UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FPUSA, LLC,

Petitioner,

v.

M-I LLC,

Patent Owner.

U.S. Patent No. 9,074,440
Issued: July 7, 2015
Filed: July 31, 2014
Inventor: Brian Carr

Title: SHAKER AND DEGASSER COMBINATION

Inter Partes Review No. IPR2016-00295

Petition for *Inter Partes* Review of

U.S. Patent No. 9,074,440

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FPUSA-EX 1005	U.S. Patent No. 8,746,460 to Vasshus, *et al*. (June 10, 2014)
FPUSA-EX 1006	U.S. Patent No. 3,929,642 to Ennis, *et al*. (December 30, 1975)
FPUSA-EX 1007	U.S. Patent No. 2,462,878 to Logue (March 1, 1949)
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I. INTRODUCTION

On behalf of FPUSA, LLC ("Petitioner") and in accordance with 35 U.S.C. §311 and 37 C.F.R. §42.100, *Inter Partes* Review ("IPR") is respectfully requested of Claims 1, 3-6, 8-12, and 14-18 of U.S. Pat. No. 9,074,440 [Ex. 1001] ("the '440 Patent"). The prior art discussed below demonstrates that the methods and systems in the '440 Patent were widely known and used or would have been obvious before the '440 Patent's purported priority date, and accordingly, Claims 1, 3-6, 8-12, and 14-18 should be cancelled.

A. Certification that the '440 Patent May be Contested by Petitioner

Petitioner certifies that the '440 Patent is available for IPR. Petitioner also certifies it is not barred or estopped from IPR of the claims of the '440 Patent. Neither Petitioner, nor any party in privity with Petitioner, has filed a civil action challenging the validity of any claim of the '440 Patent, and therefore this Petition complies with 37 C.F.R. §42.101(a). The '440 Patent has not been the subject of a prior IPR by Petitioner or a privy of Petitioner.

Petitioner also certifies this Petition for IPR is timely filed, as Petitioner has been served with notice of assertion of the '440 Patent within one year of the filing of this Petition, specifically on August 12, 2015. Ex. 1028 at 9. *See* 37 C.F.R. §42.101(b). In addition, the '440 Patent is a "first-to-invent" or "pre-AIA" patent, as it pre-dates the "first-to-file" system, satisfying 37 C.F.R. §42.102(a)(2).

The ‘440 Patent qualifies as a “first-to-invent” or “pre-AIA” patent, because it claims priority to U.S. Pat. No. 9,004,288 [Ex. 1002] (“the ‘288 Patent”) (issued April 14, 2015) and U.S. Pat. No. 8,613,360 [Ex. 1031] (“the ‘360 Patent”), which themselves pre-date the “first-to-file” system. *See* MPEP 2159.03; Ex. 1031; Ex. 1032 at 3; Ex. 1033 at 3.

To be examined using the first-inventor-to-file provisions under the AIA, the application must contain a claim to a claimed invention that has an effective filing date as defined in 35 U.S.C. §100(i) that is on or after March 16, 2013 or claims the benefit of an earlier filing date under 35 U.S.C. §§ 120, 121 or 365 based upon an earlier application with such a claim. *See* MPEP 2159.02. The Petitioner asserts that the ‘440 Patent does not have such a claim for the purposes of this Petition.[1] The ‘288 Patent was examined under the “pre-AIA” guidelines; however, the ‘440 Patent was mistakenly examined under the “post-AIA” provisions. Ex. 1010 at 3.

Because the ‘440 Patent claimed priority to the ‘360 Patent, it should have

[1] 35 U.S.C. §100(i)(1)(B) states that the “effective filing date” is “the filing date of the earliest application for which the patent or application is entitled, as to such invention, to a right of priority under section 119, 365(a), 365(b), 386(a), or 386(b) or to the benefit of an earlier filing date under section 120, 121, 365(c), or 386(c).”

been examined as a pre-AIA patent.[2] Therefore for the purposes of this Petition, the '440 Patent is rightly treated as a "pre-AIA" patent and subject to IPR.

B. Fees for IPR (37 C.F.R. §42.15(a))

The Director is authorized to charge the fees specified by 37 C.F.R. §42.15(a), including the IPR request fee, the IPR post-institution fee, any excess claims fees, and any other fees necessary to accord this Petition a filing date, to the credit card provided during the electronic filing of this Petition.

C. Mandatory Notices (37 C.F.R. §42.8(b))

1. Real Party in Interest (§42.8(b)(1))

The real party in interest of this Petition pursuant to §42.8(b)(1) is FPUSA, LLC, located at 10314 WCR 72, Midland, TX 79707.

2. Related Matters (§42.8(b)(2))

On May 15, 2015, M-I LLC ("Patent Owner") asserted claims, including Claims 1 and 16, of the '288 Patent against Petitioner in the U.S. District Court for the Western District of Texas ("District Court") and contemporaneously filed a motion for a preliminary injunction ("PI") predicated on its allegations of patent

[2] The Patent Owner did not affirmatively assert the statement under 37 C.F.R. §§ 1.55 and 1.78 for AIA applications in the Application Data Sheets, and thus the Examiner should have examined the application as a pre-AIA application. *See* Ex. 1032 at 3; 1033 at 3.

infringement. *See* Ex. 1017. The District Court granted the PI on June 24, 2015, as to system Claim 16. *See* Ex. 1018. On September 24, 2015, the Federal Circuit upheld the PI. *See* Ex. 1019. Previous to this Petition for IPR, Petitioner filed a Petition for IPR for various claims of the '288 Patent on November 19, 2015 [Ex. 1026]. The '440 Patent at issue here was filed as a continuation of the '288 Patent.

Regarding the '440 Patent, Patent Owner unsuccessfully attempted to assert certain claims on August 12, 2015 in an amended complaint pursuant the '288 Patent litigation.[3] Ex. 1028. The District Court granted leave for Patent Owner to file an amended complaint on October 26, 2015. Ex. 1030.

3. Lead and Backup Counsel (§42.8(b)(3))

Lead Counsel is: Brad Y. Chin, Reg. No. 52,738, (713) 221-1569, brad.chin@bgllp.com. Backup Counsel are: Douglas F. Stewart, Reg. No. 51,060, (206) 204-6271, doug.stewart@bgllp.com, Kevin R. Tamm, Reg. No. 70,580, (713) 221-1141, kevin.tamm@bgllp.com, and Brendan N. McCommas, Reg. No. 73,119, (713) 221-1182, brendan.mccommas@bgllp.com, all of Bracewell & Giuliani LLP.

[3] The original filing was technically improper because Patent Owner was required to seek leave of the District Court but did not do so. An agreement was later reached on other issues and Petitioner agreed not to oppose Patent Owner's request for leave. Ex. 1029.

4. Service Information (§42.8(b)(4))

Service on Petitioner may be made by e-mail to docketing@bgllp.com, and by mail or hand-delivery to Brad Y. Chin, Bracewell & Giuliani LLP, 711 Louisiana Street, Suite 2300, Houston, TX 77002. The fax number for lead and backup counsel is (800) 404-3970, and the phone number is (713) 223-2300.

5. Proof of Service (§§42.6(e) and 42.105(a))

Proof of Service of this Petition is provided in Ex. 1003.

II. IDENTIFICATION OF THE CLAIMS BEING CHALLENGED (37 C.F.R. §42.104(b))

Ground	Claims	Basis for Challenge
1	1, 3-6, 8-12, and 14-18	Anticipated by *Derrick* – 35 U.S.C. §102(b)
2	1, 3-6, 8-12, and 14-18	Anticipated by *Vasshus* – 35 U.S.C. §102(e)
3	1, 3-6, 8-12, and 14-18	Obvious over *Ennis* in view of *Logue* – 35 U.S.C. §103(a)
4	9 and 18	Alternatively Obvious over *Ennis* in view of *Logue* in further view of *Riedel* or *Lee* – 35 U.S.C. §103(a)

Petitioner requests that the Board institute IPR of Claims 1, 3-6, 8-12, and 14-18 to cancel these claims, because there is a reasonable likelihood that Petitioner will prevail with respect to at least one challenged claim. 35 U.S.C. §314(a).

Specifically, Claims 1, 3-6, 8-12, and 14-18 are anticipated by U.S. Pat. App. Pub. No. 2005/0082236 of Derrick, *et al*. [Ex. 1004] ("Derrick") and U.S.

Pat. No. 8,746,460 of Vasshus, *et al*. [Ex. 1005] ("Vasshus"). The recited claims are also unpatentable as being obvious over U.S. Pat. No. 3,929,642 of Ennis, *et al*. [Ex. 1006] ("Ennis") in view of U.S. Pat. No. 2,462,878 of Logue [Ex. 1007] ("Logue"). Alternatively, Claims 9 and 18 are also unpatentable as being obvious over Ennis in view of Logue in further view of U.S. Pat. No. 2,663,427 of Riedel [Ex. 1008] ("Riedel"), *or* U.S. Pat. No. 5,259,952 of Lee [Ex. 1009] ("Lee"). The references qualify as prior art to the '440 Patent under at least 35 U.S.C. §§102(a), 102(b), and/or 102(e) (pre-AIA). Pursuant to 37 C.F.R. §42.104(b)(4), an explanation of how the challenged claims are unpatentable, including where each claim element is found in the prior art, is provided in Section IV.

Pursuant to 37 C.F.R. §42.104(b)(5), the exhibit numbers of the supporting evidence relied upon and the relevance of the evidence to the challenges raised, including identification of specific portions of the evidence, are provided in the attached Exhibit List. In support of the asserted grounds of rejection, this Petition is accompanied by the declaration of Mr. Peter Matthews [Ex. 1013], the President of Performance Fluid Management, a consulting firm in the oil and gas industry. Ex. 1013 at ¶ 2; *See also* Ex. 1020.

III. RELEVANT INFORMATION CONCERNING THE '440 PATENT

A. Overview of the '440 Patent [Ex. 1001]

1. The '440 Patent Specification

The ‘440 Patent was filed on July 31, 2014, as a continuation of U.S. Pat. App. No. 13/845,704, which was filed on March 18, 2013, and issued as the ‘288 Patent on April 14, 2015. The disclosure of the ‘440 Patent describes and shows various embodiments of systems for separating components of a slurry of drilling fluid and drill cuttings. Ex. 1001 at FIGS. 1-7. The ‘440 Patent recites various methods for separating components of drilling fluid slurry. *Id.* at 4:6-38, Claims 1-15. FIGS. 1 and 2 of the ‘440 Patent show a side view and a cross-sectional view, respectively, of a separator 5 with an inlet 52, an outlet 54, and a screen 42. *Id.* at 5:32-6:16. A sump 50 collects fluids and other materials passed through the screen 42, and these materials are discharged through the outlet 54. *Id.* Solids and other materials that are not passed through the screen 42 are discharged from the end of the screen 42 to be collected. *Id.* A basket 24 and the screen 42 are vibrated by rotary eccentric vibrators 56 and 58. *Id.*

A pressure differential device of the ‘440 Patent is used to create a pressure differential between the vapor space above screen 42 and the vapor space between screen 42 and sump 50. *Id.* at 6:5-7:9. Pumps and valves can be used to toggle or pulse the pressure differential across the screen to avoid solids build-up on the screen. *Id.* In FIG. 4, a sump 96 with an outlet 98 can apply a pressure differential to two screens 92A, 92B, without applying a pressure differential to two additional screens 92. *Id.* at FIG. 4, 8:26-36. FIGS. 5-7 of the ‘440 Patent illustrate alternate

systems for separating the components of a drilling fluid. FIG. 6 shows a degassing chamber 212 for separating gaseous fluid from liquid fluid after fluid has passed through a shaker screen 204. *Id.* at FIG. 6, 9:9-46.

2. Representative Claims

Claims 1 and 10 are independent method claims, while Claim 16 is an independent system claim. Claim 1 of the '440 Patent reads as follows:

> 1. A method comprising:
> [a] introducing a slurry to a shaker having a first screen and a second screen;
> [b] flowing the slurry over the first screen;
> [c] 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
> [d] 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.

Method Claims 1 and 10 recite a "while maintaining the first pressure differential" limitation, and system Claim 16 recites a similar limitation in claiming the "chamber" element. *Id.* at Claims 1, 10, and 16. Method Claim 10 includes a degassing chamber. *Id.* at Claim 10. Dependent method Claim 9 recites a "controlling air flow" limitation, and dependent system Claim 18 recites "air or vapor pulled through the first screen is adjustable to prevent stalling of drill

cuttings on the first screen." *Id.* at Claim 18.

3. Partial Summary of Prosecution History

In a Non-Final Office Action [Ex. 1010] issued on October 31, 2014, Claims 1, 8, 9, 10, 15-17, 19, and 20 (which include all of the issued independent claims) were rejected as being anticipated by Derrick. Ex. 1010. Amended claims were submitted in a Response filed on February 2, 2015 [Ex. 1011], and Claims 1 and 10 were amended to include the "while maintaining the first pressure differential" limitation shown above. Ex. 1011 at 4-5. Claim 17 was similarly amended. *Id.* at 6. In a Notice of Allowance dated May 29, 2015 [Ex. 1012], the Examiner noted:

> Discussed and agreed upon claim amendments detailing the method and system claims and how they relate to the Bongert reference. Agreed that claim amendments overcame the prior art Bongert in that it differed step and structurally from the claimed invention. Ex. 1012 at 5.

U.S. Pat. No. 3,970,552 to Bongert (July 20, 1976) is attached as Ex. 1027. The Examiner failed to provide any other statement indicating how the claim amendments overcame Derrick. Petitioner respectfully asserts that the "while maintaining the first pressure differential" claim limitation is disclosed in multiple prior art references discussed below, including, for example, Derrick, which was cited by the Examiner in the Non-Final Office Action.

B. Effective Filing Date of the '440 Patent

The ‘440 Patent was filed as a continuation of U.S. Pat. App. No. 13/845,704, filed March 18, 2013, which itself was filed as a continuation of U.S. Pat. App. No. 11/862,955, which was filed on September 27, 2007, and itself claims priority to U.S. Prov. Pat. App. Nos. 60/827,567 and 60/827,542, both of which were filed on September 29, 2006. Thus, the earliest possible priority which could be accorded to the ‘440 Patent is September 29, 2006.[4]

C. The Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) in the field of the ‘440 Patent would be someone involved in the manufacture and/or use of shale shakers and accessories thereto. One would likely 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. Ex. 1013 at ¶ 23.

D. Claim Construction for the ‘440 Patent

In this proceeding, claims must be given their broadest reasonable

[4] While September 29, 2006 is used as the date in this Petition to validate the availability of prior art references, Petitioner makes no assertion that any claim of the ‘440 Patent is supported by the filings of September 29, 2006, or has priority to this date.

construction in light of the specification. 37 C.F.R. §42.100(b). In the District Court Litigation, Petitioner, Patent Owner, and the District Court advanced respective claim constructions for the '288 Patent.[5] *See* Ex. 1014; Ex. 1017; Ex. 1018. Herein, Petitioner identifies representative subject matter within the scope of the claims, read with the broadest reasonable interpretation ("BRI") as to a POSITA. Petitioner expressly reserves its right to advance different constructions in any district court litigation that employs a different claim construction standard. Any phrases not explicitly addressed should be given their plain and ordinary meaning as to a POSITA.

[5] Petitioner sought to have the District Court construe the phrase "first and second screen" pursuant to *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) as understood by those of ordinary skill in the art and as the terms are used in the industry, which was reflected in the testimony of Petitioner's technical expert. However, the District Court ruled at the preliminary injunction phase that the use of "first" and "second" did not connote any ordinal sequence to the claimed "screens." Accordingly, Petitioner acknowledges—for purposes of this Petition *only*—that the BRI would be consistent with the broad claim construction asserted by Patent Owner, and adopted by the District Court, in the underlying litigation. Petitioner's acquiescence for purposes of this Petition should not be considered binding in any District Court litigation. *See* Ex. 1014; Ex. 1017-1019.

1. "screen"

The term "screen" is used consistently throughout the '440 Patent. Under its BRI, the term "screen" includes *any perforated material capable of separating solids from fluids by allowing fluids to flow through the material in preference to solids*. The '440 Patent provides, "Typically, the shale shaker is an angled table with a generally perforated filter screen bottom." Ex. 1001 at 2:1-3. Certain examples of screen types are provided by the specification as follows:

> The screen may have two or more overlaying layers of screen cloth or mesh. Layers of cloth or mesh may be bonded together and placed over a support, supports, or a perforated or apertured plate…. The fineness or coarseness of the mesh of a screen may vary depending upon mud flow rate and the size of the solids…. *Id.* at 2:48-59.

With the variety of examples provided by the specification of the '440 Patent and the knowledge of the POSITA, Petitioner asserts that the term "screen" includes *any perforated material capable of separating solids from fluids by allowing fluids to flow through the material in preference to solids*.

2. "a first screen and a second screen"

Method Claims 1 and 10, and system Claim 16, recite a shaker with "a first screen and a second screen." *Id.* at Claims 1, 10, 16. Certain other claims, for example, dependent method Claim 3, also use the terms "first" and "second" referring to screens and portions of screens. In litigation concerning the '288

Patent, the District Court preliminarily found that the terms do not denote spatial location. Ex. 1018 at 13-14 (citing Free Motion Fitness, Inc. v. Cybex Intern., Inc., 423 F.3d 1343, 1348 (Fed. Cir. 2005)). Based on this preliminary ruling, Petitioner asserts that the BRI of the terms "first" and "second" does not connote any particular ordinal sequence relative to the shaker inlet or outlet. These terms merely distinguish between repeated instances of screens or components.

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

Under the BRI of this step in Claim 9, Petitioner asserts that this phrase includes *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*. Ex. 1013 at ¶ 25. The '440 Patent provides, "In some embodiments, the pressure differential may be pulsed, toggled, or intermittently interrupted." Ex. 1001 at 6:36-37. The specification continues, "By toggling the pressure between vacuum and static, conveyance of 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." *Id.* at 6:56-60. Multiple examples of pressure differential devices are provided at column 6, lines 17-35. FIGS. 1-7 provide a variety of configurations for the devices.

With the specification providing a wide array of exemplary pressure differential devices and a variety of configurations for use of such devices, a

POSITA could conceive of many embodiments to effect a pressure differential across a screen to avoid slurry build-up. Under the BRI, this step includes *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*.

4. "intermittently interrupting the step of applying the first pressure differential"

Under the BRI, the limitation of dependent method Claim 5 includes *changing the pressure differential across a screen*. Ex. 1013 at ¶ 25. A similar clause appears in dependent method Claim 11. The specification explains:

> … the partial vacuum may be generated by causing a flow of fluid from a space below the screen, … , and *the toggling may be performed by intermittently interrupting the vacuum* by disrupting the flow of recovered vapor. *Id.* at 4:14-19 (*emphasis added*).
>
> *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. *Id.* at 6:37-41 (*emphasis added*).

Thus, because "toggling" includes "intermittently interrupting," and because "toggling or pulsing" refers to changing the pressure differential, the limitations of Claims 5 and 11 include *changing the pressure differential across a screen*.

5. "a degassing chamber"

Claim 1 requires in the "pulling" step "a degassing chamber." Claim 10 also

recites a "degassing chamber." The '440 Patent at column 9, lines 20-46 describes degassing chambers. The specification states, "The fluid 210 collecting in degassing chamber 212 during the separation process may be degassed or partially degassed by the vacuum or partial vacuum generated by the pressure differential device 216." *Id.* at 9:36-39. In the '288 Patent litigation, the District Court preliminarily found that a fluid/air separator could be a "degassing chamber." *See* Ex. 1018 at 21; Ex. 1013 at ¶ 26. A POSITA would thus find the BRI to include *any chamber under at least a partial vacuum which separates gas from liquids*.

6. "wherein the air or vapor pulled through the first screen is adjustable to prevent stalling of drill cuttings on the first screen"

Under the BRI, this phrase in dependent system Claim 18 includes *an adjustable pressure differential across a screen*. The '440 Patent explains how to prevent stalling of drill cuttings on a screen:

> By *toggling the pressure between vacuum and static*, conveyance of 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. Ex. 1001 at 6:56-60 (*emphasis added*).

The "adjustable" nature of the vacuum creates an inherent ability "to prevent stalling of drill cuttings on the first screen." The specification at column 6, lines 37-41 explains the terms "toggling" and "pulsing" as recited *supra* in Section III.D.4. Based on the specification, the accumulation of solids, or "stalling of drill

cuttings" as Claim 18 recites, is avoided by "toggling the pressure between vacuum and static." Toggling refers to "changing of the pressure differential" from static to at least a partial vacuum, and under the BRI, this claim limitation includes *an adjustable pressure differential across a screen*. Ex. 1013 at ¶ 27.

IV. CLAIMS 1, 3-6, 8-12, and 14-18 OF THE '440 PATENT ARE UNPATENTABLE

A. Ground 1 – Claims 1, 3-6, 8-12, and 14-18 are Unpatentable as Anticipated by Derrick Under 35 U.S.C. §102(b)

1. Identification and Date Qualification of Prior Art

Each limitation of Claims 1, 3-6, 8-12, and 14-18 is disclosed or suggested by Derrick [Ex. 1004]. Derrick qualifies as prior art under 35 U.S.C. §102(b) (pre-AIA) because Derrick published more than one year before September 29, 2006, the earliest date to which the '440 Patent could claim priority. During the prosecution of the '440 Patent, the Examiner considered Derrick. Ex. 1010. The Examiner found, and Patent Owner conceded, that Derrick disclosed many of the limitations recited in the claims of the '440 Patent. However, after an amendment by Patent Owner discussed above in Section III.A.3., a Notice of Allowance issued when Derrick should have been cited for also disclosing additional claim limitations. Derrick discloses all of the '440 Patent claim limitations, either explicitly or inherently.

2. Brief Summary of Derrick [Ex. 1004]

Derrick is entitled, "Vibratory Screening Machine with Suction and Method for Screening a Slurry," and discloses a method and apparatus for screening a slurry, in which the slurry is vibrated and conveyed across a set of screens, and suction is applied from below one or more of the screens. Like the '440 Patent, Derrick is directed toward a method for screening slurries that separates the gas and liquid from the solid for disposal purposes. After fine particles, air, and liquid are drawn through openings in the screen, the liquid and particles are conveyed and separated in a separator from the air. Ex. 1004 at Abstract. The features disclosed in Derrick anticipate all of the limitations of Claims 1, 3-6, 8-12, and 14-18 of the '440 Patent.

Derrick's vibratory screening machine for screening a slurry withdraws fine particles and liquid from a slurry on a screen bed area when chambers underneath the screen bed are subjected to suction. *Id.* at [0044]. Drying the particles allows disposal of the particles without the withdrawn liquid. One vibratory screening machine is shown in FIG. 1 of Derrick, and is reproduced in Ex. 1025 at 1.

Derrick's vibratory screening machine 10 includes a slurry feeder 19 to deposit slurry at the slurry inlet end of the machine, vibratory motors 42, suction-pressure chambers 73, 74, and 75, one or more of which is intermittently subjected to suction and release, a screen bed containing multiple screens (above the suction chambers), a plurality of centrifugal blowers 154 with suction inlets 155 and

pressure outlets 157, which apply pneumatic pressure in order to "unclog the screens," and a cyclone separator (234 in FIG. 23). Ex. 1004 at [0058]-[0059], [0062]-[0063], and [0082]. In FIG. 23, Ex. 1025 at 2, the side view shows slurry passing through conduit 222 onto a vibrating screen bed where suction is applied through chamber 75 beneath screen 4 (see also reference numeral 75 in FIG. 1). Ex. 1004 at [0078]. Derrick carries liquid and gas to cyclone separator 234 for separation. *Id.* at [0080].

3. Derrick renders Independent Claim 1 Unpatentable

a. "introducing a slurry to a shaker having a first screen and a second screen" (claim limitation 1[a])

From the claim construction in Section III.D.1., the term "screen" includes *any perforated material capable of separating solids from fluids by allowing fluids to flow through the material in preference to solids*, and the terms "first" and "second" do not require specific spatial ordering relative to the shaker inlet or outlet. Slurry is introduced to a vibratory screening machine 10 (the shaker) having a screen bed in FIGS. 1, 4, and 23 of Derrick. Ex. 1025 at 1, 2, and 3. FIG. 4 shows a configuration with the screen bed with vacuum chambers 73, 74, and 75 (from FIG. 1) underneath each screen separated by plastic strips 104.

Paragraph [0055] of Derrick states, "…there are two undulating screens 112 (FIGS. 4, 4C and 14) positioned in sealing relationship with the bed of the movable frame above chambers 73 and 74." Ex. 1004 at [0055]. FIG 23. shows a

configuration with four screens and with one chamber 75 under screen 4. Paragraph [0078] clarifies that the device can be configured with various screens and chambers depending on the application. The screens in Derrick take the form of mesh screens. *Id.* at [0064]. Derrick discloses that the slurry is passed over the screens and the screens can be "alternately subjected to suction to thereby draw liquid and fine particles from a slurry being screened …." *Id.* at [0051]. Therefore, Derrick discloses claim limitation 1[a].

b. "flowing the slurry over the first screen" (claim limitation 1[b])

FIG. 23 of Derrick, Ex. 1025 at 2, discloses that a slurry composed of "fine drilling mud solids, coarse drilled material particles and liquid" is introduced through conduit 222 onto a screen bed with screens, for example screens 1, 2, 3, and 4 with a vibratory screening machine 221. Ex. 1004 at [0004], [0044], and [0078]. Therefore Derrick discloses claim limitation 1[b].

c. "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" (claim limitation 1[c])

Derrick states at [0063] regarding FIGS. 1, 3, 15, 16, and 17:

> … a plurality of centrifugal blowers 154 is provided …. *each blower has a conduit 160 which connects the four-way valve 159 to suction conduit 155 of the blower, and a conduit 161 connects the blower pressure outlet 157 to the four-way valve.* …, the chamber such as 73, 74 and 75 will be subjected to suction because the air flow will be

from the suction-pressure chamber through duct 166 leading from the chamber…. *The suction will cause fine particulate material and liquid to be withdrawn from the slurry and deposited in chambers 73, 74 and 75 while the coarse material will not pass through the screens and it will be dried*. Ex. 1004 at [0063] (*emphasis added*).

Derrick discloses applying a first pressure differential with a pressure differential device to at least a portion of the first screen by blower 154, and discloses separating a solids component from a liquid component of the slurry by suction generated by blower 154. Derrick therefore discloses claim limitation 1[c].

d. "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" (claim limitation 1[d])

Derrick discloses, either explicitly or inherently, claim limitation 1[d]. Patent Owner provided a strained argument against Derrick disclosing this claim limitation in the Response to the Non-Final Office Action. Ex. 1011 at 8-17. The Notice of Allowance did not accept or comment on this line of argument. Ex. 1012. However, cyclone separator 234 in FIG. 23 of Derrick clearly discloses this claim element by conduit 239 (a flow line) through which the liquid component and air or vapor are pulled together during a vacuum suction cycle. Ex. 1004 at [0078]-[0082]. Cyclone separator 234 is a "degassing chamber" as it separates solid particles and liquid into tank 249, and air is pulled out through conduit 233

by blower 229. *Id.* "The first pressure differential across the first screen" (screen 4 in FIG. 23) is maintained while pulling the liquid component and air or vapor together through a flow line (conduit 239) to the degassing chamber (cyclone separator 234) during the vacuum cycle. *Id.*

Paragraph [0079] explains that liquid and fine particles are released to tank 224 by duckbill valves 152 when there is a release of suction to atmospheric pressure; however, during 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…." *Id.* at [0082].

Assuming, *arguendo*, that during the suction cycle some portion of liquid or fine particles was deposited in duckbill valves 152 rather than conveyed to cyclone separator 234 from beneath screen 4, paragraph [0078] states "The major part of the fine particles and liquid are separated from the slurry during passage over screens 1, 2 and 3…." and paragraph [0080] states, "The positions of valves 230, 241 and 242 can be modulated by control system 240 to create a desired amount of suction on chamber 75. … the positions of valves 230, 241 and 242 can be modulated to control … the load on blower 229." *Id.* at [0078], [0080]. A POSITA would understand the suction cycle in chamber 75 can be set such that *all* or *substantially all* of the drilling fluid, air, and fine particles are sent to cyclone

separator 234 "while maintaining the first pressure differential across the first screen." Ex. 1013 at ¶ 33.[6] Therefore, Derrick discloses claim limitation 1[d].

In prosecution, Patent Owner stated regarding paragraph [0082] of Derrick, "Applicant respectfully submits that this airborne liquid is appreciably different from the liquid component of the slurry, as recited in independent claim 1. That is, airborne liquid is merely composed of droplets and is simply *not* the same as the liquid component of the slurry." Ex. 1011 at 11 (emphasis in original). However, Derrick does not discuss "droplets" as alleged by Patent Owner, and cyclone separator 234 discloses claim limitation 1[d], as air is removed from cyclone separator 234 by conduit 233 to filter 232, and "liquid and fine particles are separated from the air stream and deposited into tank 249." Ex. 1004 at [0082].

Once again, paragraph [0078] states "The major part of the fine particles and

[6] Petitioner notes that nothing about "external" degassing chambers receiving air or vapor and the drilling fluid is novel or nonobvious. Ex. 1024 at 9 explains in a shaker system "[a]ll other removal equipment (degasser…) should process all of the fluid entering the suction compartment. This may exceed the rig flow if drilling fluid enters upstream from another process or from mud guns." Ex. 1024 at 9. Figure 7-2 of Ex. 1024 also shows a degasser external to a main shaker. This textbook qualifies as supporting prior art because it was published in 1999. *See also* Ex. 1013 at ¶ 21.

liquid are separated from the slurry during passage over screens 1, 2 and 3….” and paragraph [0080] states, “The positions of valves 230, 241 and 242 can be modulated by control system 240 to create a desired amount of suction on chamber 75. … the positions of valves 230, 241 and 242 can be modulated to control … the load on blower 229.” *Id.* at [0078], [0080]. Thus whatever composition remains at screen 4, such as “liquid component and air or vapor” as claimed in limitation 1[d], the composition could be pulled “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” by cyclone separator 234. Derrick therefore discloses claim limitation 1[d].

Moreover, Petitioner respectfully asserts that degassing chambers are well known in the art of drilling mud separations and have been for years. *See, e.g.*, Manuel *et al.* [Ex. 1023] at FIGS. 6A, 6B reference numeral 410 and 10:18-31; Ex 1024. A POSITA would understand placement, arrangement, and disposition of degassing chambers with separation units and would be motivated to combine degassing chambers to increase the efficiency of separations. Ex. 1013 at ¶ 64.

4. Derrick renders Independent Claim 10 Unpatentable

a. “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” (claim limitation 10[a])

Derrick discloses that the slurry includes “fine drilling mud solids, coarse

drilled material particles and liquid," which is introduced through conduit 222 onto a screen bed with screens, for example screens 1, 2, 3, and 4 with a vibratory screening machine 221. Ex. 1004 at [0004], [0044], [0078]-[0079], and FIG. 23. Therefore, Derrick discloses claim limitation 10[a].

b. "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" (claim limitation 10[b])

Derrick discloses that an operator can program each chamber to apply suction, pressure, and ambient air as desired. Ex. 1004 at [0051], [0063]-[0064], [0069], [0075]-[0076], and [0078]-[0079]. FIG. 3 of Derrick depicts a centrifugal blower 154 *external to the shaker and sump, and in fluid communication with the shaker and sump* (chambers 73, 74, 75). Therefore, Derrick discloses claim limitation 10[b].

c. "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" (claim limitation 10[c])

Similar to the discussion for claim limitation 1[d] above, Derrick discloses claim limitation 10[c]. Patent Owner provided a strained argument against Derrick disclosing this claim limitation in the Response to the Non-Final Office Action. Ex. 1011 at 8-17. The Notice of Allowance did not accept or comment on this line

of argument. Ex. 1012. However, cyclone separator 234 in FIG. 23 of Derrick clearly discloses this claim element by conduit 239 "pulling air or vapor and substantially all of the drilling fluid component together from the area below the first screen inside the shaker" (screen 4) "into a degassing chamber external to the shaker" (cyclone separator 234) "while maintaining the first pressure differential" (during the suction cycle). Ex. 1004 at [0078]-[0082].

Cyclone separator 234 is a "degassing chamber" as it separates solid particles and liquid into tank 249, and air is pulled out through conduit 233 by blower 229. *Id.* "The first pressure differential" across the first screen (screen 4 in FIG. 23) is maintained while pulling the liquid component and air or vapor together through a flow line (conduit 239) to the degassing chamber (cyclone separator 234) during the vacuum cycle. *Id.* Paragraph [0078] states "The major part of the fine particles and liquid are separated from the slurry during passage over screens 1, 2 and 3…." and paragraph [0080] states, "The positions of valves 230, 241 and 242 can be modulated by control system 240 to create a desired amount of suction on chamber 75. … the positions of valves 230, 241 and 242 can be modulated to control … the load on blower 229." *Id.* at [0078], [0080]. Thus, the composition remaining at screen 4, such as "liquid component and air or vapor" as claimed in limitation 10[c], could be pulled "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." Derrick therefore discloses claim limitation 10[c]. *See also supra* claim limitation 1[d]; Ex. 1023 at FIGS. 6A, 6B ref. no. 410, 10:18-31; Ex. 1024. at 9, Figure 7-2; Ex. 1013 at ¶ 21.

5. Derrick renders Independent Claim 16 Unpatentable

a. "a first screen having an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker" (claim limitation 16[a])

Derrick discloses, in FIG. 4, two undulating screens 112 above chambers 73 and 74 with an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker. Ex. 1004 at [0055]. Derrick therefore discloses claim limitation 16[a].

b. "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" (claim limitation 16[b])

In FIG. 23, Derrick discloses a pressure differential generator or vacuum chamber 75 that pulls air or vapor through the first screen (4) and does not create a pressure differential for the second screen (1, 2, or 3). Derrick states, "… screens 1, 2, or 3 may include vacuum chambers. … [S]creen 4 … comprises a vacuum or suction chamber associated therewith, such as chamber 75 described above." Ex.

1004 at [0078]. In FIG. 1, the screen above either chamber 73 or 74 can be operated with suction and pressure or suction and ambient and the last screen above the "third chamber" 75 can be operated "without suction and pressure." *Id.* at [0076]-[0077]. Therefore, Derrick discloses claim limitation 16[b].

c. "a sump disposed below the first screen and configured to receive the flow of drilling fluid through the first screen" (claim limitation 16[c])

Derrick discloses sumps located below screens by chambers 73, 74, and 75, which are configured to collect the air or vapor and the drilling fluid passing through screens, as depicted in FIGS. 1 and 2. Ex. 1004 at [0051]. Therefore, Derrick discloses claim limitation 16[c].

d. "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" (claim limitation 16[d])

Similar as discussed *supra* with regards to claim limitations 1[d] and 10[c], Derrick discloses claim limitation 16[d] with cyclone separator 234 in FIG. 23. Derrick discloses "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" by cyclone separator 234 in fluid communication with blower 229, which is "located external to the shaker for collecting the air or vapor and the drilling fluid from the sump" (suction-pressure chamber 75) "while

the pressure differential generator is configured to apply a pressure differential across the first screen" (during the suction cycle under screen 4). Ex. 1004 at [0078]-[0082].

6. Derrick renders Dependent Claims 3-6, 8, 9, 11, 12, 14, 15, 17, and 18 Unpatentable

a. Dependent Claim 3

Claim 3 depends from Claim 1, and recites "applying a second pressure differential to the first screen wherein the second pressure differential is zero." Derrick discloses each chamber 73, 74, 75 can apply suction, pressure and ambient air as desired. Ex. 1004 at [0070]. Derrick discloses that the last screen above the "third chamber" 75 can be operated "without suction and pressure." *Id.* at [0076]-[0077]. Therefore, Derrick discloses the limitation of Claim 3.

b. Dependent Claim 4

Claim 4 depends from Claim 1, and recites "toggling the first pressure differential between static and at least a partial vacuum." Derrick states, "In the test, the suction was applied for periods of four seconds and there were intermittent releases of suction for periods of one second." Ex. 1004 at [0069]. Therefore, Derrick discloses the limitation of Claim 4.

c. Dependent Claims 5 and 11

Claim 5 depends from Claim 1, and recites "intermittently interrupting the step of applying the first pressure differential." Claim 11 depends from

independent Claim 10, and recites a similar limitation. Derrick recites, "*intermittently applying a greater suction and a lesser suction by intermittently venting the chamber to produce periods of lesser suction.*" Ex. 1004 at [0069] (*emphasis added*). Therefore, Derrick discloses the limitations of Claims 5 and 11.

d. Dependent Claims 6 and 12

Claim 6 depends from Claim 1, and recites "pulsing the step of applying the first pressure differential between the first pressure differential and a second pressure differential wherein the second pressure differential is different than the first pressure differential." Claim 12 depends from independent Claim 10, and recites a similar limitation. Derrick discloses these limitations at paragraph [0069] as recited above with regard to Claims 5 and 11. Derrick discloses changing pressure intermittently, and therefore discloses the limitations of Claims 6 and 12.

e. Dependent Claims 8 and 17

Claim 8 depends from Claim 1, and recites "wherein the applying the first pressure differential is generated by a vacuum external to the shaker." Claim 17 depends from independent Claim 16, and recites a similar limitation. The phrase "external to the shaker" includes units *external to the shaker and sump, and in fluid communication with the shaker and sump*. FIG. 3 of Derrick discloses a blower 154 external to and in fluid communication with the shaker and sump, which is used to create a vacuum to generate the first pressure differential. Ex. 1004 at

[0063]. Therefore, Derrick discloses the limitations of Claims 8 and 17.

f. Dependent Claim 9

Claim 9 recites the step of "controlling air flow under the screen to prevent stalling of the slurry on the screen." Per the BRI of this claim element in Section III.D.3., the phrase includes *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*. Paragraphs [0062] and [0063] of Derrick disclose an embodiment in which the vacuum is so strong that the screens are clogged -- thus the cuttings are stalled on the screens. *See* Ex. 1004 at [0063]. The prosecution history fails to discuss, however, other embodiments in Derrick that explicitly disclose controlling air flow to prevent stalling on the screen—in the same manner disclosed in the '440 specification. Derrick at paragraph [0079] recites:

> 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. Id.* at [0079] (*emphasis added*).

This is also described in Derrick as "intermittent releases" that can be controlled by a programmable logic controller (PLC). *Id.* at [0069]. This is precisely how "controlling air flow to prevent stalling of the slurry" is described in

the ‘440 specification: “In some embodiments, the pressure differential may be pulsed, toggled, or intermittently interrupted. … By toggling the pressure between vacuum and static, conveyance of solids across the screen may proceed unhindered….” Ex. 1001 at 6:36-37, 56-58; Ex. 1013 at ¶ 25. Stalling is prevented by operation of the PLC in connection with suction chamber(s) either inherently or explicitly in Derrick at [0069]. Ex. 1004 at [0069], [0075], and [0076]. Neither M-I nor the Examiner addressed these issues during prosecution of the ‘440 Patent. Derrick thus discloses this claim limitation, because it teaches *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*.

g. Dependent Claim 14

Claim 14 depends from Claim 10, and recites, “separating the air or vapor from the drilling fluid component in the degassing chamber.” As noted previously in the discussion of FIG. 23 of Derrick, cyclone separator 234 separates air or vapor by conduit 233 to blower 229 from the drilling fluid component, which is sent to tank 249. Therefore, Derrick discloses the limitation of Claim 14.

h. Dependent Claim 15

Claim 15 depends from independent Claim 10, and recites “applying vacuum pressure to a portion of the total length of the first screen.” FIG. 5 of Derrick is reproduced in Ex. 1025 at 4. The first screen is interpreted to be the

middle screen, which has three ducts for suction and pressure 99 on one portion and one duct 99 for suction and pressure on another portion. This creates regions of varied suction over a portion of the first screen (the middle screen), regardless of which direction of the screen is viewed as a "portion of the total length." Pressure can be applied to "a portion of the total length" over the middle screen, viewing the "length" of the middle screen as either the longer or shorter side. Ex. 1004 at [0076]-[0077]. Therefore, Derrick discloses the limitation of Claim 15.

i. Dependent Claim 18

Claim 18 depends from independent Claim 16. Derrick discloses the limitation of Claim 18, "wherein the air or vapor pulled through the first screen is adjustable to prevent stalling of drill cuttings on the first screen." Per the claim construction, this phrase includes *an adjustable pressure differential across a screen*. Derrick describes *an adjustable pressure differential across a screen* at paragraphs [0063]-[0064], [0069]-[0070], and [0075]-[0076]. Paragraphs [0075]-[0076] disclose controlling air flow under screen portions using a PLC to obtain a desirable separation of the slurry particles and fluids. Ex. 1004 at [0075]-[0076]. Therefore, Derrick discloses the limitation of Claim 18, because it teaches in multiple instances *an adjustable pressure differential across a screen*, which facilitates the conveyance of the coarse particles from the slurry.

B. Ground 2 – Claims 1, 3-6, 8-12, and 14-18 are Unpatentable as Anticipated by Vasshus Under 35 U.S.C. §102(e)

1. Identification and Date Qualification of Prior Art

Each limitation of Claims 1, 10 and 16 is disclosed or suggested by Vasshus [Ex. 1005]. Vasshus qualifies as prior art under 35 U.S.C. §102(e) (pre-AIA) because it is a patent which issued on June 10, 2014, from a PCT application filed on June 26, 2006, that was published in English and that designated the U.S. after November 28, 2000 (*See* Ex. 1016 and MPEP §2136). The 35 U.S.C. §102(e) (pre-AIA) date is the filing date of the PCT application (June 26, 2006), which is prior to September 29, 2006, the earliest possible priority date for the '288 Patent.

2. Brief Summary of Vasshus [Ex. 1005]

Vasshus is entitled, "Apparatus for Sieving and Fluid Separation and a Method of Using Same," and discloses an apparatus for the sieving and fluid separation of a material containing fractions of a solid and fluid, with material being placed on an upper side of at least two screens (9) and (13), and the apparatus (1) being provided with at least one fluid-flow-generating device (5) for the production of a fluid flow through a portion of the material-carrying sieving element (13). Ex. 1005 at Abstract. The method and apparatus disclosed in Vasshus disclose all of the limitations of the claims of the '440 Patent.

Vasshus discloses an apparatus and method for "sieving a material such as, but not limited to, a drilling fluid containing drilling mud and drilled particles or cuttings, and separating liquid and gas which are liberated from the material." *Id.*

at 1:14-18, 1:29-42. The apparatus of Vasshus has a first sieving device 9 and a sieving element 13, which act to screen out the slurry. FIG. 1 is reproduced in Ex. 1025 at 5. The slurry enters over first stationary sieving device 9 from supply portion 7, which "is arranged to receive material containing drilling mud and drilled particles and to separate at least some of the drilling mud from the drilled particles," and then passes over the sieving element 13. Ex. 1005 at 5:18-24.

3. Vasshus renders Independent Claim 1 Unpatentable

a. "introducing a slurry to a shaker[7] having a first screen and a second screen" (claim limitation 1[a])

From the claim construction above in Section III.D.1., the term "screen" includes *any perforated material capable of separating solids from fluids by allowing fluids to flow through the material in preference to solids*. As noted, the terms "first" and "second" do not require any specific spatial ordering relative to

[7] Regarding the term "shaker," Vasshus provides a vibrating/oscillatory embodiment at column 5, lines 9-15: "Likewise, it will be understood 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 by means of mechanical means (not shown) or by means of gravitational forces, possibly by means of vibratory/oscillating devices (14) and/or acoustic sound sources (55). (not shown)." Ex. 1005 at 5:9-15.

the shaker inlet or outlet. Vasshus states, "The sieving unit 3 includes a supply portion 7, which is provided with a first stationary sieving device 9. … The material to be treated is supplied to the supply portion 7 and carried by means of the sieving device 9 onto a sieving element 13." Ex. 1005 at 4:44-48. The "first screen" of Claim 1 corresponds to sieving element 13 while the "second screen" of Claim 1 corresponds to sieving device 9. Vasshus thus discloses claim limitation 1[a]. Vasshus does not limit itself to this two-component configuration, but discloses that multiple, stationary-sieving elements may be used. *See id.* at 5:1-15.

b. "flowing the slurry over the first screen" (claim limitation 1[b])

Vasshus discloses claim limitation 1[b], because a slurry is flowed over sieving element 13, which is a first screen. Ex. 1005 at 4:46-48. Therefore, Vasshus discloses claim limitation 1[b].

c. "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" (claim limitation 1[c])

In describing FIG. 4, Vasshus states:

> Because of the fluid which is evacuated through the suction nozzles 20, a fluid flow is provided from, … , the supply portion 7, through the drilled material (not shown) present in the portion of the sieving element 13 located above the suction nozzles 20, and though said portion of the sieving element 13. *In trials carried out with a fluid flow of approximately 12 m^3/minute through the ventilation system 32,*

> *substantial amounts of fluid were drawn or sucked out of the drilled material carried across the sieving element 13. Said fluid, … , drilling fluid and gases from it, and also air, is carried into the fluid separation unit 5*. Ex. 1005 at 5:66-6:9 (*emphasis added*).

In other words, suction pumps 26 of fluid separation unit 5 apply a pressure differential to sieving element 13 by suction nozzles 20 to separate a solids component from a liquid component of the slurry, and Vasshus therefore discloses claim limitation 1[c]. *Id.* at FIGS. 1, 4.

d. "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" (claim limitation 1[d])

Vasshus discloses claim limitation 1[d] in describing FIG. 4 at column 5, line 66 to column 6, line 9, recited *supra* for claim limitation 1[c]. Suction pumps 26 of fluid separation unit 5 apply a pressure differential to sieving element 13 by suction nozzles 20 to separate a solids component from a liquid component of the slurry. Regarding a degassing chamber, Vasshus discloses:

> On activation of the suction pumps 26 fluid substantially in a gas phase will be evacuated through the suction pumps 26 into a ventilation system 32 and further to treatment in a manner known per se or disposal. The fluid evacuated from the fluid separation unit 5 is replaced substantially by fluid, which is sucked through the suction nozzles 20 and pipe arrangement 24. Ex. 1005 at 5:48-54, FIGS. 1-3.

Fluid separation unit 5 separates air or vapor from fluid by suction pumps 26 and ventilation system 32. Unit 5 includes a separator plate 34, "which will facilitate the separation of the liquids of the fluid from the gases of the fluid." *Id.* at 6:11-12. Therefore, Vasshus discloses claim limitation 1[d].

4. Vasshus renders Independent Claim 10 Unpatentable

a. "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" (claim limitation 10[a])

Vasshus states, "In the figures the reference numeral 1 identifies a sieving and fluid separation apparatus, which is arranged, for example, but not exclusively, to separate drilled particles from drilling mud." Ex. 1005 at 4:30-33. As discussed with regard to claim limitations 1[a] and 1[b] *supra*, the first screen is sieving element 13 and the second screen is sieving device 9. Therefore, Vasshus discloses claim limitation 10[a].

b. "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" (claim limitation 10[b])

Vasshus discloses claim limitation 10[b]. The phrase "external to the shaker" includes units *external to the shaker and sump, and in fluid communication with the shaker and sump*. Vasshus discloses "… a suction nozzle, which is in fluid communication with at least one vacuum-generating device through a pipe

arrangement, a portion of the suction nozzle being moved up towards an underside of the sieving element." Ex. 1005 at 2:47-50, FIGS. 3-4. The fluid separation unit 5 with suction pumps 26 in FIG. 3 is external to the sieving unit 3. Therefore, Vasshus discloses claim limitation 10[b].

c. "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" (claim limitation 10[c])

Vasshus discloses claim limitation 10[c] in describing FIG. 4 at column 5, line 66 to column 6, line 9, recited *supra* for claim limitations 1[c] and 1[d]. Suction pumps 26 of fluid separation unit 5 apply a pressure differential to sieving element 13 by suction nozzles 20 to separate a solids component from a liquid component of the slurry. Vasshus discloses a degassing chamber in that fluid separation unit 5 separates air or vapor from fluid by suction pumps 26 and ventilation system 32. Ex. 1005 at 5:48-54, FIGS. 1-3. Unit 5 includes a separator plate 34 to, "facilitate the separation of the liquids of the fluid from the gases of the fluid." *Id.* at 6:11-12. Vasshus therefore discloses claim limitation 10[c].

5. Vasshus renders Independent Claim 16 Unpatentable

a. "a first screen having an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker" (claim limitation 16[a])

Sieving element 13 of Vasshus discloses a first screen having an upper side

and a lower side for separating drill cuttings and drilling fluid within a shaker. Therefore, Vasshus discloses claim limitation 16[a].

b. "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" (claim limitation 16[b])

FIGS. 3-5 of Vasshus show trough-like elements 22 in fluid communication with suction pumps 26, and these create a pressure differential across sieving element 13 (the "first screen"), which is not created across sieving device 9 (the "second screen"). For example, according to column 6, lines 28-42, control valve 38 of pipe arrangement 28 can be deactivated as to one sieving element, while trough-like elements 22 can still apply a vacuum to another sieving element. Therefore, Vasshus discloses claim limitation 16[b].

c. "a sump disposed below the first screen and configured to receive the flow of drilling fluid through the first screen" (claim limitation 16[c])

Vasshus discloses, "The liquid *collected in the bottom portion of the sieving unit 3* could be passed on via a pipe arrangement 28 into the bottom portion of the fluid separation unit 5, by means of, for example, a pump not shown." Ex. 1005 at 6:17-20 (*emphasis added*). Moreover, trough-like elements 22 convey air or vapor and the drilling fluid collected below the "first screen" to fluid separation unit 5.

Id. at FIG. 3. Therefore, Vasshus discloses claim limitation 16[c].

d. "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" (claim limitation 16[d])

As discussed previously with regards to claim limitations 1[d] and 10[c], Vasshus discloses "a chamber in fluid communication with the pressure differential generator and located external to the shaker" by fluid separation unit 5, which is external to sieving unit 3, and which is for "collecting the air or vapor and the drilling fluid from the sump," such as trough-like elements 22, "while the pressure differential generator is configured to apply a pressure differential across the first screen." In other words, the liquid, air, and particles collected by trough-like elements 22 while under suction are passed to fluid separation unit 5. Therefore, Vasshus discloses claim limitation 16[d].

6. Vasshus renders Dependent Claims 3-6, 8, 9, 11, 12, 14, 15, 17, and 18 Unpatentable

a. Dependent Claim 3

Claim 3 depends from Claim 1, and recites "applying a second pressure differential to the first screen wherein the second pressure differential is zero." FIGS. 3-5 of Vasshus show trough-like elements 22 in fluid communication with suction pumps 26, and these create a pressure differential across sieving element 13 (the "first screen"), which is not created across sieving device 9 (the "second

screen"). According to column 6, lines 28-42, control valve 38 of pipe arrangement 28 can be deactivated as to one sieving element, while trough-like elements 22 can apply a vacuum to another sieving element. Therefore, Vasshus discloses the limitation of Claim 3.

b. Dependent Claim 4

Claim 4 depends from Claim 1, and recites "toggling the first pressure differential between static and at least a partial vacuum." Vasshus discloses that the arrangement between the suction nozzles and the fluid separation unit contain shut-off and control valves which are tied to changing the pull of the vacuums based on a flow sensor reading and whether a filter 46 becomes clogged. This is discussed further *infra* with regard to the limitation of Claim 9. Ex. 1005 at 6:30-42. Therefore Vasshus discloses the limitation of Claim 4.

c. Dependent Claims 5 and 11

Claim 5 depends from Claim 1, and recites the step of "intermittently interrupting the step of applying the first pressure differential." Claim 11 depends from independent Claim 10, and recites a similar limitation. Vasshus discloses that the arrangement between the suction nozzles and the fluid separation unit contain a shut-off valve, which is tied to changing the application of the vacuums based on a flow sensor reading and whether the filter 46 is clogged, in column 6, lines 28-42. Therefore, Vasshus discloses the limitations of Claims 5 and 11.

d. Dependent Claims 6 and 12

Claim 6 depends from Claim 1, and recites the step of "pulsing the step of applying the first pressure differential between the first pressure differential and a second pressure differential wherein the second pressure differential is different than the first pressure differential." Claim 12 depends from independent Claim 10, and recites a similar limitation. Pulsing refers to the changing of the pressure differential from static to at least a partial vacuum below the screen. Ex. 1001 at 6:36-41. Vasshus teaches that the arrangement between the suction nozzles 20 and the fluid separation unit 5 contains a shut-off valve 42 and a control valve 38 which are tied to changing the pull of the vacuums based on a flow sensor 44 reading and whether the filter 46 gets clogged up, as cited above, at column 6, lines 28-42. Therefore, Vasshus discloses the limitations of Claims 6 and 12.

e. Dependent Claims 8 and 17

Claim 8 depends from Claim 1, and recites the step of "wherein the applying the first pressure differential is generated by a vacuum external to the shaker." Claim 17 depends from and further limits independent Claim 16, and recites a similar limitation. The suction pumps 26 in FIG. 3 are external to sieving unit 3, and are used to generate a pressure differential. Therefore, Vasshus discloses the limitations of Claims 8 and 17.

f. Dependent Claim 9

Claim 9 depends from Claim 1 and recites the step of "controlling air flow under the screen to prevent stalling of the slurry on the screen." As set forth in Section III.D.3. above, the claim limitation includes *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*. Vasshus discloses the use of a shut-off valve 42 to adjust the application of suction to a screen, reciting:

> *One of the purposes of the shut-off valve 42 is to shut off communication between the suction nozzle 20 of the sieving unit 3 and the fluid separation unit 5 if the fluid flow carries particulate material such as, but not limited to, cuttings in the cases of ruptures in the sieving element 13 or for other reasons. A sensor device such as, but not limited to, a flow sensor 44 and a particle filter 46 are placed at each of the pipe arrangements 24.* If the particle filter 46 gets clogged up at least partially, the flow sensor 44 may output a signal, … , to an activating mechanism (not shown) for activating the shut-off valve 42. Similarly, the control valve 38 of the pipe arrangement 28 could be controlled. Ex. 1005 at 6:30-42 (*emphasis added*).

Therefore, because Vasshus discloses *adjusting a pressure differential across a screen to allow solids to be conveyed along the screen unhindered and to allow fluid flow through the screen*, the limitation of Claim 9 is disclosed.

g. Dependent Claim 14

Claim 14 depends from Claim 10 and recites, "separating the air or vapor from the drilling fluid component in the degassing chamber." Fluid separation unit

5 separates air or vapor from fluid by suction pumps 26 and ventilation system 32. Ex. 1005 at 5:48-54, FIGS. 1-3. Unit 5 includes a separator plate 34, "which will facilitate the separation of the liquids of the fluid from the gases of the fluid." *Id.* at 6:11-12. Therefore, Vasshus discloses the limitation of Claim 14.

h. Dependent Claim 15

Claim 15 depends from independent Claim 10, and recites "applying vacuum, pressure to a portion of the total length of the first screen." FIG. 3 of Vasshus shows pressure applied by trough-like elements 22 to a portion of the total length of sieving element 13. Vasshus thus discloses the limitation of Claim 15.

i. Dependent Claim 18

Claim 18 depends from independent Claim 16. Vasshus discloses the limitation of Claim 18, "wherein the air or vapor pulled through the first screen is adjustable to prevent stalling of drill cuttings on the first screen." Per the BRI of this claim element, the phrase includes *an adjustable pressure differential across a screen*. Vasshus discloses *an adjustable pressure differential across a screen* at column 6, lines 30-42, as discussed *supra* with regard to the limitation in Claim 9. Therefore, Vasshus discloses the limitation of Claim 18.

C. Ground 3 – Claims 1, 3-6, 8-12, and 14-18 are Unpatentable as Obvious Over the Combination of Ennis in View of Logue Under 35 U.S.C. §103(a)

D. Ground 4 – Claims 9 and 18 are Unpatentable as Obvious Over the Combinations of Ennis in View of Logue in further view of Riedel or

Lee Under 35 U.S.C. §103(a)

1. Identification and Date Qualification of Prior Art

Each limitation of Claims 1, 3-6, 8-12, and 14-18 of the '440 Patent is disclosed or suggested by Ennis [Ex. 1006] in view of Logue [Ex. 1007]. Alternatively, Claims 9 and 18 are obvious over Ennis in view of Logue, in further view of Riedel [Ex. 1008], *or* in view of Lee [Ex. 1009]. Ennis, Logue, Riedel, and Lee qualify as prior art under 35 U.S.C. §§102(b) and 103(a) (pre-AIA) because they are printed publications published more than one year before September 29, 2006, the earliest possible priority date for the '440 Patent.

Petitioner also asserts in the alternative that a POSITA would have been motivated to combine the disclosure of Ennis with Derrick. Derrick and Ennis share a common inventor.[8] Ex. 1004; 1006. Ex. 1021 is a Derrick Corporation Composite Catalog showing that one embodiment of the device disclosed in Ennis was in commercial use in 2005, the same time as the Derrick application was filed. Ex. 1021 at 5. Combined with the common inventorship, the facts show that those in the industry (inventor Derrick) were motivated to combine various features (controlling air flow and degassing from Derrick) with Ennis to improve upon it.

[8] Ennis and Derrick share a common inventor, Robert G. Derrick of Buffalo, New York, which shows the analogous nature of these references. *See* Ex. 1004; 1006; 1021.

2. Brief Summary of Prior Art Used in Grounds 3 and 4

a. Ennis [Ex. 1006]

Ennis is entitled "Dewatering System," and discloses a fluid separation system using a plurality of vibrating screens with a vacuum chamber positioned beneath the downstream screen for "removing substantial additional amounts of water from a bed of solid particulate material passing along the top surface thereof." Ex. 1006 at Abstract. Ennis applies to "dewatering aggregate slurries containing solids having a wide range of particle size." *Id.* at 1:9-11. Ennis employs a screen deck 20 with multiple screens and a vacuum chamber 28. *Id.* at FIG. 1. The "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." *Id.* at 4:65-5:1. Vacuum assist regulator 42 periodically withdraws water from the compartment 28. *Id.* at 5:14-43.

Column 1, lines 12-20 clarify that Ennis applies to "other liquids," in "related industries," and "other processes." *Id.* at 1:12-20. At column 4, line 46, Ennis discusses using different sizes and capacities of exhaust fans and Ennis states, "However, the exhaust fan should be of sufficient strength to generate a reduced pressure sufficient to provide removal of significant additional amounts of surface moisture from those particles passing across the top surface of the

downstream screen panel." *Id.* at 4:60-64. Ennis contemplates solid matter not stalling on the screens -- if the matter is "passing across," then it is not stalling. Ennis inherently discloses controlling air flow by stating the particles pass across the screen and by explaining that the amount of exhaust needed varies depending on the material being filtered. The motivation to a POSITA to combine Ennis with Logue or Riedel or Lee would be to create a system with enhanced control. Ex. 1013 at ¶¶ 71, 74, and 79.

b. Logue [Ex. 1007]

Logue is entitled "Vibrating Screen with Vacuum Control Therefor," and discloses an apparatus for "filtering liquids from finely divided solids and more particularly relates to methods and means for dewatering bodies of finely divided solids subject to a conveying movement." Ex. 1007 at 1:1-5. The motivation for a POSITA to combine Ennis and Logue is to create a beneficial solid-liquid separation device with enhanced control, discussed below. Ex. 1013 at ¶ 71. Logue provides a "simple, efficient and economical vacuum filtering treatment for the removal of liquid from finely divided solids." Ex. 1007 at 1:40-43. Further, Logue discloses that by applying different degrees of vacuum influence to different portions of a body of wet material moving together, material can be dewatered without "impeding the impelling movement." *Id.* at 2:3-8.

c. Riedel [Ex. 1008]

Riedel is entitled "Installation for Dewatering Slimes," and discloses an apparatus for separating water from fine materials. Ex. 1008 at 1:1-3. The motivation for a POSITA to combine Ennis with Logue and Riedel would be to create a beneficial solid-liquid separation device with enhanced control. Ex. 1013 at ¶ 74. FIG. 1 of Riedel shows a screen 7 with a charge supply opening 2, bottom screens 6, a charge 4, and a vacuum pump 19. Ex. 1008 at FIG. 1. Valves 22, 23 can be used to control the vacuum provided by vacuum pump 19 to screen 7. *Id.* at 3:51-54. As Riedel states, "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.*

d. Lee [Ex. 1009]

Lee is entitled "System for Separating Solids from a Liquid in a Divided Channel," and discloses a system 10 for separating solids from a slurry 12 which contains solids within a liquid carrier. Ex. 1009 at FIG. 1. The motivation for a POSITA to combine Ennis and Logue and Lee would be to create a beneficial solid-liquid separation device with enhanced control. Ex. 1013 at ¶ 79. A control system 28 "controls the flow of the slurry, the line speed of the foraminous medium, and the differential pressure across the foraminous medium…." Ex. 1009 at 6:40-43, 6:54-7:54, and 8:62-9:45.

3. Ennis in view of Logue Renders Independent Claim 1 Unpatentable

a. "introducing a slurry to a shaker having a first screen and a second screen" (claim limitation 1[a])

Ennis discloses a plurality of individual screen panels 26 which are utilized to form screen deck 20 and can be arranged so as to provide a continuous smooth top screening surface 22, or can be arranged so as to cause a cascading effect as the slurry of solid material passes from one screen panel to the next. Ex. 1006 at 3:56-62. Therefore, Ennis discloses claim limitation 1[a].

b. "flowing the slurry over the first screen" (claim limitation 1[b])

Ennis discloses screen deck 20 and plurality of screen panels 26 over which slurry flows. Ex. 1006 at FIG. 1. Ennis therefore discloses claim limitation 1[b].

c. "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" (claim limitation 1[c])

Ennis discloses in FIG. 1 a vacuum compartment 28 below screen 26' of plurality of screens panels 26. Ennis states, "The 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." Ex. 1006 at 4:65-5:1. Ennis therefore discloses claim limitation 1[c].

d. "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" (claim limitation 1[d])

Once again, Petitioner asserts that utilizing degassing chambers in shaker systems while maintaining a pressure differential across a screen is not novel or nonobvious. Ex. 1024 shows degassing chambers with a shaker were well known and common in the art. Ex. 1024 at 9 explains in a shaker system "[a]ll other removal equipment (degasser…) should process all of the fluid entering the suction compartment. This may exceed the rig flow if drilling fluid enters upstream from another process or from mud guns." Ex. 1024 at 9. Figure 7-2 of Ex. 1024 shows a degasser external to a main shaker. It is therefore not remotely novel to attach an external degassing chamber to a shaker. One reference chosen here to show a degasser is Logue, while other references in the art, such as Vasshus, Manuel, and Derrick discussed above, show the claimed degasser. In describing mechanism 37 of FIGS. 3 and 4, Logue states:

> The mechanism 37 … is designed to subject the conduit 22a to intermittent suction influences through the provision of a plurality of valves 38 and 39 which open differentially to subject the contents of a chamber 40 communicating with conduit 22a, to the influences of a suction passage 41 and an atmospheric or low pressure air opening 42 respectively. Ex. 1007 at 5:61-69. *See also* 6:1-12.

In other words, suction passage 41 pulls vacuum, and when valve 38 is open by cam 43, all material in compartment 15a goes to chamber 40. Alternatingly,

when cam 44 opens valve 39, air enters by low pressure or atmospheric air opening 42 and exits mechanism 37 to conduit 22a and compartment 15a, while they are substantially empty. Any fluid in unit 37/40 is "degassed" by low pressure or atmospheric air going through 42, then 40 (where liquid would be with entrained air) and then out through 22a to 15a. Ex. 1013 at ¶ 65.

Thus, "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" is satisfied by screen 23, conduit 22a, and mechanism 37 while mechanism 37 is subjecting conduit 22a to vacuum. Ennis in view of Logue, and any other common degassing chamber reference such as Ex. 1024 or Manuel, renders Claim 1 obvious, because a POSITA looking to these references would have arrived at all of the limitations of Claim 1.

4. Ennis in view of Logue Renders Independent Claim 10 Unpatentable

a. "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" (claim limitation 10[a])

Ennis discloses "a new and improved dewatering system and technique particularly adapted for use in dewatering aggregate slurries containing solids having a wide range of particle size." Ex. 1006 at 1:8-11. Ennis discloses delivering the slurry to screen deck 20 and plurality of screen panels 26. *Id.* at

FIG. 1. Therefore, Ennis discloses claim limitation 10[a].

b. "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" (claim limitation 10[b])

The phrase "external to the shaker" includes units *external to the shaker and sump, and in fluid communication with the shaker and sump*. A vacuum is created in vacuum chamber 28 in Ennis by exhaust fan 40, and a pressure differential is created across screen panel 26 above vacuum chamber 28. Therefore, Ennis discloses the "generating" step of claim limitation 10[b].

c. "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" (claim limitation 10[c])

Similar as to discussed *supra* with regard to claim limitation 1[d], Petitioner asserts that utilizing degassing chambers in shaker systems while maintaining a pressure differential across a screen is not novel or nonobvious. Ex. 1024 at 9 explains in a shaker system "[a]ll other removal equipment (degasser…) should process all of the fluid entering the suction compartment. This may exceed the rig flow if drilling fluid enters upstream from another process or from mud guns." Ex. 1024 at 9. Figure 7-2 of Ex. 1024 shows a degasser external to a main shaker. Logue shows a degasser, while other references in the art, such as Vasshus, Manuel, and Derrick discussed above, also show the claimed degasser.

In Logue, suction passage 41 pulls vacuum, and when valve 38 is open by cam 43, all material in compartment 15a goes to chamber 40. Alternatingly, when cam 44 opens valve 39, air enters by low pressure or atmospheric air opening 42 and exits mechanism 37 to conduit 22a and compartment 15a, while they are substantially empty. Any fluid in unit 37/40 is "degassed" by low pressure or atmospheric air going through 42, then 40 (where liquid would be with entrained air) and then out through 22a to 15a. Ex. 1007 at 5:61-69. *See id.* 6:1-12. Ex. 1013 at ¶ 65. Ennis in view of Logue renders Claim 10 obvious, because a POSITA looking to these references would have arrived at all of the limitations of Claim 10.

5. Ennis in view of Logue Renders Independent Claim 16 Unpatentable

a. "a first screen having an upper side and a lower side for separating drill cuttings and drilling fluid within a shaker" (claim limitation 16[a])

Ennis discloses a plurality of screen panels 26 having an upper side and a lower side for separating solids (drill cuttings) and a fluid (drilling fluid) within a dewatering unit 10 (shaker). Column 1, lines 12-20 of Ennis clarify that it applies to "other liquids," in "related industries," and "other processes." Ex. 1006 at 1:12-20. Therefore, Ennis discloses claim limitation 16[a].

b. "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" (claim limitation 16[b])

Ennis discloses that the exhaust fan 40 is configured to apply a vacuum by way of vacuum chamber 28 to a portion of plurality of screen panels 26, while other portions of screen panels 26 do not have a vacuum applied to them. Therefore, Ennis discloses claim limitation 16[b].

c. "a sump disposed below the first screen and configured to receive the flow of drilling fluid through the first screen" (claim limitation 16[c])

Ennis discloses "The 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." Ex. 1006 at 4:65-5:1. Therefore, Ennis discloses claim limitation 16[c].

d. "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" (claim limitation 16[d])

The phrase "external to the shaker" includes units *external to the shaker and sump, and in fluid communication with the shaker and sump*. Similar as to discussed *supra* with regard to claim limitations 1[d] and 10[c], utilizing degassing chambers in shaker systems while maintaining a pressure differential across a screen is not novel or nonobvious. Ex. 1024 at 9 explains in a shaker system "[a]ll

other removal equipment (degasser…) should process all of the fluid entering the suction compartment. This may exceed the rig flow if drilling fluid enters upstream from another process or from mud guns." Ex. 1024 at 9, Figure 7-2. The reference chosen here to show a degasser is Logue, while other references in the art, such as Vasshus and Manuel, discussed above, show the claimed degasser.

Any fluid in unit 37/40 is "degassed" by low pressure or atmospheric air going through 42, then 40 (where liquid would be with entrained air) and then out through 22a to 15a. Ex. 1007 at 5:61-69. *See id.* at 6:1-12. Ex. 1013 at ¶ 65. Ennis in view of Logue renders Claim 16 obvious, because a POSITA looking to these references would have arrived at all of the limitations of Claim 16.

6. Ennis in view of Logue Renders Dependent Claims 3-6, 8, 9, 11, 12, 14, 15, 17, and 18 Unpatentable. Alternatively, Claims 9 and 18 are unpatentable as being obvious over Ennis in view of Logue in further view of Riedel or Lee.

a. Dependent Claim 3

Claim 3 depends from Claim 1. Logue discusses applying vacuum intermittently at column 5, lines 24-33. Logue states, "The intermittent action is subject to regulation varying the on and off intervals of the vacuum, and in this way a close control can be exercised over the dewatering action." Ex. 1007 at 5:34-37. Therefore, Logue discloses the limitation of Claim 3.

b. Dependent Claim 4

Claim 4 depends from Claim 1. Ennis discloses in FIG. 1 that pressure is

applied to the first screen through the vacuum chamber 28 and no pressure is applied to the other screens. Ennis inherently discloses that the device applying a vacuum can be turned on and off. Therefore Ennis discloses the limitation of Claim 4. Logue also discloses this limitation, at least at column 5, lines 61-69.

c. Dependent Claims 5 and 11

Claim 5 depends from Claim 1. Claim 11 depends from independent Claim 10, and recites a limitation similar to Claim 5. Logue discusses applying vacuum intermittently at column 5, lines 24-37 and lines 61-69, as noted *supra* with regard to Claims 3 and 4. Therefore, Logue discloses the limitations of Claims 5 and 11.

d. Dependent Claims 6 and 12

Claim 6 depends from Claim 1. Claim 12 depends from independent Claim 10, and recites a limitation similar to Claim 6. Logue discloses applying vacuum intermittently at column 5, lines 24-37 and lines 61-69, and discloses controlling the degree of vacuum along the entire screen length at columns 3-4. Logue therefore discloses the limitations of Claims 6 and 12.

e. Dependent Claims 8 and 17

Claim 8 depends from Claim 1. Claim 17 depends from independent Claim 16, and recites a limitation similar to Claim 8. Ennis discloses an exhaust fan 40 external to the shaker which generates vacuum in the vacuum chamber 28. Ex. 1006 at FIG. 1. Therefore, Ennis discloses the limitations of Claims 8 and 17.

f. Dependent Claim 9

Petitioner first asserts that Ennis discloses, either explicitly or inherently, the limitation of Claim 9, specifically at column 4, lines 46 to 64. Modification of the vacuum in a vacuum chamber beneath a screen according to equipment size and the materials selected for dewatering is disclosed. Ex. 1006 at 4:46-64. Moreover, Ennis states exhaust blowers, "can readily be tailored to the specific use to which the dewatering deck is to be applied." *Id.* at 4:58-59. Systems can "provide removal of significant additional amounts of surface moisture from those particles passing across the top surface of the downstream screen panel." *Id.* at 4:62-64.

In the alternative, Logue, Riedel, or Lee all independently disclose the limitation of Claim 9. Logue discloses detailed instructions on controlling air flow under portions of fine mesh screen 25 and screen 23 at column 3, line 50 to column 4, line 59, and column 7, lines 47-69. Logue states at column 4, lines 52-59:

> … *the proper degree of vacuum is exerted on the cake in all stages of its movement from the pool to its point of discharge to insure complete and efficient dewatering.* …, the product delivered across chute 12 into hopper 13 is essentially dry and in an ideal condition for storage, shipment, …. Ex. 1007 at 4:52-59 (*emphasis added*).

Riedel discloses the limitation of Claim 9. FIG. 1 of Riedel in combination with the description at columns 3 to 4 provides detailed instructions on controlling the vacuum pump 19. *See* Ex. 1008 at 3:51-54. *See also id.* at 4:45-46. Regarding

Lee, a control system 28 "controls the flow of the slurry, the line speed of the foraminous medium, and the differential pressure across the foraminous medium…." Ex. 1009 at 6:40-43. *See also id.* at 6:54-7:54, 8:62-9:45. With regards to FIGS. 1 and 2, Lee states:

> … pressure underneath the foraminous medium *is adjusted by selectively applying a vacuum supplied from a source 31 to the underside of the foraminous medium*. … a series of individually controllable compartments 34a-34d may be provided underneath the foraminous medium. A series of valves 36a-36d … allows selective application of suction forces underneath the foraminous medium…. *Id.* at 7:7-16 (*emphasis added*).
>
> *…, the system travels the slurry along the first section 21 of the channel 20 at a rate … which is sufficient, in the absence of suction or other forces, to cause 10 solids contained within the slurry to be swept along with the slurry.... …, essentially no solids are deposited on the foraminous medium in this first section, but rather the solids are swept along the length of the section 21 and ar[e] thereby prevented from depositing on the medium and/or from entering or blocking the foramen of the foraminous medium. Id.* at 7:20-41 (*emphasis added*).

Therefore, Ennis in view of Logue, or Ennis in view of Logue in further view of Riedel *or* Lee renders Claim 9 obvious, because a POSITA looking to these references would have arrived at the limitation of Claim 9.

g. Dependent Claim 14

Claim 14 depends from Claim 10. As discussed *supra* with regards to claim

limitations 1[d], 10[c], and 16[d], Logue shows that any fluid in unit 37/40 is "degassed" by low pressure or atmospheric air going through 42, then 40 (where liquid would be with entrained air) and then out through 22a to 15a. Therefore, Logue discloses the limitation of Claim 14.

h. Dependent Claim 15

Claim 15 depends from independent Claim 10. Ennis discloses a screen deck 20 and a plurality of screen panels 26. Ex. 1006 at FIG. 1. Logue discloses individually controllable vacuum compartments disposed beneath perforated mediums, and it would be obvious to a POSITA to arrange the system "applying vacuum, pressure to a portion of the total length of the first screen" for an advantageous separation. The combination discloses the limitation of Claim 15.

i. Dependent Claim 18

Claim 18 depends from independent Claim 16. Under the BRI, the limitation includes *an adjustable pressure differential across a screen*. Logue discloses detailed instructions on controlling air flow under portions of fine mesh screen 25 and screen 23. *See* Ex. 1007 at 3:50-4:59, 7:47-69. FIG. 1 of Riedel in combination with the description at columns 3 to 4 provides detailed instructions on controlling the vacuum pump 19. Ex. 1008 at 3:51-54. Lee discloses a system 10 for separating solids from a slurry 12 which contains solids within a liquid carrier. Ex. 1009 at FIG. 1. A control system 28 "controls the flow of the slurry,

the line speed of the foraminous medium, and the differential pressure across the foraminous medium…." *Id.* at 6:40-43. A detailed summary with regards to FIGS. 1-2 of Lee is provided *supra* with regard to the limitation of Claim 9.

Therefore, Ennis in view of Logue, or Ennis in view or Logue in further view of Riedel *or* Lee renders Claim 18 obvious, because a POSITA looking to these references would have arrived at the limitation of Claim 18.

V. No Secondary Considerations Exist

There are no secondary considerations in the record that would lead to a finding of nonobviousness for Claims 1, 3-6, 8-12, and 14-18 of the '440 Patent.

VI. CONCLUSION

Because Claims 1, 3-6, 8-12, and 14-18 of the '440 Patent are anticipated under Derrick and Vasshus, and because Claims 1, 3-6, 8-12, and 14-18 are obvious in light of Ennis in view of Logue, optionally with Riedel or Lee, Petitioner respectfully requests that Claims 1, 3-6, 8-12, and 14-18 be invalidated.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of December, 2015, copies of this Petition for *Inter Partes* Review, Attachments, and Exhibits have been served in their entirety by Federal Express on the Patent Owner at the correspondence address of record for the subject patent and counsel for the Patent Owner at the following addresses in accordance with 37 C.F.R. §42.105:

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