Petitions in the 213 IPR and the 295 IPR relied on the same six references in the asserted grounds of unpatentability:

Derrick	US 2005/0082236 A1	Apr. 21, 2005	Ex. 1004
Vasshus	US 8,746,460 B2	June 10, 2014	Ex. 1005
Ennis	US 3,929,642	Dec. 30, 1975	Ex. 1006

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Logue	US 2,462,878	Mar. 1, 1949	Ex. 1007
Riedel	US 2,663,427	Dec. 22, 1953	Ex. 1008
Lee	US 5,259,952	Nov. 9, 1993	Ex. 1009

D. Instituted Grounds of Unpatentability

In the 213 IPR, we instituted trial as to claims 1, 3–6, 8–12, and 14–18 of the '288 patent on the following grounds:

References	Basis	'288 Patent Claims
Derrick	§ 102	1, 3–6, 8, and 9
Vasshus	§ 102	10 and 14–17
Ennis in view of Logue, Riedel, or Lee	§ 103	1, 4–6, and 8
Ennis in view of Logue	§ 103	3, 9–12, and 14–18

See 213 Dec. on Inst. 29.

In the 295 IPR, we instituted trial as to claims 1, 3–6, 8–12, and 14–18 of the '440 patent on the following grounds:

References	Basis	'440 Patent Claims
Derrick	§ 102	1, 3–6, 8, 9, and 16–18
Vasshus	§ 102	1, 3, 8, 10, and 14–17
Ennis in view of Logue	§ 103	1, 3–6, 8–12, and 14–18
Ennis in view of Logue in further view of Riedel or Lee	§ 103	9 and 18

See 295 Dec. on Inst. 29.

II. TIMELINESS OF PETITION IN 295 IPR

Under the rules governing *inter partes* review proceedings, the timeliness of a petition depends on whether the patent it challenges is subject

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to the “first-inventor-to-file” provisions of the AIA.² A petition for *inter partes* review of a “first-inventor-to-file” patent (i.e., a patent described in section 3(n)(1) of the AIA) may not be filed until after at least “the date that is nine months after the date of the grant of the patent.” 37 C.F.R.

§ 42.102(a)(1).³ By contrast, a petition for *inter partes* review of a “first-to-invent” patent (i.e., a patent *not* described in section 3(n)(1) of the AIA) may be filed at any time after “the date of the grant of the patent.” 37 C.F.R.

§ 42.102(a)(2). Under section 3(n)(1), the first-inventor-to-file provisions apply to any application for patent, and to any patent issuing thereon, that contains or contained at any time a claim to a claimed invention that has an effective filing date on or after March 16, 2013. *See* AIA § 3(n)(1).

In the 295 IPR, the Petition was filed on December 8, 2015, less than nine months after the ’440 patent issued on July 7, 2015. 295 IPR, Ex. 1001, at [45]. Accordingly, the Petition in the 295 IPR is timely under 37 C.F.R. § 42.102(a) only if the ’440 patent is a “first-to-invent” patent, notwithstanding the July 31, 2014, filing date of the application that issued as the ’440 patent. *Id.* at [22].

Petitioner contends that the ’440 patent is a “first-to-invent” patent because, by virtue of its priority claims, it does not contain a claim having an effective filing date on or after March 16, 2013. 295 Pet. 2. In our Decision on Institution in the 295 IPR, we outlined the analysis that led to our preliminary determination that Petitioner had sufficiently shown that the

² Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”).

³ If a post-grant review of such a patent is instituted, a petition for *inter partes* review is not timely until after the termination of the post-grant review. 37 C.F.R. § 42.102(a)(3).

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'440 patent is a “first-to-invent” patent and, therefore, the Petition in the 295 IPR was timely. *See* 295 Dec. on Inst. 8–11. We also noted that “Patent Owner has the opportunity to present contrary evidence after institution.” *Id.* at 11. Patent Owner did not present any argument or evidence on this issue in its Patent Owner Response in the 295 IPR. At the hearing, Patent Owner stated that it does not dispute that the Petition in the 295 IPR was timely filed. *See* Tr. 73:22–74:5. Therefore, for the reasons discussed in our Decision on Institution, we determine that the Petition in the 295 IPR was timely.

III. CLAIM CONSTRUCTION

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under that standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). The Board’s construction under the broadest reasonable interpretation standard “cannot be divorced from the specification and the record evidence.” *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (quoting *In re NTP, Inc.*, 654 F.3d 1279, 1288 (Fed. Cir. 2011)).

The parties’ claim construction proposals, and the arguments and evidence they offer in support thereof, are substantially similar, if not identical, in the 213 IPR as in the 295 IPR. *Compare* 213 Pet. 9–14 *with*

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295 Pet. 10–15; *compare* 213 PO Resp. 22–25 *with* 295 PO Resp. 24–27; *compare* 213 Pet. Reply 3–5 *with* 295 Pet. Reply 4–6. Given the commonality of the parties’ arguments and the relationship of the ’288 and ’440 patents, we adopt the same construction for like terms in both patents. *See Trustees of Columbia University v. Symantec Corp.*, 811 F.3d 1359, 1369 (Fed. Cir. 2016) (“[W]here multiple patents ‘derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents.’”) (quoting *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005)).

A. “first” and “second” screens

Each of the independent claims of the ’288 and ’440 patents recites a shaker having “a first screen” and “a second screen.” In our Decisions on Institution in these proceedings, we adopted Petitioner’s proposal that the modifiers “first” and “second” do not denote spatial location relative to the shaker’s inlet. *See* 213 Dec. on Inst. 8–9; 295 Dec. on Inst. 12. That construction was the same as the District Court’s construction in its preliminary injunction ruling in the Parallel District Court Litigation, which the Federal Circuit held was “proper in light of the claim language and the specification.” *M-I LLC*, 626 Fed. Appx. at 997; Ex. 1018, 13–14. After institution, Patent Owner indicated its agreement with the construction in our Decisions on Institution. 213 PO Resp. 22 n.1; 295 PO Resp. 24 n.1. Accordingly, we maintain the construction set forth in our Decisions on Institution.

B. The “controlling” step

The phrase “controlling air flow under at least a portion of the first screen to prevent stalling of the slurry on the screen” appears in claim 1 of

the '288 patent. Similarly, claim 9 of the '440 patent recites “controlling air flow under the screen to prevent stalling of the slurry on the screen.”

Petitioner argues that these phrases “include[] adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid to flow through the screen.” 213 Pet. 11–12; 295 Pet. 13–14. In support of this construction, Petitioner points to the specification’s disclosure that “[b]y toggling the pressure⁴ between vacuum and static, conveyance of the solids across the screen may proceed unhindered, thereby avoiding solids accumulating or sticking on the screen, and thus not preventing fluid flow through the screen.” 213 Pet. 11 (quoting Ex. 1001, 6:54–58); 295 Pet. 13.

Patent Owner argues that the claim phrases mean “the effective volume of air pulled through the screen is adjustable to prevent the slurry from not moving relative to the screen with the objective of avoiding cuttings build-up on the screen.” 213 PO Resp. 24; 295 PO Resp. 26–27. Patent Owner supports its proposal through citation to the declaration of its expert, Mr. Robert Palmer. *Id.* (citing Ex. 2015 ¶¶ 24–25, 48). Patent Owner also cites the testimony of Petitioner’s expert, Mr. Peter Matthews, in which Mr. Matthews agreed that preventing stalling means that solids are allowed to be conveyed along the screen unhindered. *Id.* at 24–25 (citing Ex. 1013 ¶ 24; Ex. 2017, 17:7–10).

⁴ The specification includes the following explanation of what it means to toggle the pressure: “Toggling or pulsing of the pressure differential, as used herein, refers to the changing of the pressure differential from static (a zero pressure differential across the screen) to at least a partial vacuum below the screen.” Ex. 1001, 6:35–39.

We note that the parties' experts are in agreement that "preventing stalling" means avoiding clogging the screen with solids. Ex. 1013 ¶ 24; Ex. 2015 ¶¶ 49–50; Ex. 2017, 28:8–14. The specification supports this understanding of what it means to prevent stalling. See Ex. 1001, 3:37–42, 47–49, 6:34–39, 54–58. Further, both parties' proposed constructions reflect this understanding of what it means to prevent stalling. In this respect, the parties' proposals are similar. The parties capture that concept using slightly different wording. In our view, Petitioner's construction hews more closely to the description in the specification. See *id.*

Therefore, we adopt Petitioner's proposed construction that "controlling air flow under at least a portion of the first screen to prevent stalling of the slurry on the screen" in claim 1 of the '288 patent and "controlling air flow under the screen to prevent stalling of the slurry on the screen" in claim 9 of the '440 patent include adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid to flow through the screen.

C. "*slurry*"

Claims 1 and 10 of both the '288 and '440 patents recite a "slurry." Patent Owner proposes that this term should be construed to mean "a mixture of drilling fluid and drill cuttings." 213 PO Resp. 25. Patent Owner notes that the parties stipulated to this construction in the Parallel District Court Litigation. *Id.* (citing Ex. 2018). In the claim construction section of Petitioner's Reply, Petitioner does not respond to Patent Owner's proposal or propose a different construction of this term. See 213 Pet. Reply 3–5. The specification supports Patent Owner's proposal because it sets forth the proposed construction as an express definition of the term. See Ex. 1001,

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5:20–21 (“As used herein, a slurry refers to a mixture of drilling fluid and drill cuttings.”). Therefore, we adopt Patent Owner’s proposal that “slurry” means “a mixture of drilling fluid and drill cuttings.”

D. “shaker”

Each of the independent claims of the ’288 and ’440 patents recites a “shaker.” Patent Owner proposes that this term means “a vibratory separator used to remove cuttings and other solid particles from drilling fluid used in the oil and gas industry.” 213 PO Resp. 22. Patent Owner’s proposal is based on the description in the specification of a shale shaker, coupled with the deposition testimony of Petitioner’s expert indicating his agreement that “shaker” in claim 1 of the ’288 patent refers to a shale shaker. *Id.* at 22–24 (citing Ex. 1001, 1:63–2:9; Ex. 2017, 11:8–15).

Petitioner counters that Patent Owner’s proposal improperly imports limitations from the specification into the claims, and “is inconsistent with the general concept of a ‘shaker,’ which has applicability in multiple industries, including those referenced in the prior art.” 213 Pet. Reply 4. In its Reply, Petitioner did not propose its own construction for this term. However, during the hearing, Petitioner agreed that “shaker” should be construed to require a vibratory separator. *See* Tr. 9:14–25.

We agree with Petitioner that Patent Owner’s proposal improperly equates the description of a “shale shaker” in the specification with the broader term “shaker” used in the claims. Although the specification focuses heavily on shale shakers that are used in the oil and gas industry, Patent Owner did not use the word “shale shaker” in its claims and instead chose the broader term “shaker.” *See In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004) (“We have cautioned against reading

limitations into a claim from the preferred embodiment described in the specification, even if it is the only embodiment described, absent clear disclaimer in the specification.”). The deposition testimony of Petitioner’s expert cited by Patent Owner does not persuade us that a “shaker” means only a “shale shaker” and cannot include any other type of vibratory separator because Mr. Matthews was not asked that question; he was only asked the more ambiguous question of whether the term shaker “refers to” a shale shaker. Ex. 2017, 11:8–15. Therefore, we adopt only the parties’ agreed-upon portion of Patent Owner’s construction and interpret “shaker” to mean “a vibratory separator.”⁵

E. “degassing chamber”

Claims 9 and 16 of the ’288 patent and claims 1 and 10 of the ’440 patent recite a “degassing chamber.” Petitioner argues that this term “include[s] any chamber under at least a partial vacuum which separates gas from liquids.” Pet. 13–14 (citing Ex. 1001, 9:17–43). When asked at the hearing about the “under at least a partial vacuum” portion of its proposed construction, Petitioner indicated that its presence in the proposal was a result of the Parallel District Court Litigation and that a degassing chamber need not actually be under a partial vacuum. See Tr. 10:13–19. Nevertheless, Petitioner argued that this portion of its proposal is immaterial to the issues in these proceedings because the degassing chambers in the cited references all operate under at least a partial vacuum. See *id.* at 10:23–25, 11:11–15.

⁵ We note that the dispute over the meaning of “shaker” is not dispositive because the independent claims of both the ’288 and ’440 patents all require drilling fluid, either by expressly reciting drilling fluid or by virtue of the construction of “slurry” that we have adopted.

In the claim construction section of its Response, Patent Owner does not respond to Petitioner's proposed construction of this term or propose a different construction. *See* 213 PO Resp. 21–25; 295 PO Resp. 24–27. However, during the hearing, Patent Owner stated that it does not agree with Petitioner's proposal. Tr. 64:6–18. In rebutting one of Petitioner's anticipation challenges, Patent Owner argues that “a degassing chamber removes gas or vapor *from a liquid*” as distinct from a device that separates liquid from an air stream. 295 PO Resp. 33. In other words, Patent Owner's position is that a chamber into which a predominantly gaseous mixture of gas and liquid enters and the gas and liquid are separated therein is not a degassing chamber. Patent Owner relies on its expert, Mr. Palmer, in support of that understanding of a degassing chamber. *Id.* (citing Ex. 2015 ¶ 56).

The parties do not point us to, and we do not find, any express definition of “degassing chamber” in the specification. The specification appears to use that term in accordance with its plain and ordinary meaning of a chamber in which gas and liquid are separated. Specifically, the specification describes that both liquids and vapors are pulled into a degassing chamber, and vapors collecting therein can be recovered via one flow line while fluids collecting in the degassing chamber can be recovered via a different flow line. *See* Ex. 1001, 9:22–27.

Patent Owner does not provide adequate support for its narrower interpretation that a degassing chamber requires that gas or vapor must be removed from a liquid. The testimony of Mr. Palmer on which Patent Owner relies merely repeats the assertion in the Patent Owner Response and does not cite any underlying evidence in support thereof. 295 IPR, Ex. 2015

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¶ 56. Accordingly, this testimony does not persuade us that a skilled artisan reviewing the specification would understand a “degassing chamber” to have the narrower meaning that Patent Owner advocates. *See* 37 C.F.R.

§ 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”); *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1368 (Fed. Cir. 2004) (“[T]he Board is entitled to weigh the declarations and conclude that the lack of factual corroboration warrants discounting the opinions expressed in the declarations.”).

Moreover, Patent Owner’s contentions regarding the meaning of “degassing chamber” in these proceedings appear to be narrower than the District Court’s understanding of that term in the Parallel District Court Litigation. *See Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 3126 (Fed. Cir. 2015) (holding that the Board should consider a previous judicial interpretation of a disputed claim term and assess whether it is consistent with the broadest reasonable construction of the term). In its preliminary injunction ruling, the District Court did not expressly construe this term, but as part of its infringement analysis, it agreed with Patent Owner that the limitation was met by a system by which the drilling fluid is separated from residual air or gas. Ex. 1018, 21. This finding was upheld by the Federal Circuit. *M-I*, 626 Fed. Appx. at 998.

Based on the specification and the plain and ordinary meaning of the term, we construe “degassing chamber” to mean “a chamber that separates gas from liquids,” which construction is consistent with the treatment of this term in the Parallel District Court Litigation.

IV. LEVEL OF ORDINARY SKILL IN THE ART

In determining the level of skill in the art, we consider the type of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, and the sophistication of the technology. *Custom Accessories, Inc. v. Jeffrey-Allan Indus. Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986). Also, we are guided by the level of skill in the art as reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner contends that a person of ordinary skill in the field of the '288 and '440 patents would have “an engineering degree in mechanical or industrial engineering, or equivalent industry experience or education, as well as having at least 3 years of experience in the operation, design, manufacture, and/or use of shakers and a deep understanding of how shakers interact with other pieces of solids processing equipment.” 213 Pet. 9 (citing Ex. 1013 ¶ 22); 295 Pet. 10.

Patent Owner does not respond to Petitioner’s proposed level of ordinary skill in the art, nor does Patent Owner present its own proposal on this issue. However, Patent Owner’s expert, Mr. Palmer, testifies that a person of ordinary skill in the art “is a person with at least five years of experience in the application, operation, and design of shale shakers.” Ex. 2015 ¶ 23.

The differences between these competing articulations of the level of ordinary skill in the art are fairly minor. Our analysis below, including the conclusions we reach, would be substantially the same under either proposal. Nevertheless, after considering the evidence of record, we adopt Mr. Palmer’s definition of the level of ordinary skill in the art because we

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agree that five years of relevant experience is sufficient to achieve the level of ordinary skill in this art. We are not convinced that an engineering degree is necessary, and Petitioner’s proposal is not specific about what “equivalent industry experience or education” would involve.

V. ANTICIPATION GROUNDS

A. Legal Principles

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. Inc., v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). “[T]he dispositive question regarding anticipation is whether *one skilled in the art* would reasonably understand or infer from the prior art reference’s teaching that every claim element was disclosed in that single reference.” *Wasica Finance GmbH v. Continental Automotive Sys., Inc.*, 853 F.3d. 1272, 1284 (Fed. Cir. 2017) (quoting *Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003)).

B. Anticipation by Derrick

1. Summary of Derrick

Derrick, a published U.S. patent application, discloses a method and apparatus for screening a slurry in which the slurry is vibrated and conveyed across a screen and suction is applied from below the screen. Ex. 1004, at [57]. In its Background, Derrick describes that in oil drilling applications, it is desirable to recover drilling mud for reuse from the “slurry of fine drilling mud solids, coarse drilled material particles and liquid.” *Id.* ¶ 4. Figure 23 of Derrick is reproduced below:

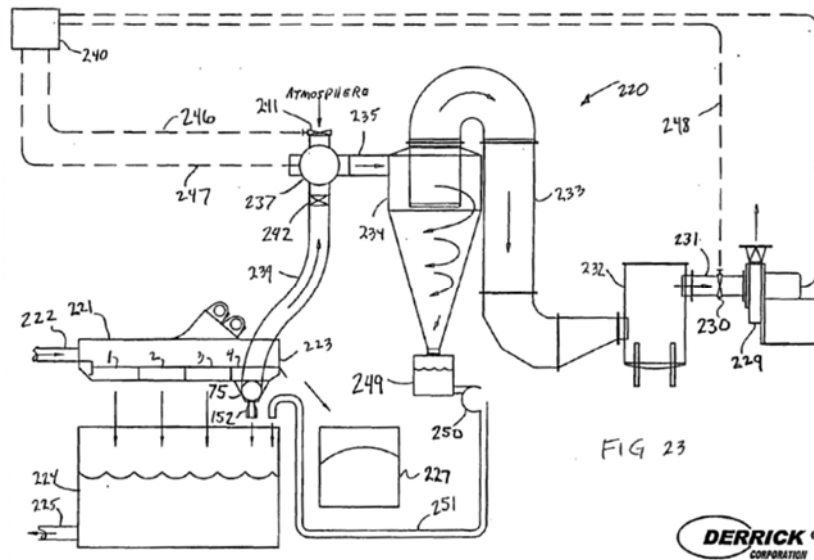


Figure 23 is a schematic view of vibratory screening machine 221, blower 229 used to create suction, and a system for separating particles and liquid from air. *Id.* ¶¶ 43, 79–80. Slurry enters from feed 222 and passes across screens 1, 2, and 3 toward exit end 223. *Id.* ¶ 78. “The major part of the fine particles and liquid are separated from the slurry during passage over screens 1, 2, and 3, and they fall into drilling mud tank 224 from which they are conducted back to the borehole.” *Id.*

Derrick further describes that

[i]n a preferred embodiment, a vacuum or suction . . . is applied to suction chamber 75, and this suction is intermittently released. This alternate application of suction and release of suction causes the coarse particles traveling along undulating screen 4 to have liquid and fine particles withdrawn therefrom, and the coarse particles are thereafter conveyed off of the vibratory screening machine 221 into oversize container 227. The liquid and fine particles which are suctioned into vacuum chamber 75 exit from the plurality of duckbill valves 152 when there is a release of suction.

Id. ¶ 79. “During the suction cycle of chamber 75, airborne liquid and fine particles (including the particles entrained in the liquid) are passed to

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cyclone separator 234 wherein liquid and fine particles are separated from the air stream and deposited into tank 249.” *Id.* ¶ 82.

2. *The ’288 Patent*

Petitioner asserts that Derrick anticipates claims 1, 3–6, 8, and 9 of the ’288 patent. Pet. 15–21, 27–30.

a. *Claim 1*

Looking first at claim 1, we find that Petitioner has presented persuasive evidence and explanation as to how Derrick discloses the “introducing” step (Pet. 17 (citing Ex. 1004 ¶¶ 55, 78, Fig. 23)), the “flowing” step (*id.* at 18 (citing Ex. 1004 ¶ 78, Fig. 23)), and the “applying” step (*id.* at 18–19 (citing Ex. 1004 ¶¶ 70, 76–77)). Patent Owner does not dispute that Derrick discloses these elements of claim 1. We agree with and adopt Petitioner’s analysis of how Derrick discloses these limitations of claim 1.

Petitioner further argues that Derrick teaches the “controlling” step of claim 1 because it describes alternate application of suction and release of suction so that, as the slurry travels along the screen, liquid and fine particles are withdrawn while the coarse particles are conveyed off of the vibrating screen into a container. 213 Pet. 20 (citing Ex. 1004 ¶¶ 69, 79). Petitioner acknowledges that during prosecution, Patent Owner overcame an anticipation rejection based on Derrick by arguing that Derrick does not disclose controlling air flow to “prevent stalling of the slurry” as recited in the “controlling” step. *Id.* at 19 (citing Ex. 1011, 7–8). Specifically, Patent Owner argued that “Derrick discloses controlling air flow such that the slurry is stalled on the screen and **pressure is subsequently applied to unclog the screens** and continue movement of the stalled slurry on the

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screen while chambers 73, 74, 75 are emptied.” Ex. 1011, 8 (citing Ex. 1004 ¶¶ 62–63) (emphasis added). But Petitioner contends that these arguments during prosecution do not address the disclosure in Derrick of alternately applying and **releasing** suction. 213 Pet. 19–20 (citing Ex. 1004 ¶ 79).

Patent Owner disputes that Derrick discloses the “controlling” step of claim 1. See 213 PO Resp. 28–30. In its Response, Patent Owner argues, as it did during prosecution, that Derrick does not disclose this step because Derrick’s suction operates to stall the slurry. 213 PO Resp. 28–29. Patent Owner points to Derrick’s disclosure that its screens can be alternately subjected to suction and pressure for the purpose of “blowing out material which clogs the screens.” *Id.* at 29 (quoting Ex. 1004 ¶ 51).

We agree with Petitioner that Derrick discloses the “controlling” step. As discussed in Section III.B. above, we construe this limitation to include adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid to flow through the screen. The specification of the ’288 patent describes accomplishing this by toggling the pressure between vacuum and static. Ex. 1001, 6:35–39, 54–58. In the Parallel District Court Litigation, Patent Owner relied on that disclosure as support for the “controlling” step. Ex. 1018, 24. As indicated in our summary of Derrick above, Derrick describes the same technique for the same purpose. Ex. 1004 ¶ 79. Patent Owner’s arguments are not persuasive because they do not address the portions of Derrick on which Petitioner’s challenge is based. Patent Owner’s arguments distinguish Derrick’s disclosure of alternating application of suction and pressure. But Petitioner’s challenge is based on Derrick’s disclosure of alternating

application and release of suction. Accordingly, we find that Derrick discloses each element of claim 1.

b. Claims 3–6, 8, and 9

Turning to the dependent claims, Petitioner explains how Derrick discloses the subject matter of claims 3–6, 8, and 9. 213 Pet. 28–30. Aside from pointing out their dependency from claim 1, Patent Owner does not dispute Petitioner’s arguments regarding these claims. *See* 213 PO Resp. 30. Having reviewed the underlying evidence cited in support of Petitioner’s arguments, we agree with and adopt Petitioner’s analysis of how Derrick discloses the features of these dependent claims.

3. The ’440 Patent

Petitioner argues that Derrick anticipates claims 1, 3–6, 8, 9, and 16–18 of the ’440 patent.

a. Claim 1

With respect to claim 1, similar to claim 1 of the ’288 patent, Patent Owner does not dispute Petitioner’s assertions that Derrick discloses the “introducing” step (295 Pet. 18–19 (citing Ex. 1004 ¶¶ 55, 78, Fig. 23)), the “flowing” step (*id.* at 19 (citing Ex. 1004 ¶¶ 4, 78, Fig. 23)), and the “applying” step (*id.* at 19–20 (citing Ex. 1004 ¶ 63); *see also* Ex. 1004 ¶¶ 79–80, Fig. 23). We agree with and adopt Petitioner’s analysis of how the referenced portions of Derrick disclose these three steps of claim 1 of the ’440 patent.

Petitioner asserts that Derrick teaches the “pulling” step because Derrick’s cyclone separator 234 shown in Figure 23 is a degassing chamber into which liquid and air or vapor are pulled during a vacuum suction cycle,

while the pressure differential is maintained across screen 4. 295 Pet. 20–21 (citing Ex. 1004 ¶¶ 78–82).

We agree with Petitioner that Derrick discloses the “pulling” step. Derrick describes that “[d]uring the suction cycle of chamber 75, airborne liquid and fine particles (including particles that are entrained in the liquid) are passed to cyclone separator 234 wherein liquid and fine particles are separated from the air stream and deposited into tank 249.” Ex. 1004 ¶ 82. Thus, liquid and air suctioned through screen 4 in chamber 75 are conveyed to cyclone separator 234, and the liquid is then separated from the air.

We recognize that in Derrick, only some of the liquid that passes through screen 4 is conveyed to cyclone separator 234, with the rest exiting through duckbill valves 152. *Id.* ¶¶ 79, 82, Fig. 23. Yet claim 1 does not require that all of the liquid in the slurry must be pulled into the degassing chamber. Claim 1 simply recites that “a liquid component” of the slurry is separated from a solids component and the liquid component is pulled into a degassing chamber. Because the airborne liquid that is passed to cyclone separator 234 in Derrick is part of the liquid portion of the slurry that enters vibratory screening machine 221 via feed 222 and is separated from solids by being suctioned through screen 4 into chamber 75, we agree with Petitioner that it meets the limitation of the “liquid component” recited in claim 1. *Id.* ¶¶ 78–79, 82, Fig. 23.

We have considered Patent Owner’s counterarguments regarding this “pulling” limitation, see 295 PO Resp. 30–35, but we do not find them persuasive for the reasons that follow. First, Patent Owner argues that in Derrick, only airborne liquid droplets and fine particles are transferred to cyclone separator 234 during the suction cycle. 295 PO Resp. 31.

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According to Patent Owner, airborne liquid is merely composed of droplets and is not the same as the claimed “liquid component” of the slurry. *Id.* at 32. On this point, as just discussed, we agree with Petitioner that Derrick’s airborne liquid is “a liquid component” of the slurry. *See* 295 Reply 8.

Second, Patent Owner argues that Derrick’s cyclone separator is not a degassing chamber because a degassing chamber removes gas or vapor from a liquid, whereas Derrick’s cyclone separator 234 separates airborne liquid and fine particles from the air stream. 295 PO Resp. 32–33 (citing Ex. 1004 ¶ 82; Ex. 2015 ¶ 56). This argument is premised on a narrower construction of the term “degassing chamber” than the record supports. For the reasons explained in Section III.E. above, we construe “degassing chamber” to mean “a chamber that separates gas from liquids.” Derrick’s cyclone separator 234 separates gas from liquids. Ex. 1004 ¶ 82.

Third, Patent Owner argues that Derrick does not disclose pulling the vapor or air and drilling fluid while maintaining the first pressure differential across the first screen. 295 PO Resp. 33–34. Patent Owner points to Derrick’s teaching that liquid and fine particles suctioned into vacuum chamber 75 exit via duckbill valves 152 when suction is released. *Id.* (citing Ex. 1004 ¶ 79). “Accordingly, Derrick does not disclose that the liquid component of the slurry and air or vapor are pulled into a degassing chamber external to the shaker ‘while maintaining’ the first pressure differential across the first screen.” *Id.* at 34–35. However, as Petitioner notes in its Reply, Patent Owner’s argument does not address the anticipation challenge as Petitioner has framed it. *See* 295 Reply 10. Specifically, Petitioner relies on Derrick’s cyclone separator 234 as the claimed “degassing chamber.” *See* 295 Pet. 20. As such, Patent Owner’s comments regarding whether

suction is applied as fluid passes through Derrick's duckbill valves 152 is not germane to the anticipation analysis Petitioner has presented.

b. Claims 3–6, 8, and 9

Having addressed claim 1, we consider dependent claims 3–6, 8, and 9. Petitioner presents evidence and explanation of how Derrick discloses the subject matter of those claims. 295 Pet. 28–31. Aside from pointing out their dependency from claim 1, Patent Owner does not dispute Petitioner's arguments regarding these claims. *See* 295 PO Resp. 35. Having reviewed the underlying evidence cited in support of Petitioner's arguments, we agree with and adopt Petitioner's analysis of how Derrick discloses the features of these dependent claims.

c. Claim 16

Petitioner's case against claim 16 is largely unrebutted. After reviewing Petitioner's arguments and evidence, we find that Derrick discloses a "first screen" as recited in claim 16 (295 Pet. 26 (citing Ex. 1004 ¶ 55, Fig. 4); *see also* Ex. 1004 ¶ 78, Fig. 23), the claimed "pressure differential generator" (*id.* at 26–27 (citing Ex. 1004 ¶¶ 76–78, Fig. 23)), and the claimed "sump" (*id.* at 27 (citing Ex. 1004 ¶ 51, Figs. 1, 2); *see also* Ex. 1004, Fig. 23). We also agree with Petitioner that Derrick's cyclone separator 234 constitutes a "chamber" as recited in claim 16, because it is in fluid communication with blower 229, it is external to vibratory screening machine 221, and it collects air or vapor and drilling fluid in the form of airborne liquid during the suction cycle of chamber 75. *Id.* at 27–28 (citing Ex. 1004 ¶¶ 78–82). Patent Owner's rebuttal on claim 16 is that Derrick does not teach collecting the air or vapor and drilling fluid while a pressure differential is applied across the first screen, as recited in the "chamber"

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limitation. *See* 295 PO Resp. 33–35. That argument is the same as Patent Owner presented for claim 1 and is unpersuasive for the reasons discussed in Section V.B.3.a. Patent Owner also argues that Derrick does not disclose a degassing chamber as required by claim 16, *see id.* at 32–33, but claim 16 of the '440 patent does not recite a degassing chamber.

d. Claims 17 and 18

Petitioner presents evidence and explanation of how Derrick discloses the subject matter of claims 17 and 18. 295 Pet. 29–30, 32. Other than to point out their dependency from claim 16, Patent Owner does not dispute Petitioner's arguments regarding these claims. *See* 295 PO Resp. 35. Having reviewed the underlying evidence cited in support of Petitioner's arguments, we agree with and adopt Petitioner's analysis of how Derrick discloses the features of these dependent claims.

C. Anticipation by Vasshus

1. Summary of Vasshus

Vasshus describes an apparatus “for the sieving and fluid separation of a material containing fractions of a solid and fluid, the material being placed on an upper side of at least one sieving element (13).” Ex. 1005, (57). The apparatus can be used to sieve “a drilling fluid containing drilling mud and drilled particles or cuttings. . . .” *Id.* at 1:14–17. Figure 1 of Vasshus is reproduced below:

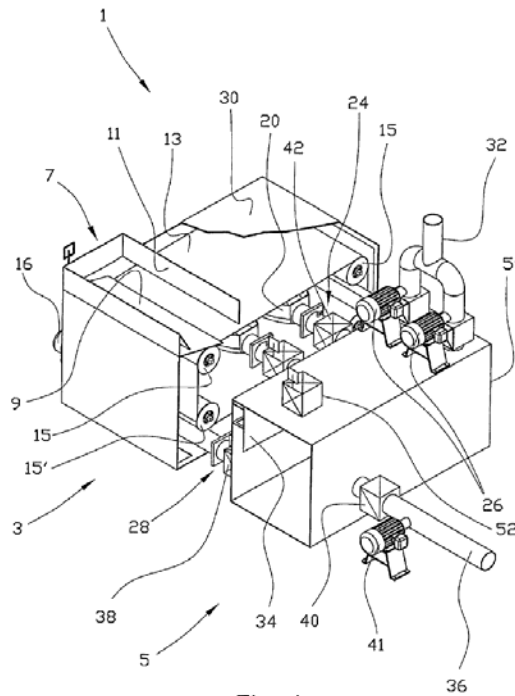


Fig. 1

Figure 1 shows a perspective and partially cut away view of sieving and fluid separation apparatus 1. *Id.* at 4:15–17. Apparatus 1 includes sieving unit 3 and fluid separation unit 5. *Id.* at 4:36–37. Sieving unit 3 includes first stationary sieving device 9, which carries the material to be treated onto sieving element 13. *Id.* at 4:44–48. Sieving element 13 is formed by sieving cloth arranged to be rotated around upper and lower turning rollers 15, 15'. *Id.* at 4:48–51. Suction nozzles 20 are placed below a portion of sieving element 13 and between upper turning rollers 15. *Id.* at 4:63–65. In operation, fluid is sucked through suction nozzles 20 and pipe arrangement 24 into fluid separation unit 5. *Id.* at 5:51–54.

2. *Vasshus Qualifies as Prior Art Under § 102(e)*

Based on Petitioner's evidence and explanation (see 213 Pet. 31; 295 Pet. 33), which Patent Owner does not dispute (Tr. 45:20–46:3), we find that Vasshus qualifies as prior art under § 102(e).

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3. *The '288 Patent*

Petitioner asserts that Vasshus anticipates claims 10 and 14–17 of the '288 patent. 213 Pet. 35–39, 41–42.

a. *Claim 10*

We find that Vasshus discloses the “delivering” step of claim 10. Specifically, we agree with and adopt Petitioner’s contention that Vasshus’s sieving element 13 corresponds to the claimed “first screen” and Vasshus’s sieving device 9 corresponds to the claimed “second screen,” and that Vasshus teaches that its device can be used to separate drilled particles from drilling mud. *Id.* at 35 (citing Ex. 1005, 4:30–33). Patent Owner argues that Vasshus does not disclose delivering a slurry to a “shaker” as claimed because Vasshus is “an air-tight, rotating belt-system combined with a stationary sieving element.” 213 PO Resp. 30. Patent Owner’s argument is unpersuasive because it does not address the disclosure in Vasshus (referenced in our Decision on Institution, *see* 213 Dec. on Inst. 19) that “one or more of the endless sieving element(s) 13 could be replaced by fixed sieving elements, across which the material to be sieved is passed . . . , possibly by means of vibratory/oscillating devices.” Ex. 1005, 5:10–14. *See also* 213 Pet. Reply 8–9 (pointing out that Patent Owner did not address the relevant portion of Vasshus). That description discloses a “shaker” as we have construed that term in Section III.D. Relatedly, Patent Owner’s argument that Vasshus describes drawbacks of conventional shale shakers (213 PO Resp. 13–14 (citing Ex. 1005, 1:52–59)) is unpersuasive because “the question whether a reference ‘teaches away’ from the invention is

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inapplicable to an anticipation analysis.” *Celeritas Techs. Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998).⁶

We also find that Vasshus discloses the “generating” step because, as argued by Petitioner, suction nozzles 20 are driven by suction pumps 26 in fluid separation unit 5, which are “external” to sieving and fluid separation apparatus 1. 213 Pet. 35 (citing Ex. 1005, 2:47–50, Figs. 3–4). Patent Owner does not dispute Petitioner’s assertions regarding this limitation.

With respect to the “applying” step, Petitioner contends that in Vasshus, suction nozzles 20 apply a different pressure to the underside of sieving element 13 than is applied to the underside of sieving device 9. 213 Pet. 36. On this point, Petitioner’s declarant testifies that “Vasshus . . . teaches that the second pressure differential is zero because no pressure is applied to sieving device 9.” Ex. 1013 ¶ 43. We noted in our Decision on Institution that

Petitioner’s explanation of how Vasshus satisfies the “applying” step finds support in claim 3 of the ’288 patent, which recites “applying a second pressure differential to the first screen wherein the second pressure differential is zero.” Ex. 1001, 11:57–58. Thus, the ’288 patent contemplates that “applying a pressure differential” encompasses applying a pressure differential of zero.

⁶ At the hearing, Patent Owner argued that substituting a vibrating fixed element might cause Vasshus to be missing other claim elements. See Tr. 55:15–56:2. Aside from the fact that Patent Owner did not identify any specific elements that would be absent, that argument was not presented in Patent Owner’s briefing. See *id.* at 56:3–10; 213 PO Resp. 30–34. “[A]t oral argument, ‘[a] party . . . may only present arguments relied upon in the papers previously submitted. No new evidence or arguments may be presented at the oral argument.’” *Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1301 (Fed. Cir. 2016) (quoting Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,768 (Aug. 14, 2012)).

213 Dec. on Inst. 19.

In its Response, Patent Owner argues that “it is impossible for Vasshus to generate a first [pressure] differential on the first screen and a second pressure differential or no pressure differential on the second screen because Vasshus is a fluid-tight vessel.” 213 PO Resp. 31 (citing Ex. 2015 ¶ 58). Petitioner replies that Patent Owner’s rebuttal is unsupported insofar as “[n]o explanation is given as to how or why the fact that Vasshus is a fluid-tight vessel somehow indicates that the pressure differential generated by a vacuum apparatus located directly under the first screen is equally applied to the second screen where no vacuum apparatus is positioned.” 213 Pet. Reply 11–12.

We agree with Petitioner that Vasshus discloses the “applying” step because suction nozzles 20 apply a different pressure to the underside of sieving element 13 than is applied to the underside of sieving device 9. Ex. 1005, 2:46–50, 4:63–65, 5:55–57, Fig. 4; Ex. 1013 ¶ 43. Patent Owner’s expert, Mr. Palmer, testifies that “there is only a single source of pressure differential being applied to sieving element 13.” Ex. 2015 ¶ 58.

Mr. Palmer further testifies that because the pipe arrangement shown as 24 in the lower portion of unit 3 in Figure 4 is “constantly flowing drilling fluid between units 3 and 5,” it cannot apply a separate pressure differential to sieving device 9. *Id.* ¶ 56 (citing Ex. 1005, 6:17–19). Thus, according to Mr. Palmer’s explanation of Vasshus’s operation, suction nozzles 20 apply a pressure differential to sieving element 13 and there is no other source of pressure differential to either sieving element 13 or sieving device 9 because the pipe arrangement at the bottom of unit 3 is filled with liquid. We agree with that understanding of Vasshus. In our view, that operation satisfies the

“applying” step. Figure 4 of Vasshus shows suction nozzles 20 applying suction to the underside of sieving element 13 and no additional structure applying suction underneath sieving device 9.

In the absence of any suction device under sieving device 9, Petitioner’s expert, Mr. Matthews, testifies that because the “second pressure differential” applied to the underside of sieving device 9 in Vasshus is “zero,” it is different than the “first pressure differential” applied to the underside of sieving element 13 via suction nozzles 20. Ex. 1013 ¶ 43. As discussed below with respect to claim 16 in Section V.C.3.c., we are not persuaded that the pressure differential across sieving device 9 is necessarily zero, because it appears possible, given the position of sieving device 9 within the mostly enclosed unit 3, that some residual pressure differential is applied indirectly to the underside of sieving device 9 from suction nozzles 20. *See* Ex. 1005, Fig. 4. But the “applying” step of claim 10 only requires that the first pressure differential is “different” than the second pressure differential, not that any pressure differential is “zero.” We find that suction nozzles 20 abutting the underside of sieving element 13 would create a greater (and, therefore, different) pressure differential across sieving element 13 than any pressure differential it incidentally creates across sieving device 9. Ex. 1005, 2:46–50, 4:63–65, 5:55–57, Fig. 4; Ex. 1013 ¶ 43.

Patent Owner contends the pressure differential across sieving device 9 isn’t merely greater than zero, but is exactly the same as the pressure differential across sieving device 13 where the vacuum suction is located. Specifically, Patent Owner’s expert, Mr. Palmer, states that because “there is only a single source of pressure differential being applied to sieving element 13, which is within the fluid tight vessel, it is impossible for a different

pressure to be present within the same vessel.” Ex. 2015 ¶ 58. The premise of Mr. Palmer’s testimony is that Vasshus is fluid tight (*see* Ex. 2015 ¶ 58 (citing Ex. 1005, 5:37–38)), yet the cited portion of Vasshus states that sieving unit 3 forms a fluid-tight vessel “[w]ith the exception of the supply portion 7, an outlet portion for cuttings falling off the sieving element 13, and connected pipe arrangements 24, 28. . . .” Ex. 1005, 5:35–37. Mr. Palmer’s testimony does not account for the disclosed openings at supply portion 7 and the outlet, and simply assumes that unit 3 is entirely fluidly sealed. Because Mr. Palmer’s improperly assumes an entirely fluidly sealed unit, we find his opinion that the pressure is the same at all points within the vessel to be unpersuasive.

We also find that Petitioner has shown how Vasshus discloses the “conveying” step and the “separating” step because it describes that the fluid captured by suction nozzles 20 is conveyed to fluid separation unit 5, which separates gases from liquid. *See* 213 Pet. 36–37; Ex. 1005, 5:48–54, 6:10–12, Figs. 3–4. Patent Owner does not dispute Petitioner’s assertions regarding these limitation. For the foregoing reasons, we find that Vasshus discloses each element of claim 10.

b. Claims 14 and 15

Petitioner explains how Vasshus discloses the subject matter of dependent claims 14 and 15. 213 Pet. 41–42. Aside from pointing out their dependency from claim 10, Patent Owner does not dispute Petitioner’s arguments regarding these claims. *See* 213 PO Resp. 34. Having reviewed the underlying evidence cited in support of Petitioner’s arguments, we agree with and adopt Petitioner’s analysis of how Vasshus discloses the features of these dependent claims.

c. *Claims 16 and 17*

Claim 16 recites “a pressure differential generator configured to ***pull air or vapor through the first screen*** to enhance the flow of drilling fluid through the first screen with respect to a second screen within the shaker in which the pressure differential generator ***does not create a pressure differential between an area above and an area below the second screen.***” Petitioner argues that “trough-like elements 22 [of suction nozzles 20] in fluid communication with suction pumps 26 . . . create a pressure differential across sieving element 13 (the ‘first screen’), which is not created across sieving device 9 (the ‘second screen’).” Pet. 38.

The parties’ post-institution briefing treats this limitation in claim 16 together with the “applying” step of claim 10. *See* PO Resp. 31–34; Pet. Reply 10–12. However, we perceive an important difference between these two limitations. In claim 10, the pressure differential applied to the second screen need only be different than the pressure differential across the first screen. Claim 16 requires that the pressure differential generator does not create a pressure differential across the second screen. Petitioner has not presented persuasive evidence or explanation to establish that Vasshus’s suction nozzles 20 necessarily would not create a pressure differential across sieving device 9.

Petitioner does not point to, and we do not find, any express disclosure in Vasshus that suction nozzles 20 would not create a pressure differential across sieving device 9. To establish that Vasshus inherently discloses this limitation of claim 16, Petitioner must show that this feature is necessarily present. *See In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Petitioner’s evidence on this issue consists of the testimony of its

expert that “the second pressure differential is zero because no pressure is applied to sieving device 9.” Ex. 1013 ¶ 43. That testimony is conclusory and does not explain why suction nozzles 20 would not indirectly create a pressure differential across sieving device 9. On the evidentiary record before us, Petitioner has not eliminated the possibility that suction nozzles 20 would create some pressure differential across sieving device 9, considering the placement of sieving device 9 within unit 3 and near its supply opening, and Vasshus’s description that unit 3 is fluid-tight other than the openings for supply, outlet and piping arrangements. See Ex. 1005, Fig. 4, 5:35–38.

Accordingly, we determine that Petitioner has not carried its burden to show by a preponderance of evidence that Vasshus anticipates claim 16. Because claim 17 depends from claim 16, Petitioner also has not shown that claim 17 is anticipated by Vasshus.

4. *The ’440 Patent*

Petitioner argues that Vasshus anticipates claims 1, 3, 8, 10, and 14–17 of the ’440 patent. 295 Pet. 34–44.

a. *Claims 1, 3, and 8*

We find that Petitioner has presented persuasive evidence and explanation as to how Vasshus discloses each limitation of claim 1. Specifically, we agree with and adopt Petitioner’s analysis of how Vasshus discloses the “introducing” step in that sieving element 13 is a “first screen,” sieving device 9 is a “second screen,” and Vasshus describes that material to be treated is supplied to supply portion 7. See 295 Pet. 34–35 (citing Ex. 1005, 4:44–48); see also Ex. 1005, 1:14–17 (disclosing that the apparatus can be used to sieve drilling fluid with cuttings). Vasshus discloses a

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“shaker” because it describes replacing sieving element 13 with a fixed sieving element subjected to vibratory/oscillating devices. *See* 295 Pet. 34 n.7 (citing Ex. 1005, 5:9–15). We further agree that Vasshus discloses the “flowing” step because the slurry flows over sieving device 9 onto sieving element 13. *See id.* at 35 (citing Ex. 1005, 4:46–48). Vasshus’s suction pumps 26 carry out the “applying” step because they apply a pressure differential to sieving element 13 via suction nozzles 20 in order to separate the solid and liquid components of the slurry. *See id.* at 35–36 (citing Ex. 1005, 5:55–6:9, Figs. 1, 4). Vasshus discloses the “pulling” step because it describes piping the liquid component and air or vapor to fluid separation unit 5, which corresponds to the claimed “degassing chamber” because it separates the liquids of the fluid from the gases of the fluid. *See id.* at 36–37 (citing Ex. 1005, 5:48–54, 6:11–12, Figs. 1–3). We also agree with and adopt Petitioner’s analysis of how Vasshus discloses the features of dependent claim 8. *See id.* at 42. Patent Owner’s rebuttal concerning these claims is that Vasshus does not disclose a “shaker,” as required by claim 1. 295 PO Resp. 35–37. This argument is unpersuasive for the reasons discussed above in Section V.C.3.a.

Claim 3 recites “applying a second pressure differential to the first screen wherein the second pressure differential is zero.” Petitioner argues that Vasshus discloses this limitation because trough-like elements 22 of suction nozzles 20 create a pressure differential across sieving element 13 but not sieving device 9. Pet. 40–41. This argument is not persuasive for the same reasons as discussed above in Section V.C.3.c. with respect to claim 16 of the ’288 patent. Therefore, Petitioner has not carried its burden to show by a preponderance of evidence that Vasshus anticipates claim 3.

b. Claims 10, 14, and 15

With respect to claim 10, we agree with and adopt Petitioner's showing that Vasshus discloses the "delivering" step (295 Pet. 37 (citing Ex. 1005, 4:30–33)), the "generating" step (*id.* at 37–38 (citing Ex. 1005, 2:47–50, Figs. 3–4)), and the "pulling" step (*id.* at 38 (citing Ex. 1005, 5:48–54, 5:66–6:9, 6:11–12, Figs. 1–4)). We also agree with and adopt Petitioner's analysis of how Vasshus discloses the features of dependent claims 14 and 15. *See id.* at 43–44.

As with claim 1 and its dependent claims, Patent Owner's rebuttal concerning these claims is limited to the argument that Vasshus does not disclose a "shaker." 295 PO Resp. 35–37. This argument is unpersuasive for the reasons discussed above in Section V.C.3.a.

c. Claims 16 and 17

Like claim 16 of the '288 patent, claim 16 of the '440 patent recites that "the pressure differential generator does not create a pressure differential between an area above and an area below the second screen." Petitioner's arguments and evidence as to why Vasshus discloses this limitation of claim 16 of the '440 patent are the same as its case against claim 16 of the '288 patent. 295 Pet. 39. Petitioner has not established that this limitation is expressly or inherently disclosed by Vasshus for the same reasons discussed above in Section V.C.3.c. Thus, Petitioner has not carried its burden to show by a preponderance of evidence that Vasshus anticipates claim 16. Because claim 17 depends from claim 16, Petitioner also has not shown that claim 17 is anticipated by Vasshus.

D. Conclusions Regarding Anticipation Grounds

Petitioner has shown by a preponderance of the evidence that Derrick anticipates claims 1, 3–6, 8, and 9 of the '288 patent and claims 1, 3–6, 8, 9, and 16–18 of the '440 patent. Petitioner has also shown by a preponderance of the evidence that Vasshus anticipates claims 10, 14, and 15 of the '288 patent and claims 1, 8, 10, 14, and 15 of the '440 patent. Petitioner has not shown that Vasshus anticipates either of claims 16 and 17 of the '288 patent or any of claims 3, 16, and 17 of the '440 patent.

VI. OBVIOUSNESS GROUNDS

A. Legal Principles

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under § 103 that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) “secondary considerations” of non-obviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.” *Id.* at 17–18. “While the sequence of these questions might be reordered in any particular case,” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007), the Federal Circuit has “repeatedly emphasized that an obviousness inquiry requires examination of all four *Graham* factors and that an obviousness determination can be made only after consideration of each factor.” *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1335 (Fed. Cir. 2016).

The first *Graham* factor was discussed in Section IV. above. With respect to the fourth *Graham* factor, the parties did not present any argument or evidence directed to secondary considerations of nonobviousness in either

the 213 IPR or the 295 IPR. We now turn to a discussion of the second and third *Graham* factors.

B. Summary of Petitioner's Obviousness References

1. Ennis

Ennis describes a dewatering system having a vibrating screen deck with a vacuum chamber positioned beneath the downstream screen of the deck. Ex. 1006, at [57].

Figure 1 of Ennis is reproduced below:

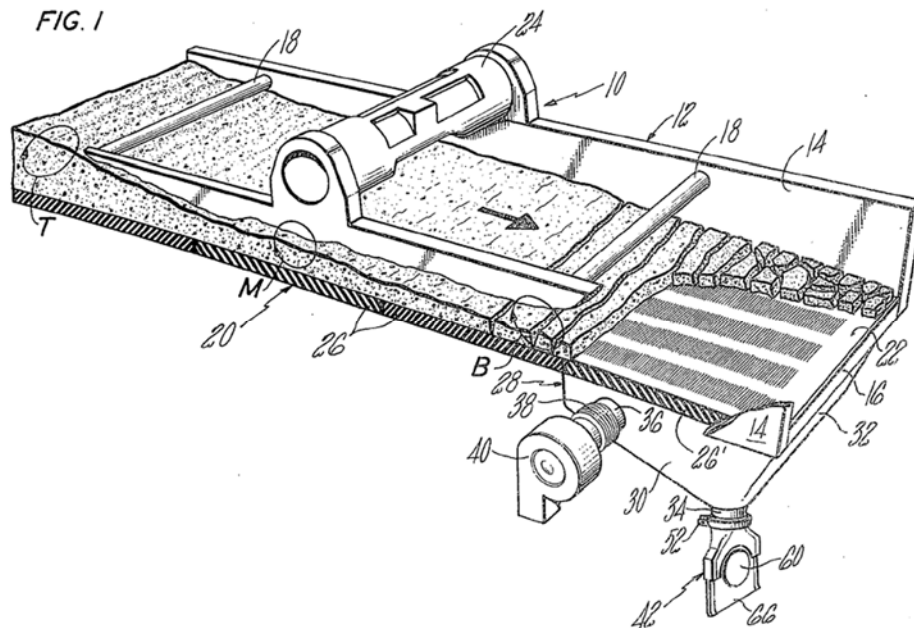


Figure 1 is a perspective view, partially broken away and partially in section, of dewatering unit 10. *Id.* at 3:24–26. “[U]nit 10 takes the form of a generally U-shaped spillway inclined so as to receive the aqueous slurry of solid granular material at the raised or elevated end thereof.” *Id.* at 3:42–45. A plurality of individual screen panels 26 form screen deck 20 and provide a continuous, smooth top screening surface 22. *Id.* at 3:56–60. Vibratory motor assembly 24 imparts vibratory motion to screen deck 20. *Id.* at 3:63–67.

Vacuum compartment 28 is positioned beneath downstream screen panel 26' of deck 20. *Id.* at 4:24–29. Exhaust fan 40 draws air from the interior of compartment 28. *Id.* at 4:37–41. Because water discharge regulator 42 seals the outlet of fluid discharge pipe 34, “the air drawn from the compartment by the exhaust fan 40 must enter the chamber through the screen panel 26’.” *Id.* at 4:41–45.

Ennis describes that

[t]he vacuum or suction force applied to the compartment by the blower 40 will cause water to be drawn from the material and to pass through the screen panel for collection within the bottom of the vacuum compartment. Accordingly, it is necessary that at least a portion of the accumulated water be periodically removed from the compartment and that the discharge of the water from the compartment take place without adversely affecting the vacuum or pressure conditions within the compartment.

Id. at 4:65–5:6. Ennis describes how discharge regulator 42 periodically discharges water without interrupting the continuous operation of the dewatering screen and without allowing air to enter compartment 28 through discharge pipe 34. *See id.* at 5:9–50.

2. *Logue, Riedel, and Lee*

Logue is directed to a vibrating screen with vacuum control for dewatering bodies of finely divided solids. Ex. 1007, 1:1–5. Logue describes that previous efforts at filtering in this manner were inadequate because “to attain a real degree of filtering, high vacuum operation has been employed, and this has served to hold the solids on the filtering medium in opposition to the conveying action until a tight cake is formed, which blinds the screen or other media and defeats the purpose of the action.” *Id.* at 1:33–39. Logue explains that “by applying different degrees of vacuum influences throughout a body of wet solids moving as a unit, an effective

dewatering of the solids may be attained without impeding the impelling movement.” *Id.* at 2:3–8. Logue also describes subjecting the wet body deposited on a filter medium to “intermittent vacuum influences” such that “the off condition in the operational cycle permits movement of the cake from the filter medium surface in response to the circular throw of the vibratory mechanism.” *Id.* at 7:47–56.

Riedel describes an apparatus for dewatering slimes in which water is discharged from lower outlet 8 of a chute into water collector 18. *See* Ex. 1008, 3:33–42, Fig. 1. Vacuum pump 19 reduces the air pressure to improve the dewatering procedure. *See id.* at 3:35–44, Fig. 1. “Valve 22 placed in the conduit between the chute and the collector 18 may be discontinuously operated to effect the loosening of the charge 4 and the cleaning of the bottom screens 6.” *Id.* at 3:51–54.

Lee is directed to a system for separating solids from slurry, in which the slurry is flowed into a separation chamber positioned over a moving foraminous medium. Ex. 1009, at [57]. Lee describes that “[t]he relative pressure underneath the foraminous medium is adjusted by selectively applying a vacuum . . . to the underside of the foraminous medium.” *Id.* at 7:6–10.

C. The ’288 Patent

1. Claim 1

Petitioner argues that claim 1 would have been obvious over Ennis in view of Logue, Riedel, or Lee. *See* 213 Pet. 47–51. Petitioner relies on Ennis as disclosing the “introducing,” “flowing,” and “applying” steps. *Id.* at 47–48. In the ground as instituted, Petitioner relies on Logue, Riedel, and Lee as disclosing the “controlling” step. *Id.* at 48–51; *see also* 213 Dec. on

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Inst. 24–25 (finding unpersuasive Petitioner’s contention that Ennis discloses the controlling step). Patent Owner presents several rebuttal arguments. *See* 213 PO Resp. 35–44.

Our analysis below focuses on the “controlling” step and the requirement in each of the steps for a “slurry.” As discussed in Section III.B., we adopt Petitioner’s construction that the “controlling” step “includes adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid to flow through the screen.” As discussed in Section III.C., we construe “slurry” to mean “a mixture of drilling fluid and drill cuttings.”

We agree with Patent Owner that Petitioner has not shown that either of Riedel or Lee discloses the “controlling” step. *See* 213 Pet. 49–51; 213 PO Resp. 36–37. Regarding Riedel, Petitioner points to its disclosure that “[v]alve 22 placed in the conduit between the chute and the collector 18 may be discontinuously operated to effect the loosening of the charge 4 and the cleaning of the bottom screens.” 213 Pet. 49–50 (quoting Ex. 1008, 3:51–54). Patent Owner responds that Riedel teaches to stall solid on the screen to improve dryness, and then the pressure differential is turned off to loosen the charge for cleaning. 213 PO Resp. 36–37 (citing Ex. 1008, 3:52–54; Ex. 2015 ¶ 72). In our view, Petitioner has not demonstrated that Riedel teaches “to adjust a pressure differential to allow solids to be conveyed along the screen unhindered.” Riedel does not appear to contemplate the solids flowing down and off the screen unhindered. Instead, “lower front wall 3 having a suitable closure, for instance, a slide closure” holds the coal fines within the chute, and Figures 1 and 2 show the solids accumulating within the chute. Ex. 1008, 3:16–18, Figs. 1–2. Riedel’s disclosure on which

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Petitioner relies describes periodically disrupting the vacuum so that the bottom screens 6 can be cleaned (Ex. 1008, 3:51–54), but that does not disclose allowing the solids to be conveyed along the screen unhindered. Petitioner’s Reply argument that “Riedel inherently discloses that the vacuum could be interrupted with greater frequency to prevent any stalling of the slurry” (213 Pet. Reply 14–15) is speculative, unsupported by record evidence, and unpersuasive.

Regarding Lee, Petitioner relies on the disclosure that the differential pressure across the foraminous medium can be controlled. *See* 213 Pet. 50 (citing Ex. 1009, 6:40–43, 7:7–16). Petitioner also highlights Lee’s description that in the first section 21 of channel 20, solids are swept along with the slurry and are not deposited on the foraminous medium. *Id.* (citing Ex. 1009, 7:20–41). Yet, as Patent Owner correctly points out, Lee teaches that no vacuum is applied to the underside of the foraminous medium in the first section 21. 213 PO Resp. 37; Ex. 1009, 7:28–37. Thus, Petitioner has not shown that Lee teaches “to adjust a pressure differential across a screen to allow solids to be conveyed along the screen unhindered.”

We do agree with Petitioner that Logue discloses adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid to flow through the screen. *See* 213 Pet. 49; 213 Pet. Reply 13; Ex. 1007, 3:50–52, 4:52–59, 5:28–31, 7:47–69. Patent Owner’s arguments to the contrary on this point are unpersuasive for the reasons articulated by Petitioner. *See* 213 PO Resp. 36; 213 Pet. Reply. 13–14. Nevertheless, Petitioner has not presented evidence that Ennis or Logue discloses a “slurry,” as we have construed that term. Further, Petitioner has not presented persuasive evidence or argument to show that it would have

been obvious to use the proposed combination of Ennis and Logue for processing a mixture of drilling fluid and drill cuttings (i.e., a “slurry,” as we have construed that term) in the manner recited in claim 1.

In its Petition, Petitioner’s only comments on the issue of whether it would have been obvious to use the proposed combination of Ennis and Logue for slurries composed of drilling fluid and drill cuttings were its observations that Ennis “applies to ‘dewatering aggregate slurries containing solids having a wide range of particle size’” and that it can be used for “‘other liquids,’ in ‘related industries,’ and ‘other processes.’” 213 Pet. 44 (citing Ex. 1006, 1:9–20); *see also id.* at 51, 54 (same). In our Decision on Institution, based on the record at that time, we determined that “a slurry having a ‘drilling fluid’ component would have been an obvious application of Ennis’s apparatus.” 213 Dec. on Inst. 27.⁷

The full record developed over the course of trial presents little additional evidence favoring Petitioner’s position (*see* Tr. 20:17–21:12) but substantial contrary evidence, as discussed below. Based on the full record, we are no longer persuaded by Petitioner’s scant showing on this point. *See TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (“[T]he Board is not bound by any findings made in its Institution Decision. At that point, the Board is considering the matter preliminarily without the benefit of a full record. The Board is free to change its view of the merits after further development of the record, and *should do so* if convinced its initial inclinations were wrong.”).

⁷ We made this statement in discussing claim 10, which expressly recites that the slurry has a drilling fluid component.

Patent Owner argues that separating drill cuttings and drilling fluid is “a very different task than separating other mixtures of solids and liquids.” 213 PO Resp. 38. In this regard, Patent Owner cites the deposition testimony of Petitioner’s expert agreeing that the slurry with which Logue is concerned is substantially different than a mixture of drilling fluid and drill cuttings. *Id.* at 40 (citing Ex. 2017, 53:25–54:11). One difference is that the dewatering processes of Ennis and Logue seek to recover valuable solids, whereas drilling fluid is the valuable component sought to be recovered in the oil industry. *Id.* at 38–39. Patent Owner points out that in the Parallel District Court Litigation, the District Court relied in part on this difference in its analysis that certain claims of the ’288 patent were not obvious in view of Ennis and Logue. *Id.* at 41 (citing Ex. 2020, 26).

Petitioner replies that “whether the solids or the liquids are more valuable, the goal is the same: separate the fluids from the solids.” 213 Pet. Reply 17. Petitioner asserts that one of the inventors of Ennis was Robert Derrick, who is also the inventor of the Derrick reference. *Id.* (citing Ex. 1006; Ex. 1004). According to Petitioner, this common inventorship shows that the concepts used in Ennis could be used in oil industry applications. *Id.* Petitioner contends that Patent Owner’s alleged distinction that Ennis is not used to separate drill cuttings and drilling fluid “is refuted by both the inventor’s own innovations and common sense. Both Ennis and the device claimed in the ’288 Patent are solid/fluid separators using vibrating screens assisted by vacuum.” 213 Pet. Reply 19.

We note that it is undisputed that neither Ennis nor Logue discloses a mixture of drilling fluid and drill cuttings. *See* 213 PO Resp. 39; 213 Pet. Reply 15–17; Ex. 2015 ¶¶ 62–64; Ex. 2017, 49:2–11, 50:22–51:4, 53:14–

54:13). Petitioner’s assertion that one of the inventors of Ennis developed (some 30 years later) a shaker for oilfield applications as disclosed in Derrick is only slightly probative on the question of whether a **hypothetical** person of ordinary skill in the art reviewing the disclosures of Ennis and Logue would have found it obvious to use Ennis to separate a slurry of drilling fluid and drill cuttings. Petitioner’s argument that it would be common sense to use Ennis for slurries composed of drilling fluid and drill cuttings is unconvincing based on the evidence and arguments of record. *See Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1363 (Fed. Cir. 2016) (“[W]hile ‘common sense’ can be invoked, even potentially to supply a limitation missing from the prior art, it must still be supported by evidence and a reasoned explanation.”).

The testimony of Petitioner’s expert, Mr. Matthews, indicates that drilling fluid is a “specialty liquid” and that separating it from solids presents “a unique problem” because of certain environmental and economic considerations particular to drilling fluids. Ex. 2017, 12:14–20, 31:8–15. Mr. Matthews further testifies that separating drilling fluids from drill cuttings can be difficult because of the chemical bond therebetween, which becomes stronger as the cuttings get finer. *Id.* at 13:4–16. Consistent with that testimony, Patent Owner’s expert, Mr. Palmer, describes some of the unique challenges of separating drilling fluid and drill cuttings, including the wide particle size distribution of drill cuttings, the desirability of maintaining within the drilling fluid certain solid additives of similar particle size to the drill cuttings, and the high viscosity of drilling fluid. Ex. 2015 ¶¶ 26, 40. Moreover, Mr. Palmer testifies that the elastomeric screen that Ennis teaches for its dewatering application would be ineffective in oilfield applications

because its poor fluid handling capacity would result in immediate loss of drilling fluid. Ex. 2015 ¶ 36.

Against this backdrop, we do not find sufficient evidentiary support in the record for Petitioner’s contention that it would have been obvious to use Ennis as modified by Logue for slurries that are a mixture of drilling fluid and drill cuttings.

Accordingly, we determine that Petitioner has not carried its burden to show by a preponderance of evidence that claim 1 would have been obvious over Ennis in view of Logue, Riedel or Lee.

2. *Claims 4–6 and 8*

Each of claims 4–6 and 8 depends from claim 1. For the same reasons discussed above in Section VI.C.1., Petitioner has not carried its burden to show by a preponderance of evidence that claim 1 would have been obvious over Ennis in view of Logue, Riedel or Lee.

3. *Claims 3 and 9*

Each of claims 3 and 9 depends from claim 1. For the same reasons discussed above in Section VI.C.1., Petitioner has not carried its burden to show by a preponderance of evidence that claim 1 would have been obvious over Ennis in view of Logue.

4. *Claim 10–12 and 14–18*

Claim 10 recites a “slurry” that has “a drilling fluid component.” Similarly, claim 16 recites a first screen “for separating drill cuttings and drilling fluid within a shaker.” Petitioner’s arguments and evidence that these limitations would have been obvious are unpersuasive for the same reasons discussed above in Section VI.C.1. in connection with the “slurry” limitation of claim 1.

Accordingly, Petitioner has not carried its burden to show by a preponderance of evidence that either of claims 10 or 16 would have been obvious over Ennis in view of Logue. Because of their dependency from claims 10 or 16, we also find that Petitioner has not shown that any of claims 11, 12, 14, 15, 17, and 18 would have been obvious over Ennis in view of Logue.

D. The '440 Patent

Petitioner's obviousness challenges to the claims of the '440 patent suffer the same infirmities as discussed above with respect to the '288 patent. Namely, claim 1 recites processing "a slurry" in several steps. Claim 10 recites subjecting a "slurry having a drilling fluid component" to several processing steps. Claim 16 recites a first screen "for separating drill cuttings and drilling fluid within a shaker." Petitioner's arguments and evidence that these limitations would have been obvious (*see* 295 Pet. 51–53) are unpersuasive for the same reasons discussed in Section VI.C.1. above with respect to the "slurry" limitation of claim 1 of the '288 patent.

By virtue of their dependency from claims 1, 10 or 16, we also find that Petitioner has not shown that any of claims 3–6, 8, 9, 11, 12, 14, 15, 17, or 18 would have been obvious over Ennis in view of Logue.

Petitioner's reliance on Riedel or Lee for its challenges to dependent claims 9 and 18 (*see* 295 Pet. 57–60) does not address the shortcomings discussed above. Thus, Petitioner has not demonstrated that either of claims 9 or 18 would have been obvious over Ennis in view of Logue and further in view of Riedel or Lee.

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E. Conclusions Regarding Obviousness Grounds

Petitioner has not carried its burden to demonstrate unpatentability for any of the obviousness grounds on which we instituted review.

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 3–6, 8–10, 14, and 15 of the '288 patent are held unpatentable;

FURTHER ORDERED that claims 1, 3–6, 8–10, and 14–18 of the '440 patent are held unpatentable; and

FURTHER ORDERED that any party seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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