

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MAGELLAN MIDSTREAM PARTNERS L.P. and
POWDER SPRINGS LOGISTICS, LLC,
Petitioner,

v.

SUNOCO PARTNERS MARKETING & TERMINALS L.P.,
Patent Owner.

IPR2019-00025
Patent 9,606,548 B2

Before BARRY L. GROSSMAN, JON B. TORNQUIST, and
BRENT M. DOUGAL, *Administrative Patent Judges*.

TORNQUIST, *Administrative Patent Judge*.

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

I. INTRODUCTION

Magellan Midstream Partners L.P. and Powder Springs Logistics, LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–16 of U.S. Patent No. 9,606,548 B2 (Ex. 1001, “the ’548 patent”). Sunoco Partners Marketing & Terminals L.P. (“Patent Owner”) filed a Preliminary Response to the Petition (Paper 8). Upon consideration of the Petition and the Preliminary Response, we determined that Petitioner had demonstrated a reasonable likelihood of prevailing with respect to claims 1–16 and instituted trial. Paper 9 (“Decision on Institution” or “Dec. on Inst.”).

Following institution of trial, Patent Owner filed a Patent Owner Response (Paper 18, “PO Resp.”), Petitioner filed a Reply (Paper 27, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 30, “Sur-reply”).¹

Pursuant to Board authorization, Petitioner filed an “Identification of Non-Compliant Arguments and Exhibits in Patent Owner’s Sur-Reply” (Paper 33), to which Patent Owner filed an Opposition (Paper 37).

In support of their respective arguments, Petitioner relies on the declaration testimony of Dr. Michael Nikolaou (Ex. 1003) and Dr. Robert S. Maness (Ex. 1035). Patent Owner relies on the declaration testimony of Dr. Norman Goddard (Ex. 2001), Dr. Harri Kytomaa (Ex. 2101), Mr. Terrence S. Higgins (Ex. 2102), and Dr. Keith Ugone (Ex. 2103).

An oral hearing was held on January 14, 2020, and a transcript of the oral hearing is included in the record. Paper 47 (“Tr.”).

¹ Redacted, publically-available versions of Patent Owner’s Response, Petitioner’s Reply, and Patent Owner’s Sur-reply are provided in the record. See Paper 19; Paper 28; Paper 31.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies Magellan Midstream Partners, L.P.; Magellan GP, LLC; Magellan OLP, L.P; Magellan Operating GP, LLC; Magellan Logistics & Services L.P.; Magellan NGL, LLC; Powder Springs Logistics, LLC; Trinidad Products, Inc.; and Colonial Pipeline Company as real parties in interest. Pet. 70. Patent Owner identifies Sunoco Partners Marketing & Terminals L.P. as the real party in interest. Paper 5, 4.

B. *Related Matters*

The parties identify *Sunoco Partners Marketing & Terminals, L.P. v. Powder Springs Logistics, LLC and Magellan Midstream Partners, L.P.*, case No. 17-1390 (D. Del. 2017) (“Delaware Action”) and *Sunoco Partners Marketing & Terminals, L.P. v. U.S. Venture, et al.*, Case No. 1:15-CV-08178 (N.D. Ill. 2015) (“Illinois Action”), as related matters. Pet. 70; Paper 5, 4. The parties also note that IPR2019-00024 is directed to related U.S. Patent No. 9,494,948 (“the ’948 patent”). Pet. 70; Paper 5, 4.

C. *The ’548 Patent*

The ’548 patent discloses a system and a method for “blending butane into gasoline streams, and for blending butane into a gasoline stream at any point along a petroleum pipeline.” Ex. 1001, Abstract. The ’548 patent explains that gasoline is distributed from ports and refineries to storage facilities through petroleum pipelines. *Id.* at 1:29–35. Petroleum products delivered through pipelines are stored in tank farms and are typically “dispensed to tanker trucks in what is known as a rack, which usually comprise several outlet ports to which different gasoline transports may be coupled.” *Id.* at 1:35–46.

A “significant physical property of gasoline is its volatility, or its ability to combust,” and “[i]n order to keep cars performing at a consistent level year-round, gasoline marketers blend agents such as butane with gasoline to increase the Reid vapor pressure and volatility of the gasoline, especially during the colder months.” *Id.* at 1:49–54. Gasoline marketers also add butane to the gasoline to reduce the cost of the gasoline. *Id.* at 1:54–55.

Figure 1 of the '548 patent is reproduced below:

Figure 1

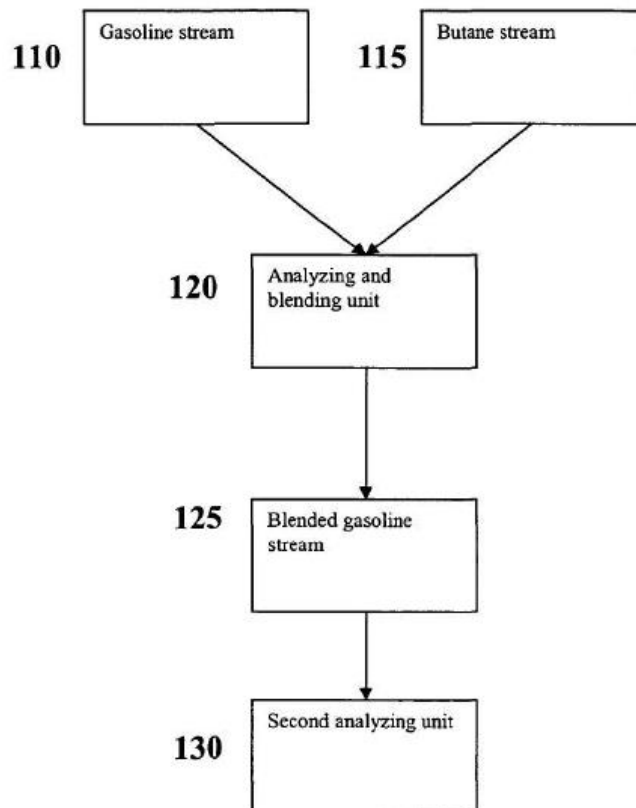


Figure 1 is a functional block diagram of an exemplary butane blending system of the '548 patent. *Id.* at 7:12–13. Figure 1 “shows a gasoline stream 110 and a butane stream 115 entering an analyzing and blending

unit 120.” *Id.* at 11:30–33. Analyzing and blending unit 120 may include a gasoline vapor pressure sensor and/or vapor to liquid ratio sensor in sensory communication with gasoline stream 110. *Id.* at 11:36–40. Blended gasoline stream 125 exits analyzing and blending unit 120 and enters a second analyzing unit 130, which “may comprise a vapor pressure sensor and/or vapor to liquid ratio sensor in sensory communication with said blended gasoline stream 125.” *Id.* at 11:32–35, 11:40–43.

The ’548 patent indicates that “[b]y combining the advantages of in-line vapor pressure monitoring both upstream and downstream of a butane blending operation, the inventors have developed a tightly controlled butane blending system with surprising versatility that can be used to blend butane with petroleum products at practically any point along a petroleum pipeline.” *Id.* at 3:18–23.

In the “Background of the Invention” section, the ’548 patent discusses several prior art blending systems. *Id.* at 2:24–3:2. The first such system is a patent issued to Mayer (U.S. Patent No. 3,751,644) that “describes a system for automatically adjusting the amount of butane added to a gasoline stream at a petroleum refinery, based on continuous measurements of the Reid vapor pressure of the gasoline downstream from the point of blending.” *Id.* at 2:26–33. According to the ’548 patent, Mayer does not disclose measuring the Reid vapor pressure upstream of the blending operation or calculating the blend ratio based on the Reid vapor pressure upstream from the blending operation. *Id.* at 2:33–39.

Next, the ’548 patent discusses a patent to Bajek (U.S. Patent No. 3,999,959) that “discloses a system for blending butane and gasoline at a petroleum refinery.” *Id.* at 2:40–42. The ’548 patent explains that Bajek’s system “blends butane with a low-octane gasoline stream and a high-octane

gasoline stream, and then analyzes the blended gasoline to measure characteristics such as Reid vapor pressure and vapor to liquid ratio.” *Id.* at 2:42–46. The ’548 patent asserts, however, that Bajek does not “disclose monitoring the gasoline upstream of the blending operation, or calculating the blend ratio based upon such upstream monitoring.” *Id.* at 2:46–49.

D. Illustrative Claim

Petitioner challenges claims 1–16 of the ’548 patent. Claims 1, 6, 9, and 14 are independent claims. Independent claim 1 is illustrative of the challenged claims and is reproduced below:

1. A system for blending butane with a gasoline stream having a gasoline flow rate, comprising:

an injection device injecting the butane into the gasoline stream at a butane flow rate;

a volatility measurement device in communication with the gasoline stream, the volatility measurement device configured to output data representative of a volatility measurement; and

a processor in connection with the injection device and the volatility measurement device, the processor configured to:

receive the volatility measurement; receive a target volatility value;

determine an adjustment to the butane flow rate based on the volatility measurement and the target volatility value; and

output a signal representative of the adjustment to the injection device.

Ex. 1001, 17:11–28.

E. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–16 would have been unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §	References/Basis
1–16	§ 102(b)	Hass ²
2, 10	§ 103	Hass
1–16	§ 102(b)	Bajek ³
1–16	§ 103	Bajek or Bajek, Hass
1, 4, 6–9, 12, 14–16	§ 102(b)	Stanton ⁴
1–16	§ 103	Stanton or Stanton, Hass
1, 2, 4–10, 12–16	§ 102(b)	Chin ⁵
1–16	§ 103	Chin or Chin, Hass

III. ANALYSIS

A. Legal Standards

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) if in the record, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

² US 3,530,867, issued September 29, 1970 (Ex. 1008, “Hass”).

³ US 3,999,959, issued December 28, 1976 (Ex. 1010, “Bajek”).

⁴ US 3,484,590, issued December 16, 1969 (Ex. 1009, “Stanton”).

⁵ US 4,543,819, issued October 1, 1985 (Ex. 1011, “Chin”).

B. Level of Ordinary Skill in the Art

Dr. Nikolaou testifies that a person of ordinary skill in the art would have had “a degree in chemical engineering, petroleum engineering, process engineering, mechanical engineering, or a similar field with 1-2 years of experience in designing fluid control systems or other comparable hands-on experience.” Ex. 1003 ¶ 17.

Dr. Kytomaa testifies that a person of ordinary skill in the art would have had “a degree in mechanical, civil, chemical, or petroleum engineering with 1-2 years of experience designing fluid control systems or would have had field or ‘hands-on’ experience equivalent to that.” Ex. 2101 ¶ 39; see Ex. 2001 ¶ 29.

Because it is consistent with the disclosures of the ’548 patent and the prior art of record, we adopt Patent Owner’s definition of one of ordinary skill in the art for purposes of this decision. We note, however, that we discern no substantive difference between the parties’ definitions of a person of ordinary skill in the art and the parties do not assert that selection of either definition would impact the outcome of this case.

C. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are construed according to their broadest reasonable interpretation in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2018).⁶ In determining the broadest reasonable construction, we presume

⁶ Because the Petition was filed before November 13, 2018, a recent amendment to this rule does not apply here. See Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b); effective November 13, 2018).

that claim terms carry their ordinary and customary meaning. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may define a claim term in a manner that differs from its ordinary meaning; however, any special definitions must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

The parties provide proposed constructions for the terms “gasoline”/“gasoline stream,” “vapor pressure,” “processor,” and “volatility measurement device in communication with the gasoline stream.” Pet. 4–12; PO Resp. 9–32, 37–38; Pet. Reply 2–14; Sur-reply 2–16. We address these terms below.

1. *Gasoline and Gasoline Stream*

Petitioner contends the terms “gasoline” and “gasoline stream” mean “a type of petroleum-based liquid” and include “liquid streams in a refinery as well as liquid streams downstream of the refinery.”⁷ Pet. 4. Dr. Nikolaou testifies in support of Petitioner’s construction that the term “gasoline” is used in the art to describe a wide variety of petroleum products, including “straight-run gasoline,” catalytically cracked or FCC gasoline, polymer gasoline, and alkylate gasoline. Ex. 1003 ¶ 40 (citing Ex. 1017, 20 (“Gasolines are complex mixtures of hydrocarbons, having typical boiling ranges from 100 to 400°F (38 to 205°C).”)). According to Dr. Nikolaou, regardless of where the blending of gasoline and butane occurs, the feed streams in the blending process are referred to as gasoline streams. *Id.*

⁷ Patent Owner agrees that the term “gasoline stream” in the ’548 patent means the “same thing” as “gasoline” in the ’948 patent. Tr. 40:8–11. Thus, we use these terms interchangeably.

Patent Owner contends the ordinary and customary meaning of “gasoline” “is various types of refined petroleum that are used as fuel,” which does not include gasoline stocks used in a refinery to create gasoline. PO Resp. 10. In support of Patent Owner’s construction, Mr. Terrence Higgins testifies that the EPA defines “gasoline” as “any fuel sold in any state for use in motor vehicles and motor vehicle engines, and commonly or commercially known or sold as gasoline.” Ex. 2102 ¶ 40 (citing Ex. 2107, 571). In contrast, Mr. Higgins testifies that the EPA defines “gasoline blending stock, blendstock, or component” as “any liquid compound which is blended with other liquid compounds to produce gasoline.” *Id.* According to Mr. Higgins, because gasoline blenders must comply with EPA regulations, one of ordinary skill in the art would have looked to the EPA regulations to understand the meaning of various terms that are used in those regulations, including the term “gasoline.” *Id.* ¶ 46.

On this record, we are presented with evidence that the term “gasoline” is used in the art to describe both gasoline streams within a refinery, such as straight-run gasoline, FCC gasoline, polymer gasoline, and alkylate gasoline, as well as EPA regulated gasoline, which is a fuel that is sold for use in motor engines and is commonly or commercially known as gasoline. Ex. 2102 ¶ 40; Ex. 1003 ¶ 40; Ex. 1017, 20;⁸ Ex. 1010, 6:61–68. Thus, contrary to Patent Owner’s argument, we find the term “gasoline” does not have only one ordinary and customary meaning in the art.

In any event, we must determine the meaning of “gasoline” in the ’548 patent by looking to the “intrinsic evidence of record, *i.e.*, the patent

⁸ Our citations to Exhibit 1017 are to the page numbers at the bottom of each page.

itself, including the claims, the specification and, if in evidence, the prosecution history.”⁹ *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) (explaining that the specification “is the single best guide to the meaning of a disputed term”). “In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term.” *Id.* at 1583.

a) Claims

Our analysis of the intrinsic evidence starts with the language of the asserted claims. *Vitronics*, 90 F.3d at 1582. The claims of the ’548 patent do not explain what gasoline is or how broadly this term is to be interpreted. Accordingly, we find the claims do not provide significant guidance as to the meaning of the term “gasoline.”

b) Written Description

We next look to the written description of the ’548 patent. *Vitronics*, 90 F.3d at 1582. As noted by Patent Owner, one of the primary goals identified in the ’548 patent is to blend the maximum amount of butane into gasoline and still meet EPA regulations governing volatility. PO Resp. 11–12; Ex. 1001, 1:59–2:4, 3:18–31. Generally consistent with Patent Owner’s

⁹ Although claim construction starts with the intrinsic evidence, it is appropriate to reference dictionary definitions or other extrinsic evidence to understand how a particular term is used in the art. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1317–18 (Fed. Cir. 2005) (en banc) (noting that dictionaries, treatises, and expert testimony may be used to “determin[e] the meaning of particular terminology to those of skill in the art of the invention”). In no event, however, may the extrinsic evidence be used to adopt a claim construction that is inconsistent with the intrinsic record. *Id.* at 1319; *Vitronics*, 90 F.3d at 1583 (“Allowing the public record to be altered or changed by extrinsic evidence introduced at trial, such as expert testimony, would make this right meaningless.”).

proposed construction, the EPA defines gasoline as “any fuel sold in any state for use in motor vehicles and motor vehicle engines, and commonly or commercially known or sold as gasoline.” Ex. 2102 ¶ 40 (citing Ex. 2107, 571). Given the emphasis in the ’548 patent in complying with EPA regulations related to gasoline volatility, we agree with Patent Owner that any construction of “gasoline” should encompass EPA regulated gasoline.

The ’548 patent, however, does not limit its use of the term “gasoline” to EPA regulated gasoline. Ex. 1001, 2:24–49. For example, the ’548 patent explains that “[b]utane is often blended with other gasoline components at the refinery, where it is typically added at the trunk line in response to changes in vapor pressure demand.” *Id.* at 2:24–26. The ’548 patent then describes Bajek’s exemplary refinery blending process—which blends butane with a light straight-run gasoline stream and “catalytic reformat” stream—as “a system for blending butane and gasoline at a petroleum refinery.” *Id.* at 2:40–46 (describing Bajek’s component “low-octane gasoline stream” and its component “high-octane gasoline stream”); Ex. 1010, 6:56–64. Thus, we agree with Petitioner that the ’548 patent uses the term “gasoline” in its broader sense to include component gasoline streams within a refinery. Pet. Reply 3–4.

Patent Owner asserts the discussion of Bajek in the ’548 patent must be considered in context of the refinery blending art. PO Resp. 20–21. According to Patent Owner, the ’548 patent’s explanation that “[b]utane is often blended with other gasoline components at the refinery, where it is typically added at the trunk line in response to changes in vapor pressure demand,” demonstrates that the prior art references only disclose blending butane with *gasoline components*. *Id.* at 21 (citing Ex. 1001, 2:24–25) (emphasis omitted). This argument is not persuasive because after

acknowledging that the prior art refinery systems blend butane with component gasoline streams, the '548 patent expressly describes these systems as blending butane with “gasoline,” the same term that is used in the challenged claims. Ex. 1001, 2:24–26, 2:40–42, 17:11.

Patent Owner contends the ordinary meaning of “gasoline” set forth in the EPA regulations must apply absent a clear and unambiguous redefinition of this term, which the '548 patent does not provide. PO Resp. 13–14. We do not find this argument persuasive because the evidence of record does not suggest that there is only one ordinary and customary meaning for the term “gasoline.” Moreover, the best way to understand how the '548 patent uses the term “gasoline” is to look to the '548 patent itself, which uses the term broadly and describes component gasoline streams in a refinery as “gasoline.” *Vitronics*, 90 F.3d at 1582.

For the reasons discussed above, we find that the written description of the '548 patent supports construing the term “gasoline” to include both EPA regulated gasoline (which includes “various types of refined petroleum that are used as fuel”) and component gasoline streams in a refinery.

c) Prosecution History

The relevant prosecution history also supports construing “gasoline” to include component gasoline streams in a refinery. *Phillips*, 415 F.3d at 1317 (explaining that “the prosecution history provides evidence of how the PTO and the inventor understood the patent”); *Vitronics*, 90 F.3d at 1582 (“As such, the record before the Patent and Trademark Office is often of critical significance in determining the meaning of the claims.”). During prosecution of U.S. Patent No. 6,679,302 (“the '302 patent”), the Examiner

rejected numerous pending claims as anticipated by Bajek. Ex. 1007, 3.¹⁰ In so doing, the Examiner concluded that “[t]he Bajek reference discloses a gasoline blending system comprising a source of gasoline 6” (Bajek’s light straight-run gasoline stream). *Id.*; Ex. 1010, 6:63.

In response, the patentee did not argue that Bajek does not disclose blending butane with “gasoline,” but instead amended the pending method and system claims to specify that the blending occurs at a tank farm, which is typically the point of distribution to tanker trucks or other forms of transportation. Ex. 1007, 17. In support of the patentability of these amended claims, the patentee expressly admitted that Bajek “teaches a system for blending gasoline streams” and distinguished the amended claims based on the new limitations requiring blending at a tank farm:

The Bajek patent teaches a system for blending gasoline streams. However, the technology disclosed in Bajek is limited to blending gasoline streams as part of the refining process. As the specification of the Bajek patent states, it is directed to controlling “the octane blending values of the various gasoline streams, that of the butane rich stream, and . . . [the] lead-containing compound required to attain the target octane rating for that particular refinery pool.” The various gasoline streams the refiner works with are part of the refining process and are not the end product that is distributed to retailers. Accordingly, Bajek is limited to controlling gasoline pools at the refinery before entering the pipeline to be transported to the tank farm

As described in the specification of the present application, blending at the refinery is only the first stage in the delivery process for gasoline. The inventions defined by

¹⁰ The ’548 patent claims benefit to U.S. Application No. 10/071,191, which issued as the ’302 patent, through a chain of continuing applications and one continuation-in-part application. Ex. 1001, code (63). The ’548 patent also expressly incorporates by reference the contents of the ’302 patent. *Id.* at 1:16–18.

amended Claims 1, 13, 37, and 41 are directed to controlling the volatility of gasoline at the point of distribution, *namely the tank farm*. The prior methods of blending butane at the refinery lack the precision provided by the inventions *defined by these claims*.

Ex. 1007, 17–18 (emphasis added and internal citations omitted).

Although the patentee clearly and unambiguously stated that Bajek “teaches a system for blending gasoline streams,” Patent Owner contends when this assertion is read in context of the prosecution history as a whole it cannot be deemed a definition of “gasoline.” PO Resp. 23–24. Patent Owner reasons that the above-noted disclosures merely distinguish gasoline streams that are part of the refining process from the end product that is distributed to retailers. *Id.* at 24–25.

In the identified passage, despite the fact that Bajek is focused on the refinery process, the patentee continues to use the terms “gasoline” and “gasoline streams” broadly, and without distinction from EPA regulated gasoline. Moreover, the ’548 patent, Bajek, the patentee during prosecution, and the Examiner, all identify the light straight-run gasoline stream of Bajek as “gasoline,” the same term used in the challenged claims. Ex. 1001, 2:40–42; Ex. 1010, 1:5–6, 3:34–36, 6:63, 8:22–23; Ex. 1007, 3, 17. This is persuasive evidence that the term “gasoline” in the ’548 patent includes component gasoline streams within a refinery. Indeed, at no point did the patentee argue that Bajek fails to disclose blending butane with a gasoline stream, a conclusion that would have rendered the claim amendments unnecessary. Thus, we find the prosecution history of the ’302 patent is consistent with construing gasoline to include component gasoline streams in a refinery, and is expressly inconsistent with construing the term “gasoline” narrowly to include only EPA regulated gasoline.

d) District Court Claim Construction

In the Illinois Action, the parties involved in that dispute stipulated to a construction of “gasoline” that is consistent with Patent Owner’s proposed construction in this proceeding. PO Resp. 27–28 (citing Exs. 2004, 2179). Patent Owner contends this adopted construction should be “nearly conclusive in this proceeding.” *Id.* at 28.

In contrast to the construction stipulated to by the parties in the Illinois Action, the magistrate judge in the Delaware Action construed the terms “gasoline” and “gasoline stream” to include component gasoline streams in a refinery. Ex. 1043. Given the conflict in constructions between the two district court proceedings, and given the lack of analysis as to why the construction of “gasoline” was adopted in the Illinois Action, we do not agree that the parties’ stipulation as to the meaning of “gasoline” is dispositive, or particularly instructive, in this case.

e) Conclusion

For the reasons discussed above, we find that the written description and relevant prosecution history support construing “gasoline” to include component gasoline streams in a refinery. Conversely, construing “gasoline” as limited to EPA regulated gasoline would be inconsistent with the broad use of this term in the written description of the ’548 patent and the relevant prosecution history. Thus, we construe the terms “gasoline” and “gasoline stream” in the ’548 patent to include both EPA regulated gasoline and component gasoline streams within a refinery.¹¹

¹¹ Consistent with our adopted construction of “gasoline,” the magistrate judge in the Delaware Action recommended that “gasoline” be construed to include gasoline streams in a refinery. Ex. 1043, 4, 7.

2. Vapor Pressure

Dependent claim 4 requires that the volatility measurement “is a vapor pressure.” Ex. 1001, 17:36–37. The parties dispute whether this claim phrase also encompasses determining the vapor-liquid ratio¹² of gasoline.

a) Analysis of the Intrinsic Record

The ’548 patent explains that

[t]here are two principal methods for assessing the volatility of gasoline: (1) measuring the vapor to liquid ratio, and (2) measuring the vapor pressure. The Reid method is the standard test for measuring the vapor pressure of petroleum products. Reid vapor pressure (RVP) is related to true vapor pressure, but is a more accurate assessment for petroleum products because it considers sample vaporization as well as the presence of water vapor and air in the measuring chamber.

Ex. 1001, 2:5–13; Ex. 1005, 1:30–32 (similar disclosure in the ’302 patent).

From this disclosure, it is evident that vapor pressure and vapor to liquid ratio are different measurements. The ’302 patent explains, however, that

[i]n the description of the embodiments of the invention and the claims that follow, measuring the vapor pressure will refer generally to the volatility of the gasoline or butane. Indeed, the term vapor pressure is meant to encompass both Reid vapor pressure as measured by applicable ASTM procedures, and other measures of vapor pressure such as true vapor pressure and vapor/liquid ratio. It should be understood that vapor

¹² The ’548 patent and prior art use the terms “vapor to liquid ratio,” “vapor-liquid ratio,” and “vapor/liquid ratio.” Ex. 1001, 2:6 (“(1) measuring the vapor to liquid ratio.”); Ex. 1005, 1:30–32 (“(1) measuring the vapor-liquid ratio.”); Ex. 1010, 7:51–54 (“Volatility monitor 17 generates an output signal representative of the V/L ratio of the blend.”). We understand these terms to be synonymous and use them interchangeably throughout this decision. See, e.g., Ex. 2101 ¶ 130 (Dr. Kytomaa identifying Bajek’s volatility monitor, which measures the “V/L ratio of the blend,” as a “vapor-liquid analyzer”).

pressure measurements can also include a measurement of the vapor-liquid ratio at a certain temperature.

Ex. 1005, 5:47–56.¹³ Petitioner contends this disclosure explicitly defines the term “vapor pressure” to include at least Reid vapor pressure, true vapor pressure, and vapor/liquid ratio. Pet. Reply 9–10; Pet. 9.

Patent Owner asserts the ordinary meaning of the terms “vapor pressure” and “vapor/liquid ratio” are different and that the ’548 and ’302 patents do not express a clear and unmistakable intent to redefine the term “vapor pressure” to mean “vapor to liquid ratio.” PO Resp. 28–29 (citing Ex. 1013 ¶ 3.1.5; Ex. 2111 ¶ 3.1.2; Ex. 1001, 2:5–7, 7:33–37). Patent Owner reasons that because the ASTM procedures identified in the ’302 patent “define ‘vapor pressure’ and ‘vapor/liquid ratio’ differently,” and because the ’302 patent indicates that “vapor/liquid ratio can be measured **in addition** to the vapor pressure,” it cannot be said that “vapor pressure” was defined to mean “vapor/liquid ratio.” *Id.* at 29–30 (citing *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1044 (Fed. Cir. 2019)). Patent Owner also contends that a construction equating “vapor pressure” and “vapor/liquid ratio” “runs afoul of claim differentiation” because dependent claim 4 recites that “the volatility measurement is the vapor pressure” and dependent claim 5 recites that the volatility measurement is a vapor to liquid ratio. *Id.* at 30 (discussing claims 27, 33, 34 of the ’302 patent and claims 1, 4, and 5 of the ’548 patent).

¹³ As noted above, the ’548 and ’302 patents both derive from the same parent application. Ex. 1001, code (63). When multiple patents “derive from the same parent application and share many common terms, we must interpret the claims consistently across all asserted patents.” *NTP, Inc. v. Research in Motion, Ltd.*, 418 F.3d 1282, 1293 (Fed. Cir. 2005). The parties do not disagree. Pet. 3–4; PO Resp. 30; Sur-reply 6, 9.

Upon review of the intrinsic evidence as a whole, we find that the '302 patent expresses a clear and unmistakable intent to encompass within the meaning of the term “vapor pressure” not only Reid vapor pressure, but also “other measures of vapor pressure such as true vapor pressure and vapor/liquid ratio.” Ex. 1005, 5:50–53 (“Indeed, the term vapor pressure is meant to encompass”); see *3M Innovative Properties Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1369–71 (Fed. Cir. 2003) (determining that a patentee “clearly acted as its own lexicographer” by stating that “‘Embossed’ means a topography . . .”).

As noted by Patent Owner, the '548 patent (and the '302 patent) uses the terms “vapor pressure” and “vapor to liquid ratio” to refer to different methods of measuring volatility and even describes using the two measurement techniques in a single embodiment.¹⁴ Ex. 1001, 2:5–9, 9:10–20; Ex. 1005, 1:30–32, 2:53–60, 5:56–58 (“In certain embodiments of the present invention measurements may be taken for both vapor pressure and vapor-liquid ratio.”). But even after acknowledging that the terms mean different things in the art, the '302 patent expresses a clear intent to encompass all of the disclosed methods for measuring vapor pressure (including vapor/liquid ratio) within the scope of the term “vapor pressure.” Ex. 1005, 5:50–53 (“the term vapor pressure is meant to encompass both Reid vapor pressure as measured by applicable ASTM procedures, and other measures of vapor pressure such as true vapor pressure and vapor/liquid ratio.”). Thus, we disagree that the '548 patent’s description of embodiments measuring both vapor pressure and vapor to liquid ratio

¹⁴ We note that in accurately describing these embodiments, the patentee could not simply use the term “vapor pressure” twice, even if both terms fall within the patent’s broad understanding of the term “vapor pressure.”

obviates the clear and unmistakable instruction in the '302 patent that “vapor to liquid” ratio is encompassed within the meaning of the term “vapor pressure.”

Finally, we are not persuaded that the doctrine of claim differentiation requires a different construction. As noted by Patent Owner, dependent claim 4 requires that the “volatility measurement is a vapor pressure” and dependent claim 5 requires that the “volatility measurement is a vapor to liquid ratio.” Ex. 1001, 17:36–39. That is, claim 4 requires a genus of volatility measurement techniques, including Reid vapor pressure, true vapor pressure, and vapor to liquid ratio, and claim 5 requires a particular volatility measurement technique—vapor to liquid ratio. A patent applicant is free to claim a particular species in one dependent claim and then a somewhat broader genus (that includes one or more of the same species) in another dependent claim.

In any event, the doctrine of claim differentiation is not a hard and fast rule of construction. Thus, even if the doctrine applied in this case, we would not find this to be sufficient to overcome the clear and unmistakable use of lexicography found in the '302 patent with respect to the term “vapor pressure.” See *Seachange Int'l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1369 (Fed. Cir. 2005) (explaining that the doctrine of claim differentiation “is not a hard and fast rule of construction” and “will be overcome by a contrary construction dictated by the written description or prosecution history”).

b) The Magistrate’s Construction of “Vapor Pressure”

Applying the claim construction standard set forth in *Phillips*, the magistrate judge in the Delaware Action expressly rejected our preliminary construction of “vapor pressure” as inconsistent with the intrinsic record. Ex. 1042, 5–6, 8 & n.5. Of particular relevance, the magistrate found that

the '302 patent's discussion of measuring "both vapor pressure and vapor-liquid ratio" is inconsistent with a determination that the terms "vapor pressure" and "vapor-liquid ratio" mean the same thing. *Id.* at 5–8.

To be clear, we do not find that "vapor pressure" and "vapor to liquid ratio" mean the same thing in the art. We also acknowledge that the '302 and '548 patents discuss embodiments that rely on measurements of both the vapor pressure and vapor to liquid ratio of gasoline and butane. The '302 patent, however, in seeking to encompass a broad scope for the claims, expressly indicates that the term "vapor pressure" refers "generally to the volatility of the gasoline or butane" and "is meant to encompass" not only Reid vapor pressure, "true vapor pressure[,] and vapor/liquid ratio," but "other methods for assessing the volatility of either the gasoline, or the butane, or both." Ex. 1005, 5:47–60. The public is entitled to rely upon these clear and unambiguous statements of lexicography.¹⁵ See *Paulsen*, 30 F.3d at 1480 (explaining that the patentee is free to define the specific terms used to describe his or her invention, as long as this is done clearly and unambiguously).

In view of the foregoing, although we acknowledge the magistrate's recommended construction of "vapor pressure" under the *Phillips* standard, we determine that, under the broadest reasonable construction, the clear lexicography of the '302 patent should apply.

¹⁵ As discussed below, Bajek discloses a "[v]olatility monitor 17" that measures the V/L ratio of the gasoline and butane. Ex. 1010, 7:51–54. Consistent with our construction of "vapor pressure," during prosecution of the '302 patent the Examiner found that Bajek's V/L ratio monitor anticipated a dependent claim requiring a "gasoline vapor pressure sensor." Ex. 1007, 3, 7. The patent applicant did not expressly dispute this finding during prosecution.

c) *Adopted Construction of “Vapor Pressure”*

For the reasons discussed above, we find the terms “vapor pressure” and “vapor to liquid ratio” represent two different methods for assessing the volatility of gasoline. Ex. 1001, 2:5–9. We further find, however, that the ’302 patent clearly and unambiguously indicates that the term “vapor pressure” is meant to encompass not only “Reid vapor pressure,” but also “other measures of vapor pressure such as true vapor pressure and vapor/liquid ratio.” Ex. 1005, 5:50–53, 5:58–60. Thus, for purposes of this decision, measuring the “vapor to liquid ratio” of gasoline, butane, or a blend of these two components is a measurement of “vapor pressure.”

3. *Processor*

Claim 1 of the ’548 patent requires “a processor” configured to receive a volatility measurement and a target volatility value and determine an adjustment to the butane flow rate based on these received values. Ex. 1001, 17:19–26. Both parties agree that a “processor” is “an automated device that receives data and manipulates the data according to a set of instructions to generate an output.” Pet. 10; PO Resp. 31. As this construction is consistent with the intrinsic record, we adopt it for purposes of this decision.

4. *Volatility Measurement Device in Communication with the Gasoline Stream*

Claim 1 requires “a volatility measurement device in communication with the gasoline stream.” Ex. 1001, 17:15–16. Independent claim 6 requires the same volatility measurement device, but further requires that “the volatility measurement device is in communication with the gasoline stream at a location downstream of the injection device.” *Id.* at 17:44–47, 18:1–3.

Petitioner contends claim 1 encompasses volatility measurement devices that are in communication with the gasoline stream before or after the point of butane blending. Pet. 23–24; Pet. Reply 13.

In its response, Patent Owner contends the term “gasoline stream” refers to “pre-blended gasoline.” PO Resp. 37. Patent Owner reasons that when the measurement device is upstream of the injection device, it is always in communication with the gasoline stream. *Id.* Conversely, when the measurement device is downstream of the injection device “the measurement device is ‘in communication with the gasoline’ when gasoline is flowing through the system before any butane injection.” *Id.* at 38. “After injection starts, the device is in communication with blended gasoline,” a configuration Patent Owner contends is discussed in the ’548 patent. *Id.* (citing Ex. 1001, 11:44–62).

Petitioner contends the gasoline stream of the ’548 patent does not cease to be a gasoline stream when it is blended with butane. Pet. Reply 13. Petitioner contends this construction is consistent with the written description of the ’548 patent and with claim 6, which requires a device in communication with “the gasoline stream” and then further specifies that the device is in “communication with the gasoline stream at a location downstream of the injection device.” *Id.* at 13–14.

Patent Owner responds that its construction is indeed consistent with the specification and claims because the downstream device would still measure the volatility of the gasoline before butane injection begins. Sur-reply 14. According to Patent Owner, its own “downstream only” systems are configured in just this way. *Id.* (citing Ex. 2101 ¶ 220).

As noted by Petitioner, claim 6 requires that the volatility measurement device is in communication with the gasoline stream, but then

specifies that the device is in communication with the gasoline stream downstream of the injection device. Ex. 1001, 17:44–47, 18:1–3. We agree that the structure of claim 6 indicates that the term “gasoline stream” encompasses gasoline before or after butane blending.

We do not find Patent Owner’s counter argument persuasive. Several embodiments of the ’548 patent include a vapor pressure sensor either upstream or downstream of the blending unit. *Id.* at 3:32–50, 6:20–41. The “gasoline” in these embodiments is referred to as “gasoline” before and after butane blending. *Id.* Indeed, in one embodiment of the ’548 patent reports are generated of the “blend ratio” of butane and gasoline, of the “vapor pressure of said gasoline upstream of the butane blending,” and of the “vapor pressure of said gasoline downstream of the butane blending.” *Id.* at 6:27–29.

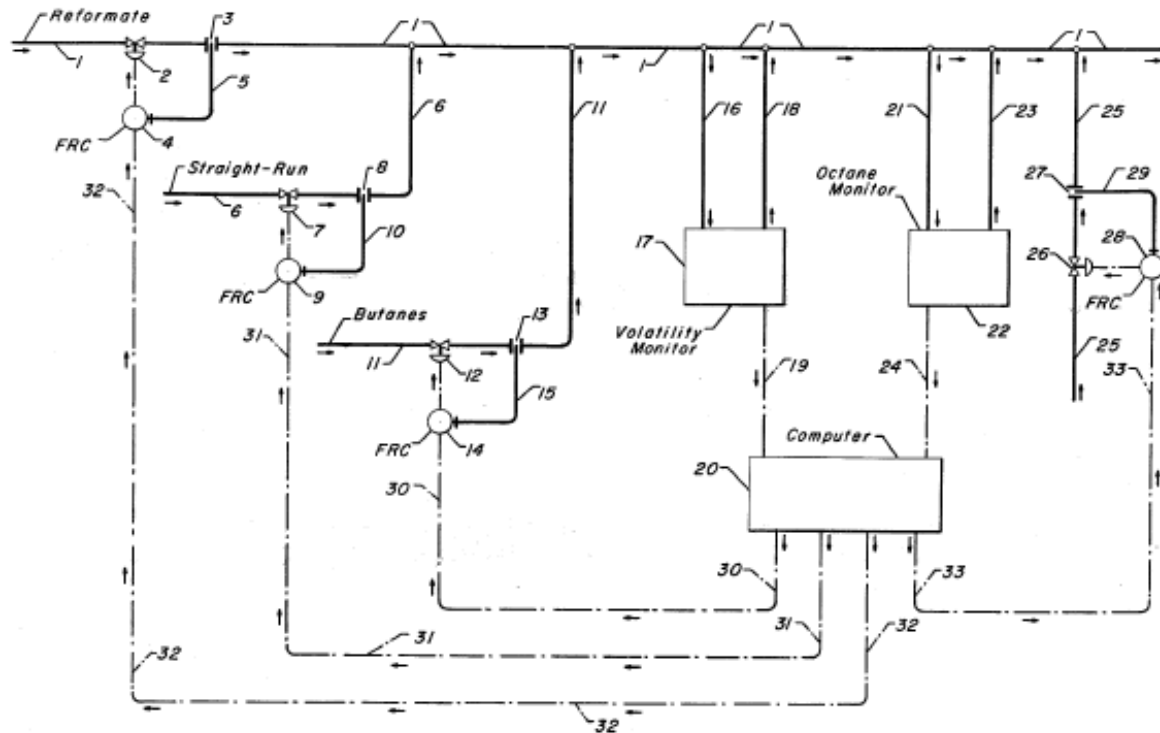
In view of the foregoing, we construe claim 1 to encompass measuring the volatility of the “gasoline stream” either before or after butane blending.

D. Claims 1–16 in view of Bajek

Petitioner contends claim 1–16 are anticipated by Bajek. Pet. 32–43.

1. Bajek

Bajek is directed to “the blending of various gasoline streams” to produce a “refinery octane pool.” Ex. 1010, 1:5–8. Bajek contains one Figure, which is reproduced below:



The Figure of Bajek is a schematic representation of the disclosed blending system. *Id.* at 6:43–55. As shown in the Figure, catalytic reformat, or the gasoline stream “emanating from a catalytic reforming unit,” is transported to a tank farm via line 1. *Id.* at 6:43–46, 6:56–58. Control valve 2 varies the flow rate of the reformat and is actuated by Flow Recorder Controller (FRC) 4, which monitors the flow through line 1 “by way of orifice meter 3 and line 5.” *Id.* at 6:57–61. The reformat is admixed in line 1 with a light straight-run gasoline stream introduced via line 6. *Id.* at 6:61–63. Control valve 7 controls the flow rate of the gasoline stream through line 6 and is actuated by FRC 9. *Id.* at 6:64–67. “The mixed gasoline stream continues through line 1, into which a mixed butane stream is added by way of line 11, the flow thereof being varied by control valve 12, which is actuated by a signal received from FRC 14.” *Id.* at 6:67–7:2. Tetraethyl lead may be added to the butane-blended gasoline via line 25. *Id.* at 7:5–7.

Volatility monitor 17 monitors the temperature at which the vapor-liquid ratio of the unleaded gasoline blend is 20. *Id.* at 7:37–40. “The obtained temperature is then compared with the ASTM specified standard for the particular locale, and the difference in temperatures is converted into the appropriate signal which dictates either an increase, or a decrease in butane addition.” *Id.* at 7:40–45. In this process, “[v]olatility monitor 17 generates an output signal representative of the V/L ratio of the blend, and transmits the same via instrument line 19 into computer (comparator means) 20.” *Id.* at 7:51–54. “[C]omputer 20 is programmed to generate up to four additional output signals as required (1) to bring the volatility of the blended gasoline within the desired specification and (2) to increase, or decrease the quantity of tetraethyl lead addition in order to meet the intended target octane rating of the gasoline pool.” *Id.* at 7:57–63. “The generated signals are transmitted via instrument lines 30, 31, 32, and 33 to FRCs 14, 9, 4, and 28, respectively.” *Id.* at 7:63–65.

2. *Analysis—Independent Claims 1, 6, 9, and 14*

Petitioner contends Bajek anticipates claims 1–16 of the ’548 patent. With respect to independent claims 1, 6, 9, and 14, Petitioner persuasively identifies where Bajek expressly discloses every limitation of these claims, including (1) blending butane with a gasoline stream having a flow rate (Pet. 34 (citing Ex. 1010, 1:61–65, 6:43–47, 6:56–64, Fig. 1; Ex. 1003 ¶¶ 72–74)); (2) an injection device (line 11 and control valve 12) for injecting butane into the gasoline stream at a butane flow rate (*id.* at 34–35 (citing Ex. 1010, 6:68–7:4; Ex. 1003 ¶ 74)); (3) a volatility measurement device (volatility monitor 17) in communication with the gasoline stream and configured to output data representative of the volatility measurement (*id.* at 35 (citing Ex. 1010, 6:68–7:4, 7:12–14, 7:51–52; Ex. 1003 ¶¶ 74–75));

(4) a processor (computer (comparator) means 20 and FRC 14) that is connected to the injection device and configured to receive an output signal representative of the V/L ratio of the blend and a target volatility value (ASTM specified standard for the particular locale), determine an adjustment to the butane flow rate based on these values, and output a signal to the injection device representative of the necessary adjustment to the butane flow rate (*id.* at 36–37 (citing Ex. 1010, 5:63–6:4, 7:40–60; Ex. 1003 ¶ 76)); and (5) a volatility measurement device that measures the volatility of the “gasoline stream” downstream of the injection device (*id.* at 38 (citing Ex. 1010, 7:12–14, 6:68–7:4, 7:51–52, Fig. 1; Ex. 1003 ¶¶ 78, 82)) (independent claim 6).

Patent Owner contends claims 1–16 are not anticipated by Bajek because Bajek does not disclose blending butane with “gasoline.” PO Resp. 40. Patent Owner further contends that claims 1–8 are not anticipated by Bajek because Bajek fails to disclose “a volatility measurement device in communication with a gasoline stream.” *Id.* at 41.

Patent Owner’s arguments are not persuasive because they rely on claim constructions that we do not adopt. As discussed in Section III.C.1 and III.C.4, we find that the terms “gasoline” and “a gasoline stream” include component gasoline streams in a refinery and that the term “the gasoline stream” encompasses gasoline before or after it is blended with butane. Ex. 1010, 6:43–64, 7:11–14, 7:37–50, Fig. 1. And, as noted above, Petitioner persuasively identifies where Bajek discloses blending butane with a light straight-run gasoline stream (a component gasoline stream in a refinery) and measuring the volatility of the gasoline stream downstream of the butane blending operation. Pet. 35, 38 (citing Ex. 1010, 6:68–7:4, 7:12–14, 7:51–52).

Upon review of parties' arguments and supporting evidence, we find that Bajek discloses every limitation of independent claims 1, 6, 9, and 14. Accordingly, Petitioner has demonstrated by a preponderance of the evidence that Bajek anticipates claims 1, 6, 9, and 14 of the '548 patent.

3. *Dependent Claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16*

Petitioner persuasively identifies where Bajek expressly discloses every limitation of dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16, including (1) a target volatility value that is based on seasonable and regional data (Pet. 40 (citing Ex. 1010, 1:30–33, 7:39–42)) (claims 2 and 10); (2) measuring the vapor pressure of the gasoline stream (volatility monitor 17) (*id.* at 41 (citing 7:51–53; Ex. 1005, 5:47–56)) (claims 4 and 12); (3) measuring the vapor to liquid ratio of the gasoline stream (volatility monitor 17) (*id.* (citing Ex. 1010, 7:51–53)) (claims 5 and 13); (4) an injection device that includes a valve (valve 12) that controls the butane flow rate into the gasoline stream (*id.* (citing Ex. 1010, 6:68–7:4)) (claims 7 and 15); and (5) a processor that calculates a blend ratio based on a target volatility measurement and a target volatility value (*id.* at 41–42 (citing Ex. 1010, 5:64–6:8)) (claims 8 and 16).

Patent Owner does not address Petitioner's arguments with respect to claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16 of the '548 patent. PO Resp. 36–39.

Upon review of Petitioner's arguments and supporting evidence, we find that Petitioner persuasively explains where Bajek discloses every limitation of dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16. Thus, Petitioner has demonstrated by a preponderance of the evidence that Bajek anticipates dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16 of the '548 patent.

4. *Dependent Claims 3 and 11*

Claim 3 requires “a plurality of gasoline streams each associated with a different type of gasoline, at least one gasoline stream being selectable for blending with the butane.” Ex. 1001, 17:32–35. Claim 11 requires “selecting the gasoline stream from a plurality of gasoline streams, wherein each of the plurality of gasoline streams is associated with a different type of gasoline.” *Id.* at 18:27–30.

Petitioner contends Bajek’s disclosure of blending butane with at least two different gasoline streams expressly discloses the limitations of claims 3 and 11. Pet. 40–42 (citing Ex. 1010, 1:5–14, 6:43–47, 6:56–64, Fig. 1).

Patent Owner contends Bajek fails to anticipate claims 3 and 11 of the ’548 patent because Bajek does not disclose blending butane with a “gasoline stream.” PO Resp. 40. This argument is not persuasive as it relies on a construction of the term “gasoline stream” that we do not adopt, i.e., that a component gasoline stream in a refinery is not a “gasoline stream.”

Patent Owner also argues that Bajek fails to disclose either gasoline streams that are “individually selectable for blending” or “blending only one type of gasoline stream” with butane, as required by claims 3 and 11. *Id.* at 39, 41. Contrary to Patent Owner’s arguments, however, claims 3 and 11 do not require blending butane with only one type of gasoline or that any particular gasoline stream be “individually selectable for blending” apart from any other gasoline stream. The claims simply require that there be a plurality of gasoline streams each associated with a different type of gasoline and that at least one of these streams is selectable for blending with butane.

Bajek discloses a plurality of gasoline streams that may be blended with butane to produce “regular” and “premium” grade gasoline pools. Ex. 1010, 1:5–11 (disclosing the use of “various gasoline streams”), 3:32–47

(identifying five different types of gasoline streams that may be used to generate different grades of gasoline). Moreover, in its disclosed embodiment, Bajek selects two of these gasoline streams for blending with butane. *Id.* at 6:43–55. Thus, we find that Bajek discloses a plurality of gasoline streams that are each associated with a different type of gasoline (reformate gasoline, light straight-run gasoline, etc.) and selecting at least one of these streams for blending with butane. Ex. 1010, 1:5–11, 3:32–47, 6:43–55, Fig. 1.

In view of the foregoing, Petitioner has demonstrated by a preponderance of the evidence that Bajek anticipates claims 3 and 11 of the '548 patent. See Ex. 1010, 6:64–69.

5. Conclusion

For the reasons set forth above, Petitioner has demonstrated by a preponderance of the evidence that Bajek anticipates claims 1–16 of the '548 patent.

E. Claims 1–16 in view of Hass

Petitioner contends claim 1–16 are anticipated by Hass. Pet. 20–29. Patent Owner disagrees. PO Resp. 36–39.

1. Hass

Hass discloses an apparatus and method for “blending gasoline and other volatile liquids to predetermined vapor-liquid ratios.” Ex. 1008, 1:6–9. Figure 2 of Hass is reproduced below:

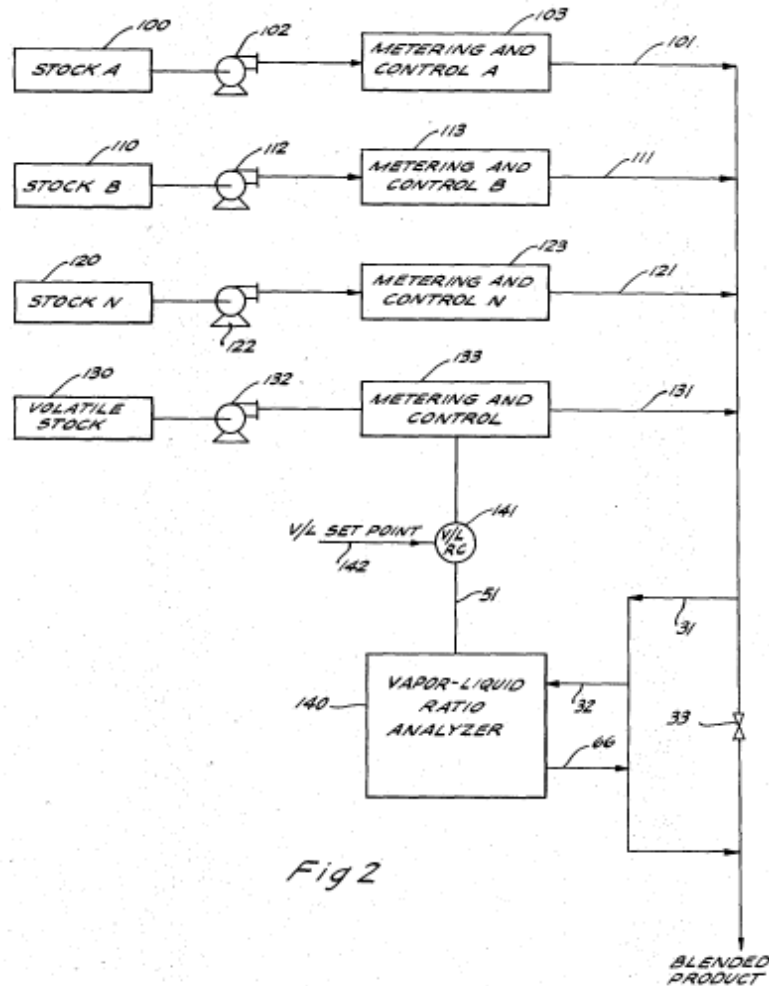


Figure 2 is a flow diagram of a liquid blending system for the production of a blended product having a predetermined vapor-liquid ratio. *Id.* at 2:35–37. In Figure 2, stocks A through N are combined in product line 30 (not numbered in Figure 2) and can represent “gasoline stocks, liquid dye solutions, corrosion inhibitors, additives, and antiknock fluids such as tetraethyl lead and tetramethyl lead.” *Id.* at 6:13–15, 6:38–41. A volatile stock, such as butane or natural gasoline, may also be added to product line 30 via component line 131. *Id.* at 6:29–31, 6:45–47.

Stocks A through N are stored in stock sources 100, 110, 120, and 130, which may be storage tanks, pipelines, tank cars, or any other devices for storage of liquid materials. *Id.* at 6:34–36. The various stocks are

delivered by pumps 102, 112, 122, and 132 to metering and control devices 103, 113, 123, and 133, respectively, which provide a means for controlling the proportion of each stock in the final blend. *Id.* at 6:21–32, 6:53–55.

Vapor-liquid analyzer 140 determines the vapor-liquid ratio of a sample withdrawn through lines 31 and 32 and transmits a signal proportional to the measured vapor-liquid ratio to vapor-liquid controller 141. *Id.* at 7:6–21. Vapor-liquid controller 141 detects any difference between the measured vapor-liquid ratio and vapor-liquid set point 142 and transmits a controlled output signal to metering and control device 133 to reset the proportion of volatile stock entering the blend. *Id.* at 7:23–28. “Alternatively, analog signal 51 can be transmitted directly to analog or digital computing devices having the desired or target vapor-liquid ratio programmed into them, and which automatically compute and execute the composition change required to achieve the target vapor-liquid ratio.” *Id.* at 7:28–32; *see also id.* at 1:61–64 (disclosing that “[s]easonal and geographic volatility control” of the gasoline is “achieved by merely specifying the temperature at which the vapor-liquid ratio is measured”).

2. *Independent Claims 1, 6, 9, and 14*

Petitioner persuasively identifies where Hass discloses every limitation of independent claims 1, 6, 9, and 14, including (1) blending butane with a gasoline stream (Stock A) having a gasoline flow rate (metering a control device A (103)) (Pet. 22–23 (citing Ex. 1008, 1:6–9, 2:27–30, 6:34–41, 6:46–47, Fig. 2; Ex. 1003 ¶ 53)); (2) an injection device (component line 131 and metering and control device 133) for injecting butane into the gasoline stream at a butane flow rate (*id.* at 23 (citing Ex. 1008, 6:59–62, 6:46–47; Ex. 1003 ¶ 55)); (3) a volatility measurement device (vapor-liquid ratio analyzer) in communication with the gasoline

stream and configured to output data representative of a volatility measurement (*id.* at 23–24 (citing Ex. 1008, 7:6–20; Ex. 1005, 5:47–56)); (4) a processor (vapor-liquid controller 141 and control device 133) that receives data from the vapor-liquid ratio analyzer, determines an adjustment to the butane flow rate based on a measurement from the analyzer and a vapor-liquid ratio set point, and sends an output signal to the injection device to control the amount of butane added to the gasoline stream (*id.* at 24–25 (citing Ex. 1008, 7:6–27, 6:59–65; Ex. 1003 ¶ 57)); and (5) a volatility measurement device that is in communication with the gasoline stream at a location downstream of the injection device (*id.* at 26 (citing Ex. 1008, 3:66–75, 7:8–12, 7:22–27, Fig. 2; Ex. 1003 ¶ 63)) (independent claim 6).

Patent Owner contends Hass does not anticipate the independent claims of the '548 patent because it fails to disclose blending butane with a “gasoline stream.” PO Resp. 36–37. This argument is not persuasive as it is based on a claim construction that we do not adopt, i.e., that the term “gasoline stream” is limited to finished gasoline outside of a refinery.

With respect to claims 1–8, Patent Owner also contends that Hass fails to disclose a “volatility measurement device in communication with the gasoline stream.” *Id.* at 37–38. Patent Owner reasons that claim 1 requires measuring the volatility of unblended gasoline, whereas Hass’s volatility monitor is downstream of the injection device where it measures the volatility of the blend of butane and gasoline. *Id.* For the reasons discussed in Section III.C.4, we do not find this argument persuasive because we determine that the term “the gasoline stream” encompasses both unblended and blended gasoline streams.

Upon review of parties’ arguments and supporting evidence, we find that Hass discloses every limitation of independent claims 1, 6, 9, and 14.

Thus, Petitioner has demonstrated by a preponderance of the evidence that Hass anticipates independent claims 1, 6, 9, and 14 of the '548 patent.

3. *Dependent Claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16*

Petitioner persuasively identifies where Hass discloses every limitation of dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16, including: (1) a target volatility value that is based on seasonable and regional data (Pet. 27–28 (citing Ex. 1008, 1:61–64)) (claims 2 and 10); (2) measuring the vapor pressure of the gasoline stream (vapor-liquid analyzer 140) (*id.* (citing Ex. 1008, 7:6–20; Ex. 1005, 5:47–56)) (claims 4 and 12); (3) measuring the vapor to liquid ratio of the gasoline stream (vapor-liquid analyzer 140) (*id.* at 28–29 (citing Ex. 1008, 7:6–17)) (claims 5 and 13); (4) an injection device that includes a valve (a flow control valve) that controls the butane flow rate into the gasoline stream (*id.* (citing Ex. 1008, 6:59–62)) (claims 7 and 15); and (5) a processor that calculates a blend ratio based on a target volatility measurement and a target volatility value (*id.* (citing Ex. 1008, 7:22–27)) (claims 8 and 16).

Patent Owner does not address Petitioner's arguments with respect to claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16. PO Resp. 36–39.

As noted above, Petitioner persuasively identifies where Hass discloses every limitation of dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16. Thus, Petitioner has demonstrated by a preponderance of the evidence that Hass anticipates dependent claims 2, 4, 5, 7, 8, 10, 12, 13, 15, and 16 of the '548 patent.

4. *Dependent Claims 3 and 11*

As noted above, dependent claims 3 and 11 require “a plurality of gasoline streams,” each “associated with a different type of gasoline.” Ex. 1001, 17:32–35, 18:27–30. Petitioner contends claims 3 and 11 are

anticipated by Hass because Hass discloses the use of multiple “gasoline stocks” and selecting at least one of these gasoline stocks for blending with butane. Pet. 27–28 (citing Ex. 1008, 6:36–41). Patent Owner contends claims 3 and 11 are not anticipated by Hass because Hass does not disclose blending butane with a “gasoline stream” or a “gasoline stream” that is “individually selectable” for blending with butane. PO Resp. 39.

Hass discloses blending multiple different “gasoline stocks” with butane. Ex. 1008, 6:36–41; Ex. 1003 ¶ 61. Dr. Nikolaou testifies that one of ordinary skill in the art would have considered Hass’s “gasoline stocks” to be different types of gasoline and Patent Owner and Dr. Kytomaa do not explain persuasively why this is incorrect. Ex. 1003 ¶ 61; Ex. 2101 ¶¶ 125–126. In particular, although Dr. Kytomaa explains that “regular *and* premium” gasoline are “types of gasoline,” he does not persuasively explain why different types of component gasoline streams are not also different types of gasoline. Ex. 2101 ¶ 125 (citing Ex. 1005, 4:61–5:3). Moreover, as noted above, we are not persuaded that claims 3 and 11 require that each different type of gasoline in Hass be individually selectable for blending with butane apart from any other gasoline stream. Thus, we credit the testimony of Dr. Nikolaou and find that Hass discloses each limitation of claims 3 and 11.

In view of the foregoing, Petitioner has demonstrated by a preponderance of the evidence that claims 3 and 11 are anticipated by Hass.

F. Claims 2 and 10 over Hass and Claims 1–16 over Bajek or Bajek and Hass

Petitioner contends that the subject matter of claims 1–16 would have been obvious over the combined disclosures of Bajek or Bajek and Hass and

that the subject matter of claims 2 and 10 would have been obvious over Hass alone. Pet. 29–31, 43–44.

Petitioner’s arguments with respect to claims 2 and 10 are provided “[t]o the extent that Hass does not disclose using a target volatility value based on a seasonal or regional data.” Pet. 30. As discussed above, we find that Hass expressly discloses this limitation and Patent Owner does not contend otherwise. Ex. 1008, 1:61–64; PO Resp. 40. Thus, we need not address this additional ground.

Petitioner’s arguments based on the combination of Bajek and Hass are provided to the extent the term “processor” is construed to require a digital computer. Pet. 43–44. We do not construe the term “processor” to require a digital computer and Patent Owner does not contend that Bajek fails to disclose a “processor.” PO Resp. 42. Thus, we need not address this additional ground.

G. Claims 1–16 in view of Stanton

Petitioner contends claims 1–16 are anticipated by Stanton. Pet. 45–54.

1. Stanton

Stanton discloses “control systems that control a plurality of phenomena.” Ex. 1009, 1:18–20. In one embodiment, the control system of Stanton can be used to control the blending of butane into gasoline. *Id.* at 2:7–21.

Figure 1 of Stanton is reproduced below:

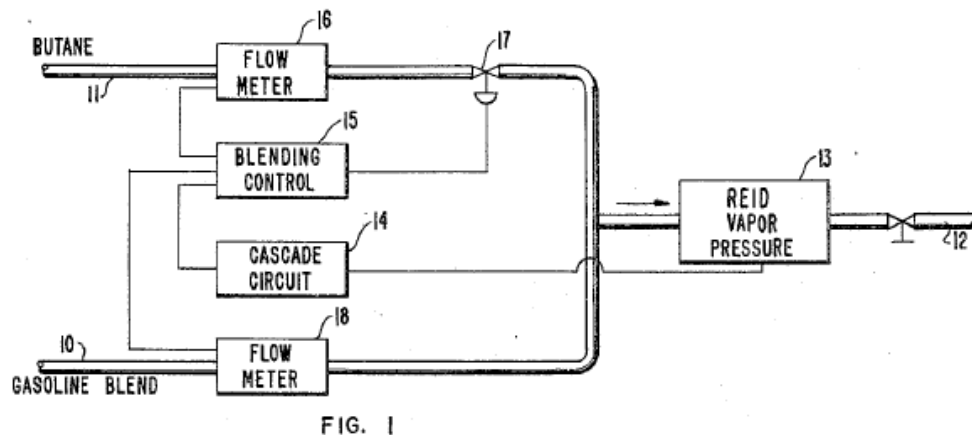


Figure 1 is a block diagram of a blending control system utilizing a cascade circuit. *Id.* at 2:42–43. As shown in Figure 1, flow stream 10 contains a gasoline blend and flow stream 11 contains butane. *Id.* at 2:47–48. The vapor pressure of the gasoline/butane blend is measured by vapor pressure measuring device 13, which supplies an analog signal to cascade circuit 14, which in turn supplies its signal to blending controller 15. *Id.* at 2:58–71.

Cascade circuit 14 “consists of a summing device” having input signal 22 representing the variable that is to be controlled and set point 21 (not shown in Figure 1). *Id.* at 3:17–20. “The summing device 20 supplies an output signal related to the difference between the input signal 22 and the set point 21.” *Id.* at 3:24–26. Blending controller 15 accepts this signal as well as signals from flow meters 16 and 18 and controls the flow of butane in line 11 in response to the flow rates of gasoline and butane and the desired ratio of butane to gasoline. *Id.* at 2:63–68, 3:1–4.

2. Analysis

Claim 1 requires a “volatility measurement device in communication with the gasoline stream.” Ex. 1001, 17:15–16. Petitioner contends Reid Vapor Pressure sensor 13 of Stanton is “in communication with” gasoline

flow stream 12. Pet. 49 (citing Ex. 1009, 2:58–61, Fig. 1; Ex. 1003 ¶¶ 90, 95).

Patent Owner contends one of ordinary skill in the art would not have understood Stanton to disclose a vapor pressure analyzer in communication with the gasoline stream because Stanton “contains no disclosure about sample piping, pumps, or valves between the analyzer and the pipe where blending occurs, as is necessary to have a ‘vapor pressure analyzer connected to said pipe.’” PO Resp. 45; Ex. 2101 ¶¶ 161–163. Although Stanton depicts Reid vapor pressure sensor 13 above flow stream 12, Dr. Kytomaa testifies that a person of ordinary skill in the art would not have understood this to be a disclosure of connecting the analyzer to a pipe because (1) a Reid vapor pressure analyzer would not receive an entire blended stream and (2) at the time Stanton was issued the standard test for Reid vapor pressure (ASTM D323) required manual steps that would have been performed by a device “physically disconnected from the pipe where gasoline and butane are blended.” Ex. 2101 ¶¶ 161–163.

Petitioner and Dr. Nikolaou provide no specific evidence or argument to explain why one of ordinary skill in the art would have understood that Stanton’s Reid vapor pressure analyzer is in communication with a gasoline stream. Pet. 49; Ex. 1003 ¶¶ 90, 95. Petitioner does argue that Stanton’s Reid vapor pressure analyzer operates in “real time,” but provides no explanation as to why a “real time” analyzer is *necessarily* in communication with a gasoline stream. Ex. 1003 ¶ 90; *see Monsanto Tech. LLC v. E.I. DuPont de Nemours & Co.*, 878 F.3d 1336, 1342–43 (Fed. Cir. 2018) (explaining that anticipation requires that every element of the claim be disclosed in a prior art reference or that an unstated limitation is necessarily present in the prior art reference). Nor does Petitioner attempt to

rebut Dr. Kytomaa's testimony that one of ordinary skill in the art would have understood that Stanton's Reid vapor pressure analyzer is "physically disconnected from the pipe." *See generally* Pet. Reply 11–16. Accordingly, we credit the testimony of Dr. Kytomaa and determine that Petitioner has not carried its burden to demonstrate by a preponderance of the evidence that Stanton expressly or inherently discloses "a volatility measurement device in communication with the gasoline stream," as recited in claim 1. Ex. 1001, 17:15–16.

H. Claims 1–16 over Stanton or Stanton and Hass

Petitioner contends the subject matter of claims 1–16 would have been obvious over the disclosures of Stanton or Stanton and Hass. Pet. 54–58. Petitioner's obviousness arguments based on Stanton and Hass do not address or remedy the deficiency noted above with respect to the limitation "volatility measurement device in communication with the gasoline stream." Thus, Petitioner has not demonstrated by a preponderance of the evidence that claims 1–16 of the '548 patent would have been obvious over Stanton or Stanton and Hass.

I. Remaining Grounds

Having determined that every claim of the '548 patent is anticipated by both Bajek and Hass, we do not address Petitioner's additional anticipation and obviousness grounds based on Chin and Chin and Hass. Pet. 58–65; *see SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"). We note, however, that Petitioner does not identify any unique disclosures in Chin that would distinguish its blending system from the refinery blending systems of Bajek and/or Hass. *See*

Ex. 1011, 3:48–50 (Chin disclosing the blending of butane with a “[g]asoline stock, for example that produced in a refinery”).

J. Objective Indicia of Non-Obviousness

Patent Owner contends objective indicia of non-obviousness demonstrate that the subject matter of claims 1–16 of the ’548 patent would not have been obvious over the recited prior art references. PO Resp. 52–54. Objective indicia of non-obviousness are not relevant to anticipation-based grounds. *See, e.g., Celeritas Techs., Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998). Thus, we need not address Patent Owner’s evidence of non-obviousness with respect to the ’548 patent.

K. Allegedly Non-Compliant Sur-Reply

The Office’s Trial Practice Guide explains that a “sur-reply may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness.” Office Patent Trial Practice Guide 14 (Aug. 2018), https://www.uspto.gov/sites/default/files/documents/2018_Revised_Trial_Practice_Guide.pdf; *see also* Consolidated Trial Practice Guide 73 (Nov. 2019), <https://www.uspto.gov/about-us/news-updates/consolidated-trial-practice-guide-november-2019> (“[A] sur-reply may not be accompanied by new evidence other than deposition transcripts of the cross-examination of any reply witness.”). Petitioner contends Patent Owner violated this instruction by filing Exhibits 2181 and 2184–2186 with its Sur-reply. Paper 33, 1. Patent Owner disagrees. Paper 37.

We need not resolve this dispute because, even considering the identified exhibits, we have found in favor of Petitioner.

IV. CONCLUSION¹⁶

We conclude that Petitioner has satisfied its burden of demonstrating, by a preponderance of the evidence, that claims 1–16 of the ’548 patent are unpatentable.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–16	102	Bajek	1–16	
1–16	103	Bajek or Bajek, Hass ¹⁷		
1–16	102	Hass	1–16	
2, 10	103	Hass ¹⁸		
1–16	102	Stanton		1–16
1–16	103	Stanton or Stanton, Hass		1–16
1, 2, 4–10, 12–16	102	Chin ¹⁹		
1–16	103	Chin or Chin, Hass ²⁰		
Overall Outcome			1–16	

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

¹⁷ As discussed above, we do not address these obviousness grounds.

¹⁸ As discussed above, we do not address this obviousness ground.

¹⁹ As discussed above, we do not address this anticipation ground.

²⁰ As discussed above, we do not address these obviousness grounds.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–16 of U.S. Patent 9,606,548 B2 have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 9,606,548 B2

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