

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARKEMA FRANCE,
Petitioner

v.

HONEYWELL INTERNATIONAL INC.
Patent Owner

Case IPR2015-00916
U.S. Patent No. 8,710,282

PATENT OWNER'S RESPONSE
PURSUANT TO 37 C.F.R. § 42.120

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LIST OF EXHIBITS

| Exhibit Number | Exhibit Title |
|-----------------------|--|
| 2001 | Richard J. Lewis, Sr., Hawley's Condensed Chemical Dictionary, (13 th ed. 1997) |
| 2002 | Declaration of Robert E. Lousenberg, Ph.D |
| 2003 | Curriculum Vitae of Robert D. Lousenberg, Ph.D. |
| 2004 | Transcript for the Video Deposition of Leo E. Manzer, Ph.D., dated January 7, 2015 |
| 2005 | Transcript for the Continued Video Deposition of Leo E. Manzer, Ph.D., dated January 8, 2015 |
| 2006 | Declaration of Hsueh Sung Tung, Ph.D |
| 2007 | March 26, 2008 email from Haluk Kopkalli |
| 2008 | Project Permit Change Form to Permit# 626 dated July 10, 2008 |
| 2009 | Project Permit Change Form to Permit# 626 dated May 16, 2008 |
| 2010 | July 2008 Monthly Technology Report of Dr. Bektesevic |
| 2011 | July 16, 2008 Instructions |
| 2012 | July 29-30, 2008 Instructions |
| 2013 | August 2008 Monthly Technology Report of Dr. Bektesevic |
| 2014 | August 2008 Monthly Highlights Report of Dr. Tung |
| 2015 | September 15, 2008 Instructions |
| 2016 | September 2008 Monthly Technology Report of Dr. Bektesevic |
| 2017 | September 2008 Monthly Highlights Report of Dr. Tung |
| 2018 | October 2008 Monthly Technology Report of Dr. Bektesevic |
| 2019 | November 2008 Monthly Technology Report of Dr. Bektesevic |
| 2020 | November 2008 Monthly Highlights Report of Dr. Tung |
| 2021 | December 2008 Monthly Technology Report of Dr. Bektesevic |
| 2022 | January 2009 Monthly Technology Report of Dr. Bektesevic |
| 2023 | January 2009 Monthly Highlights Report of Dr. Tung |
| 2024 | February 2009 Monthly Technology Report of Dr. Bektesevic |
| 2025 | February 2009 Monthly Highlights Report of Dr. Tung |
| 2026 | March 2009 Monthly Technology Report of Dr. Bektesevic |
| 2027 | March 2009 Monthly Highlights Report of Dr. Tung |
| 2028 | PowerPoint entitled "Apollo Technology Review Dehydrofluorination" and dated May 13, 2009 |
| 2029 | Invention Disclosure entitled "Integrated Continuous Process for Dehydrofluorination of 236ea and 245eb" and dated August 21, 2009 |

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| 2030 | Detailed Disclosure dated February 10, 2010 |
| 2031 | Email and certain attachments dated August 19, 2010 from James DePasque |
| 2032 | Email dated September 29, 2010 from Eric Sumner |
| 2033 | Email dated October 1, 2010 from Dr. Selma Bektesevic |
| 2034 | Email dated October 12, 2010 from Dr. Selma Bektesevic |
| 2035 | Email dated October 12, 2010 from Eric Sumner |
| 2036 | Declaration of Thomas Morris |
| 2037 | Declaration of Angela Goodie |
| 2038 | Declaration of Daniel Merkel |
| 2039 | Pages from Dr. Selma Bektesevic's laboratory notebook dated August 21, 2009 |
| 2040 | Declaration of Diana Overton |
| 2041 | Declaration of Bruce Bradford, Esq. |
| 2042 | Meeting Minutes from PC Meeting held July 12, 2010 |
| 2043 | Declaration of Joseph F. Posillico, Esq. |
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| 2046 | Declaration of Bruce Rose, Esq. |

I. INTRODUCTION

Patent Owner Honeywell International Inc. (“Honeywell” or “Patent Owner”) hereby respectfully submits this Patent Owner Response. Petitioner Arkema France (“Arkema” or “Petitioner”) filed the Petition for *Inter Partes* Review (“the Petition”) of Claims 1-20 of U.S. Patent No. 8,710,282 (“the ’282 Patent”) (Ex. 1001) and the Board instituted *inter partes* review (Paper No. 14, the “Decision”) of Claims 1-20 of the ’282 Patent. Specifically, the Board instituted review of the ’282 Patent on the asserted ground of unpatentability to determine whether Claims 1-20 of the ’282 Patent are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of WO 2009/138764 to Smith et al. (“Smith”) (EX1003), Japanese Publication No. JP-S59-70626 to Masayuki et al. (“Masayuki”) (EX1005), and U.S. Patent No. 4,414,185 to Harrison (“Harrison”) (EX1006).

For the reasons below, Arkema has failed to meet its “burden of proving a proposition of unpatentability by a preponderance of the evidence.” 35 U.S.C. § 316(e). Smith, Masayuki, and Harrison, alone or in combination, do not render obvious the claims of the ’282 Patent. That is, Arkema has failed to prove the existence of all elements of the ’282 Patent claims in the cited references, alone and in combination. Arkema also has failed to prove that a person of ordinary skill in the art (“POSITA”) would have combined Smith, Masayuki, and Harrison with any expectation of arriving at the claimed subject matter. Additionally, Arkema’s

Petition fails because Smith is not prior art to the '282 Patent. Accordingly, Arkema's challenge must be dismissed, and the Board should uphold the patentability of claims 1-20 of the '282 Patent.

II. OVERVIEW OF THE '282 PATENT

The application for the '282 Patent was filed on September 9, 2011, and claims priority to U.S. Prov. App. No. 61/392,242, filed October 12, 2010. The '282 Patent also is a continuation-in-part of U.S. App. Serial No. 13/195,429, filed August 1, 2011, which is a continuation of U.S. App. Serial No. 12/402,372, filed March 11, 2009, which claims priority from U.S. Prov. App. No. 61/036,526, filed March 14, 2008. The '282 Patent has four independent claims (Claims 1, 10, 21, and 36) and 42 dependent claims, which are separately patentable. Claims 1-20 are the subject of this *inter partes* review.

The claims of the '282 Patent generally are directed to integrated processes for the bulk manufacture of fluorinated olefins (Ex. 1001). In particular, though not exclusively, the '282 Patent relates to the processes for producing 2,3,3,3-tetrafluoropropene (HFO-1234yf) and/or 1,2,3,3,3-pentafluoropropene (HFO-1225ye). ('282 Patent at 1:23-26).

III. SUMMARY OF PATENT OWNER'S ARGUMENT

Smith, Masayuki, and Harrison fail to disclose all of the elements of claims 1-20 of the '282 Patent. In particular, the Declaration of Dr. Robert Lousenberg

(hereinafter “Lousenberg”), filed herewith as Exhibit 2002, identifies that Smith, Masayuki, and Harrison lack at least the “recovering spent DHA” recitation found in the claims of the ’282 Patent. Dr. Lousenberg is qualified to opine from the perspective of a POSITA. (EX2002, ¶¶ 7-13 and 60; *see also*, EX2003.)

Further, the Lousenberg Declaration confirms that a POSITA would not and could not consider the proposed combination of Smith, Masayuki, and Harrison for several reasons. Specifically, Dr. Lousenberg explains why the POSITA would have had no motivation to look beyond the teachings of Smith in order to formulate a more efficient process for manufacturing 1234yf or fluoroolefins generally. In addition, the proposed combination fails because when Masayuki is used with potassium hydroxide (KOH), as proposed by Petitioner, the system would become inoperable due to the concentration loop including the enricher of Masayuki. Moreover, the addition of lime as taught by Harrison and as suggested by Petitioner, to the combination of Smith and Masayuki, would also result in an inoperable system. Indeed, in order to even utilize the teachings of Harrison with Smith and Masayuki with KOH, one would have to ignore the concentration steps explicitly taught by Masayuki. Additionally, Masayuki specifically teaches away from using waste waters, which is the subject of the entire invention of Harrison.

Further, Smith does not qualify as prior art to the claims of the ’282 Patent. That is, the inventive processes of claims 1-20 were conceived of prior to the

effective prior art date of Smith, and diligently reduced to practice.

For at least these reasons, the Petitioner has failed to demonstrate, by a preponderance of the evidence, that Claims 1-20 of the '282 Patent are unpatentable.

IV. CLAIM CONSTRUCTION

“A claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1275 (Fed. Cir. 2015). There is a “heavy presumption” that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.* 288, F.3d 1359, 1366 (Fed. Cir. 2002). “Under the broadest reasonable interpretation standard, claim terms are usually given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art in the context of the entire disclosure.” *C.R. Bard, Inc. v. Medline Indus., Inc.*, IPR2015-00509, Paper No. 11, at 7 (P.T.A.B. July 15, 2015) citing *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

A. “Spent DHA”

Arkema proposes the claim term “spent DHA” should be interpreted to mean “unreacted DHA remaining after the dehydrohalogenation reaction.” In support, Arkema argues that spent DHA and by-product salts are referred to in the '282 Patent as two separate components: “[s]pent [DHA] and by-product salts (e.g. metal fluoride salts) may be withdrawn from the reactor by a product stream either

continuously or intermittently using one or more known separation techniques.” (Petition at 13, citing EX1001 at 13:16-19.) While this section may be read to indicate that the DHA can be withdrawn separately from the by-product salts, the POSITA would understand that the aqueous solution would necessarily comprise a mix of the DHA and by-product salts. (EX2002, ¶ 63.) Indeed, in the aqueous solution utilizing KOH, there are alkali metal cations (K^+), fluoride anions (F^-), and hydroxide anions (OH^-). In such a case, the alkali metal cations (K^+) are not individually associated with any one species of anion. (*Id.*)

Moreover, the use of the term “spent DHA” in the examples of the patent contemplates the aqueous solution with KF and KOH. *See* EX2004 at 85:20-86:8 (confirming that “when they collect the spent KOH, that includes unreacted KOH, the KF, which is the result of the reaction, and water” is “a reasonable interpretation” of the term “spent KOH” in the patent examples).

Thus, “spent DHA” must then be interpreted to cover both DHA and by-product salts (i.e., KF) that would be present in the aqueous phase of a reaction, such as the dehydrohalogenation reaction outlined in the '282 Patent. (EX2002, ¶ 64.) Any construction of the term “spent DHA” that does not contemplate all of the materials dissolved in the aqueous or liquid phase that are inseparably withdrawn from the reactor, and contemplates the separation of materials that are in practice inseparable, would be non-sensical. (*Id.*, ¶ 65.) That is, because the DHA and by-

product salts would exist as an aqueous mixture of alkali metal cations, fluoride anions, and hydroxide anions, they would be inseparable at this point. Accordingly, “spent DHA” should be construed as “an aqueous solution containing DHA and by-product salts.” (*Id.*)

B. “Recovering Spent DHA”

The term “recovering spent DHA” appears in Claims 1 and 10 of the ’282 Patent. Arkema proposes the claim term “recovering spent DHA” should be interpreted to mean “collecting spent DHA for further use (may include separating, purifying, concentrating and/or regenerating).” (Petition at 15.) However, Arkema’s proposed construction does not take into account the fact that “recovering spent DHA” necessarily occurs after the “spent DHA” is withdrawn and that the terms “withdrawing” and “recovering spent DHA” must not become conflated. According to Petitioner, the term “withdrawing” should be construed as “taking out or removing.” (Petition at 14.) There is no meaningful distinction between taking out, removing or collecting, effectively eliminating step (e) of Claim 1 and step (d) of Claim 10. *See Apple Inc. v. Memory Integrity, LLC*, IPR2015-00159, Paper No. 12, at 12 (P.T.A.B. May 11, 2015) citing *Cat Tech LLC v. TubeMaster, Inc.*, 528 F.3d 871, 885 (Fed. Cir. 2008) (refusing to adopt a claim construction which would render a claim limitation meaningless). Arkema’s proposed construction renders the term “recovering spent DHA” meaningless, which is improper. *See Nest Labs, Inc. v.*

Allure Energy, Inc., IPR2014-01424, Paper No. 6, at 6 (P.T.A.B. March 9, 2015) citing *Digital-Vending Servs. Int’l, LLC v. Univ. of Phoenix, Inc.*, 672 F.3d 1270, 1275 (Fed. Cir. 2012) (rejecting a construction that did not give effect to all terms in the claim).

The specification of the ’282 Patent shows that something more is required than merely “collecting spent DHA for further use.” When discussing “recovering spent DHA,” the ’282 Patent does so in the context of separating organics, and any unidentified heavies, dissolved in the aqueous reaction mixture from the previously withdrawn spent DHA. *See e.g.*, ’282 Patent at 2:61-63; 13:29-45; 15:44-49; 16:14-23; *see also*, EX2002, ¶¶ 67-68. In one example, the ’282 Patent describes “recovering” in terms of a Scrubber Product Collection Cylinder (SPCC), where the SPCC is configured to trap the dissolved organics so as to separate the dissolved organics from the spent DHA. (EX1001, 15:43-47) (“Scrubber Product Collection Cylinder (SPCC) was used to collect spent KOH and the portion of organic that was carried out with spent KOH. Organic was trapped in methylene chloride which was previously added to SPCC”).

Other claims also undercut Petitioner’s construction. *See Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1342 (Fed. Cir. 2001) (looking to the same term in other claims); *see also Laitram Corp. v. Rexnord, Inc.*, 939 F.2d 1533, 1538 (Fed. Cir. 1991) (differences among claims can also be a useful guide in understanding the

meaning of particular claim terms). In the claims of the '282 Patent, it is only after spent DHA is withdrawn and separated, that it is purified, concentrated and/or regenerated. For example, Claims 17 and 19 ultimately depend from Claim 10 and further comprise “optionally, converting the by-product salts to the dehydrohalogenating agent” (EX1001 at 17:59-60) and “optionally, concentrating the converted KOH and recycling it back to the dehydrohalogenation reaction.” (*id.*, at 17:63-65). These additional positively recited steps of converting, concentrating and/or recycling found in the dependent claims demonstrate that such steps are distinct from the steps of recovering spent DHA. Indeed, it is precisely these terms that are being improperly read into the term “recovering spent DHA” by Petitioner.

In the Decision, the Board determined that the term “recovering spent DHA” did not require an explicit construction. At the very least, “recovering spent DHA” should be construed to include a separation from the other elements in a stream. (EX2002, ¶ 69.) Indeed, in its discussion of the claim term “recovering spent DHA,” the Board notes that “[c]onsistent with the disclosures in the Specification, the spent DHA is *separated* from other components in the reaction stream before it can be recycled or re-used.” Decision, p. 8, citing EX1001 at 2:62-64, 5:16-19, 13:19-23 (emphasis added).

Accordingly, and in view of the Decision, “recovering spent DHA” should be construed as “substantially separating spent DHA from any other materials in the

reaction stream.” (EX2002, ¶ 69.)

C. “Purifying” or “Purified”

Of the claims subject to this *inter partes* review, the term “purified” is found in claim 13 and 15. Arkema does not propose any claim construction for the terms “purifying” or “purified.” However, because the terms “recovering” and “purifying”/“purified” must not become conflated, the terms “purifying”/ “purified” should be construed as something more than mere separating and necessarily occurs after the “spent DHA” has been recovered. *See* EX2002, ¶¶ 70-72; *see also* EX2004 at 119:9-10 (confirming purification is a follow-up step for a recovered product). Honeywell submits that “purifying” and “purified” should be construed as “further separating recovered spent DHA from all other materials in the reaction stream.” (EX2002, ¶ 73.)

D. “Recycling”

Of the claims subject to this *inter partes* review, the term “recycling” is found in claims 15 and 19. Arkema proposes that the term “recycling” should be construed as “returning a component of the process to the process.” (Petition at 17.)

The POSITA would understand that in recycling a component of the reaction back to the reactor, it would be beneficial to do so in the same form or substantially the same form (i.e., concentration). (EX2002, ¶ 74.) That said, the ’282 Patent is not so limited and allows for an immediate recycling of “spent DHA.” Such a

reading is consistent with the '282 Patent. For example: “[t]he organic free KOH isolate can be immediately recycled to the reactor or can be concentrated and the concentrated solution can be returned to reactor.” (EX1001 at 13:43-45.) Accordingly, “recycling” should be construed as “returning a component of the reaction back to the reaction.” (EX2002, ¶ 75.)

E. “Dehydrofluorinated product stream,” “product stream,” “product reaction stream,” “second product stream”, or “reaction stream”

“Stream” is used throughout the specification of the '282 Patent and is used to describe various inputs and outputs of the reaction system. (EX2002, ¶ 76.) As a POSITA would understand that a stream implies a measure of volume per unit of time, and thus, a flow of material such as a liquid or gas, the POSITA would interpret the contents of a claimed stream based on the reaction steps involved in the various claims in which the stream is recited. (See EX2002, ¶¶ 76-77; EX2004 at 101:2-19 (confirming that a stream implies that it is flowing).) Accordingly, “dehydrofluorinated product stream” or “product stream” should be construed as “a continuous flow of a fluid consisting of at least the olefin products resulting from a dehydrofluorination reaction.” Similarly, “product reaction stream,” “second product stream,” and “reaction stream” should result from a dehydrofluorination reaction.” (EX2002, ¶ 78.)

F. “Dissolved Organics”

The '282 Patent describes “dissolved organics” by way of examples. Specifically, entrained 236ea or 245eb. For example, the '282 Patent recites: “[t]he product stream containing spent dehydrohalogenating agent typically carries with it some dissolved organic (e.g. HFC-236ea and/or HFC-245eb).” (EX1001, 13:29-31.) “In certain embodiments, the stream of spent dehydrohalogenating agent further includes one or more dissolved organics, such as, but not limited to HFC-236ea and/or HFC-245eb.” (EX1001, 5:20-22.) While “dissolved organics” would include 236ea and 245eb when 236ea and 245eb are the haloalkanes used in the dehydrohalogenation reaction, other haloalkanes are contemplated by the '282 Patent and also would be found as “dissolved organics” in the stream of spent dehydrohalogenating agent when used as the organic feeds in the claimed invention. (EX2002, ¶ 80.)

Arkema proposes that the term “dissolved organics” be construed to mean “organic that is dissolved in a stream.” (Petition at 18.) However, the POSITA would recognize that the aqueous solubilities of organics such as 236ea and 245eb are low and that the organics are not actually soluble or “dissolved” in the aqueous solution. (EX2002, ¶ 81.) That is, due to the requirement of high sheer mixing in order to facilitate the dehydrofluorination reaction, a fraction of organic remains entrained in the aqueous phase long after mixing has stopped. (*See id.*, *see also*

EX2004 at 105:1-2.) Accordingly, the POSITA would understand that the broadest reasonable interpretation of “dissolved organics” in view of the specification as “unreacted organic materials entrained in an aqueous solution.” (EX2002, ¶ 81.)

V. **ARGUMENT**

A. **The Petition fails to make out a prima facie case of obviousness**

Obviousness is a question of law based on underlying findings of fact. *In re Kubin*, 561 F.3d 1351, 1355 (Fed. Cir. 2009). The underlying factual inquiries include: (1) the scope and content of the prior art, (2) the differences between the prior art and the claims at issue, and (3) the level of ordinary skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). Dependent claims are non-obvious if the independent claims from which they depend are non-obvious. *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988). A prior art reference teaches away from a combination “when a person of ordinary skill, upon reading the reference would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). It is also improper to apply hindsight or otherwise use the patent at issue as a roadmap when combining references. *See KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 421 (2007).

A POSITA of the ’282 Patent would have education and/or experience in the fields of chemistry or chemical engineering and would have taken courses in organic

chemistry. (EX2002, ¶ 60.) Such a person would, based on course work, have a general understanding of organic chemistry and expertise in the techniques used for separating chemicals based on their physical properties. (*Id.*) Moreover, the education and experience levels may vary between persons of ordinary skill in the art, with some persons holding a bachelor's degree, but with at least 5 years of relevant work experience, or others holding a more advanced degree, such as a Ph.D. or M.S., but having fewer years (i.e., 2-3 years) of experience. (*Id.*)

1. Asserted Ground of Rejection: Claims 1-20 are rendered obvious under 35 U.S.C. § 103 by the combination of Smith, Masayuki, and Harrison

(a) The cited references do not teach, suggest or disclose certain of the claim features

i. Smith Does Not Teach, Suggest or Disclose “Spent DHA”

Smith allegedly discloses a process for the preparation of 1234yf. Although Smith appears to be directed to preferred methods of vapor phase dehydrofluorination (*see* Examples 2 and 3; Exhibit 1003 at 19-21), Smith indicates that “another preferred method of effecting the dehydrofluorination in steps (b) and (d) is by contacting 236ea and/or 245eb with a base (base mediated dehydrofluorination).” (EX1003 at 11.) The base mediated dehydrofluorination is not the focus of Smith's disclosure or examples, accordingly, it is short on details.

Although Smith is silent with respect to the reaction by-products, a POSITA would understand that KF would be present as a reaction by-product of the base

mediated dehydrofluorination steps purportedly disclosed in Smith when utilizing KOH. (EX2002, ¶ 85.) However, Smith does not disclose the existence of, let alone any significant amount of, unreacted KOH. (*See* EX2002, ¶ 86; EX2004 at 145:10-147:5; 155:10-156:25; EX2005¹ at 208:15-209:2 (“[Smith] doesn’t discuss whether there is or is not any unreacted KOH.”); 216:15-217:18.) Indeed, a review of Smith reveals that the disclosed process does not even contemplate the existence of a significant aqueous phase output from the dehydrofluorination reaction steps. (EX2002, ¶¶ 86-88.)

For at least these reasons, the Petitioner has failed to demonstrate, by a preponderance of evidence, that Smith teaches, suggests, or discloses “spent DHA.”

ii. Smith does not teach or suggest “recovering spent DHA”

At least inasmuch as Smith is completely silent as to the presence of any significant amount of spent KOH, Smith fails to disclose “recovering spent DHA.” (EX2002, ¶ 89.) Indeed, Petitioner does not even cite to or rely on Smith in support of this limitation. Rather, Petitioner relies on the purported combination of Masayuki and Harrison for the “recovering” limitation. (Petition at 30.)

For at least these reasons, the Petitioner has failed to satisfy its burden by a preponderance of evidence that Smith teaches, suggests, or discloses “recovering spent DHA.”

¹ Citations to EX2004 and EX2005 are to the deposition page numbers themselves.

iii. **Masayuki does not teach or suggest “recovering spent DHA”**

Masayuki sought to produce chloroprene in a long term continuous process which, among other things, did not readily result in clogging of the apparatus due to the chloroprene polymer. (EX1005 at 6:5-13.) Masayuki recognized that the “salt water” produced in such a process “contains primarily unreacted alkali metal hydroxide and produced alkali metal chloride *as well as a small amount of organic components.*” (EX1005 at 4:35-38) (Emphasis added). These organic components, which are entrained in the salt water/aqueous phase, are what Masayuki realized caused clogging problems in the process:

[C]onventionally precipitation of dissolved alkali metal chloride accompanying the evaporation of this water as well as precipitation of polymer due to small amounts of 3,4-dichloro-butene-1, chloroprene and polymer contained in the aqueous phase are problematic. Though it is possible to dissolve precipitants using water, as is typically done to avoid trouble arising from the precipitation of alkali metal chloride, trouble caused by polymer requires that the apparatus used be dismantled. As a result, concentration of alkali metal hydroxide aqueous solution *containing polymerizable organics*, as is performed in the present invention, has not been previously carried out. (EX1005 at 9:15-27) (Emphasis added).

Rather than separating the small amounts of 3,4-dichloro-butene-1 and chloroprene entrained in the aqueous phase from the alkali metal hydroxide,

Masayuki's proposed solution to the clogging problem is to perform the concentration step at a high temperature (i.e., 95-150°C) in order to prevent problems caused by polymerization:

As a result of intensive investigations, it was discovered that when the operation is performed at a temperature of 95°C or greater, it is possible to avoid trouble caused by polymer, even when a standard apparatus is used. If concentration is performed at a temperature lower than 95°C, within a short period of time, disassembly of the apparatus is required due to deposition of polymer onto the apparatus. Additionally, operation at a temperature of 150°C or greater is not energy efficient and requires that expensive materials be used for the apparatus, which is not desirable. Therefore, concentration performed within a range of 95 – 150°C is suitable.

(EX1005 at 9:27-10:2; *see also* EX2002, at ¶ 91.)

Thus, although Masayuki recognizes the presence and problems associated with organic components entrained in the aqueous phase, Masayuki does not solve this problem by separating the entrained organics. (EX2002, ¶ 92.) Rather, Masayuki teaches that if the temperature is kept high during the concentration of the alkali metal hydroxide solution, “it is possible to avoid trouble caused by [the entrained organics].” (EX1005 at 9.) This difference is stark; the invention of Claims 1 and 10 removes the entrained organics from the mixture, whereas Masayuki retains the organics and uses temperature to mitigate the effect the entrained organics have on further processing. (EX2002, ¶¶ 94-95.) As such, Masayuki allegedly solved the

problem in a completely different manner; rather than remove the entrained organics (*i.e.*, substantially separating spent DHA from any other materials in the [product reaction stream (Claim 1)/second product stream (Claim 10)], Masayuki accommodates their existence. (*Id.*) As such, Masayuki does not disclose at least the “recovering spent DHA” limitation required by Claims 1 and 10, and all claims depending therefrom.

Petitioner ignores the express language of the claims in view of the specification and instead relies on Masayuki’s disclosure of decanting, concentrating, precipitating, and separating of alkali metal chloride precipitate as teaching “recovering spent DHA.” (Petition at 30-31 & 37).

Each of these steps, however, fails to separate the entrained organic components from the aqueous phase in order to recover spent KOH. (EX2002, ¶ 96.) Specifically, with respect to the decanting step, Petitioner relies on the following passage in Masayuki:

The aqueous phase was extracted via Conduit 4 such that the level of Reactor 19 remained constant and the lightly mixed lipid and aqueous phases (including precipitated sodium chloride) were separated using Decanter 20, after which the lipid phase was returned to the reactor via Conduit 5.

(EX1005 at 10:33-11:1.)

As recognized by Petitioner, by way of its expert, Dr. Manzer, the decanting step in Masayuki is utilized to separate the lipid phase having only organic catalyst

from the aqueous phase. (EX1002 at ¶ 91; EX2005 at 199:18-200:19; EX2002, ¶ 97.) Once removed, the organic catalyst (e.g., a quaternary ammonium compound, quaternary phosphonium compound, quaternary sulfonium compound or mixture thereof) is returned back to the Reactor 19 (EX1005 at 7:21-30 and 10:33-11:1.) This decanting step, however, does not remove the organic components—small amounts of 3,4-dichloro-butene-1, chloroprene and polymer—which are entrained in the aqueous phase as these organic components remain entrained in the aqueous phase as it progresses to the concentration loop consisting of the enricher and heat exchanger. (EX1005 at 9:24-27 and 11:1-9; *see also*, EX2002, ¶ 98.) In other words, the decanting step in Masayuki simply removes the non-aqueous organic catalyst phase and fails to further separate the spent DHA from any other materials in the stream, such as 3,4-dichloro-1-butene and chloroprene, from the aqueous phase in the decanter. (EX2002, ¶ 99.)

With respect to the concentrating step, Petitioner relies on the following passage in Masayuki:

The aqueous phase...was fed into a forced circulation-type Enricher 21 via Conduit 6 and concentration was carried out ... After passing through Conduit 9 from Conduit 8, the aqueous phase was heated in Heat Exchanger 22 after which it was circulating in Enricher 21 via Conduit 10.

(EX1005 at 11:1-9.)

As previously explained, in order to avoid clogging and the resulting

dismantling of the apparatus due to polymerization of the entrained organic components in the aqueous phase, Masayuki teaches performing the concentration step at 95-150°C. (EX1005 at 9:15-10:2.) Thus, it is clear that Masayuki intends that the 3,4-dichloro-1-butene, chloroprene, and polymer remain present during concentration, confirming that they were not decanted off by Decanter 20 or later removed via Conduit 32. (EX2002, ¶ 101.)

Petitioner further relies on Masayuki's disclosure of precipitating and separating the precipitated sodium chloride from the aqueous phase as "recovering spent DHA." (Petition at 30-31 and 37.) After concentration and upon entry into the slurry tank and centrifuge, however, Masayuki is again silent as to the removal of any of the 3,4-dichloro-1-butene, chloroprene components, and polymer during precipitation and separation of the solid alkali metal chloride indicating that the 3,4-dichloro-1-butene, chloroprene components, and polymer are still present (EX1005 at 11:9-16; *see also* EX2002, ¶ 102.) Thus, Masayuki fails to teach the separation of the polymerizable 3,4-dichloro-1-butene, chloroprene components, and polymer from the aqueous phase from any step in its process. (EX2002, ¶ 102.) It is clear that Petitioner advances its unreasonably broad construction of "recovering spent KOH" in an attempt to fit Masayuki (which fails to teach the separation of the organics entrained in the aqueous phase) into the claim. (*Id.*, at ¶ 103.)

Therefore, although Masayuki recognizes the presence of and the problems

associated with the 3,4-dichloro-1-butene, chloroprene components, and polymer in the aqueous phase, Masayuki does not teach a POSITA to separate such 3,4-dichloro-1-butene, chloroprene components, and polymer. (*Id.*) Rather, Masayuki directs a POSITA to carry out the concentration of the alkali metal hydroxide solution in the presence of the polymerizable organics. (*Id.*) As such, Masayuki fails to disclose at least the “recovering spent DHA” limitation required by Claims 1 and 10, and all claims depending therefrom.

iv. **Harrison does not teach or suggest “recovering spent DHA”**

Harrison is directed to a process for the preparation of calcium fluoride from industrial waste waters which comprises, among other steps, treatment of the waste waters with potassium hydroxide followed by lime precipitation (EX1006 at Abstract.) As with Masayuki, it is clear that Petitioner advances its unreasonably broad construction of the “recovering spent DHA” in an attempt to fit Harrison, which is silent with respect to any separation of the DHA from anything else in the aqueous phase, into the claim. (EX2002, ¶ 105.) Petitioner cites to the following portions of Harrison in support of “recovering spent DHA”:

... (b) contacting [an aqueous solution of potassium fluoride and potassium hydroxide] with finely divided high purity lime to thereby obtain calcium fluoride precipitate in aqueous potassium hydroxide; (c) settling the reaction product of step (b) into two phases comprising an aqueous potassium hydroxide supernatant and an aqueous slurry of

calcium fluoride; (d) recovering the aqueous potassium hydroxide supernatant...

The basic potassium fluoride solution is then mixed with solid hydrated (slaked) lime in a stirred vessel where this calcium hydroxide $[\text{Ca}(\text{OH})_2]$ reacts to form the calcium fluoride precipitate and regenerate the potassium hydroxide.

(Petition at 37, citing EX1006 at 2:14-21 and 3:6-10 (parentheticals added by Petitioner)).

A review of Harrison reveals that it is completely silent as to the substantial separation of spent DHA from any other materials in the aqueous reaction mixture. (EX2002, ¶ 105.) The only separation disclosed by Harrison appears to be the separation of calcium fluoride from converted KOH in *after* regeneration of the KOH with lime. (EX1006 at 2:14-21 and 3:6-10.) The POSITA would not interpret this separation as “recovering spent DHA” as the calcium fluoride would not be separating “spent DHA” from everything else in the reaction stream. (EX2002, ¶ 105.) As construed, “recovering” deals with “spent DHA,” while the separation of the calcium fluoride in Harrison would necessarily occur after the KF is gone as it has been converted to KOH. (*Id.*) At the point in the Harrison system when calcium fluoride would be separated, there would no longer be any by-product salts in the reaction stream. (*Id.*) That is, “spent DHA” necessarily consists of “an aqueous solution containing DHA and by-product salts” and because there are no by-product

salts present, there would no longer be any “spent DHA” as that term is defined above. As such, Harrison fails to disclose “recovering spent DHA.”

Consequently, the combination of Smith, Masayuki, and Harrison must also fail to teach or suggest “recovering spent DHA.” (*Id.*, at ¶ 106.) Therefore, for at least this reason, the Petitioner has not shown, by a preponderance of the evidence, that claims 1-20 are unpatentable under 35 U.S.C. § 103(a) over Smith, Masayuki, and Harrison.

v. The combination of Smith, Masayuki, and Harrison does not teach or suggest “recovering spent DHA” from a reaction stream that “further comprises dissolved organics”

Of the claims subject to this *inter partes* review, claim 11 requires that the second product stream comprises “dissolved organics.” As described *supra*, Smith, Masayuki, and Harrison fail to teach or suggest “recovering.” Further, Harrison is completely silent as to the presence of dissolved or entrained organics and teaches nothing regarding the separating of such organics from the spent DHA in order to recover spent DHA. (EX2002, ¶ 109.) As with Harrison, Smith is completely silent as to the existence of spent DHA and any separation of dissolved organics from spent DHA in order to recover spent DHA. (EX2002, ¶¶ 83-89, 110.) Given that none of the cited references disclose “recovering spent DHA” from a stream that comprises dissolved organics, it logically follows that the combination of references cannot disclose, teach or suggest such a recitation. (EX2002, ¶ 111.) As such, when the

claims are properly construed, Smith, Masayuki, and Harrison fail to render obvious Claim 11.

(b) No Motivation to Look Beyond Smith

Petitioner argues that “[t]o achieve a more efficient and cost effective process than the one disclosed in Smith, a POSITA would look to analogous, base-mediated dehydrohalogenation processes for suggestions of how to recover and/or recycle unreacted KOH and by-product salt(s) of the KOH (e.g., KF) formed in the reaction. (Petition at p. 26, citing EX1002 at ¶ 102.)

Petitioner further argues that “[a] POSITA would be motivated to apply the steps of Masayuki to the dehydrohalogenation process described in Smith to recover and recycle the unreacted alkali metal hydroxide (KOH) that remains after the dehydrohalogenation reaction and would have a reasonable expectation of success in doing so.” (Petition at p. 23, citing EX1002 at ¶ 102.)

Petitioner also argues that “it is a ‘rule of thumb’ in chemical process design to try to recover and re-use as much valuable material as possible in a process.” (Petition at 32.)

As discussed previously, although Smith discusses methods for producing 1234yf and intended to increase the efficiency of the reaction steps for producing 1234yf, Smith does not disclose or ever allude to the presence of, let alone, any significant amount of, spent DHA that would need to be recovered or recycled.

(EX2002, ¶¶ 83-89, 115.) Thus, there would be no motivation leading a POSITA to conclude that recovering or recycling spent DHA would be needed in the process disclosed by Smith. (*Id.*) Indeed, Dr. Manzer testified that Smith is silent as to the existence of any spent KOH or DHA. *See* EX2004 at 155:10-156:25; EX2005 at 208:15-209:2 (“[Smith] doesn’t discuss whether there is or is not any unreacted KOH.”); 216:15-217:18. Properly and objectively viewed, a POSITA reading Smith would not have, without knowledge of the ’282 Patent, looked beyond Smith in order to formulate a more efficient process for manufacturing 1234yf. (EX2002, ¶ 116.)

Moreover, Petitioner’s argument relies on the unsupported assumption that recovering and recycling spent DHA necessarily would reduce the cost of manufacture of 1234yf. However, recovering and recycling may not necessarily be the lowest cost design alternative, as confirmed by Petitioner’s expert. (EX2004 at 71:5-13 (indicating that recovering and recycling is not a rule of thumb but rather the goal is to have the “lowest cost process”); *see also*, EX2002, ¶ 113 (“Instead, the rule of thumb that I follow requires that you extract as much value out of the process, based on economics. In practice, this can mean much more or something entirely different than recovery and recycle.”).) Other considerations when developing a commercial process include capital investment and “[t]here may be situations where you have value for the potassium fluoride without converting it back to potassium hydroxide with lime.” (EX2005 at 76:9-77:4; 108:18-109:10 (“need to evaluate the

overall economics of the situation”). Petitioner’s problem is that even Masayuki explicitly teaches discarding a so-called “valuable reactant” – sodium chloride. (EX1005, 11:9-14.) Neither Dr. Manzer nor Petitioner provide evidence of the economics related to KOH, KF, or any other component of the process. Accordingly, Petitioner’s sole motivation to combine must fail.

A further inherent problem with Petitioner’s theory, is that Masayuki discloses a complete system for the manufacture of a desired product—chloroprene. Indeed, Masayuki even includes a system that deals with the salts and entrained polymers produced in such process. However, Petitioner necessarily relies on the modification of the Masayuki process, a modification that renders Masayuki inoperable, and the inclusion of both Harrison and Smith so as to meet the claims ostensibly using the ’282 Patent as a roadmap to suggest such modifications. To support its modification, Petitioner simply points to “reasonable expectation of success.” *See Plantronics v. Aliph, Inc.*, 724 F.3d 1343, 1355 (Fed. Cir. 2013) (“Where, as here, the necessary reasoning is absent, we cannot simply assume that ‘an ordinary artisan would be awakened to modify prior art in such a way as to lead to an obviousness rejection.’ It is in such circumstances, moreover, that it is especially important to guard against the dangers of hindsight bias.” (citation omitted)). Accordingly, without more, the obviousness rejection must fail for this additional reason.

Thus, it is clear that the process of Smith was sufficient for Smith’s purposes

and does not allude to the presence of any, let alone a significant amount of, spent KOH that would need to be recovered or recycled, leaving the POSITA with no motivation or reason to look beyond Smith. (EX2002, ¶¶ 83-89, 115.) As such, the Petitioner has not satisfied its burden that the combination of Smith, Masayuki, and Harrison is proper.

(c) A POSITA Would Not Have Combined Smith's Teachings With Those of Masayuki and Harrison

i. Utilizing KOH as the Dehydrohalogenating Agent Would Render Masayuki Inoperable Due to the Concentration Loop

Each of claims 1 and 10 of the '282 Patent is generally directed to a method for producing at least one fluorinated olefin comprising the steps of hydrogenating a starting material, dehydrofluorinating in the presence of a DHA, withdrawing a product reaction stream or a second product stream comprising spent DHA, and recovering spent DHA. Claims 2-9 and 11-20 depend directly or indirectly from claims 1 and 10.

While each of claims 1 and 10 of the '282 Patent may be read broader, it appears that Petitioner has limited itself to the use of KOH as the alkali metal hydroxide DHA to be used as its proposed combination includes Smith, Masayuki, and Harrison. (EX2002, ¶ 119.) Harrison, which is directed to a process for the preparation of calcium fluoride (CaF_2) from industrial waste waters, only utilizes the specific alkali metal hydroxide KOH and makes no disclosure of any other alkali

metal hydroxides. (*Id.*)

Petitioner's obviousness case is based on a reliance on a so-called "rule of thumb" and based on generic reasoning that the POSITA "would have a reasonable expectation of success. (Petition at 33-34.) Neither expert agrees with Petitioner's purported rule of thumb. (EX2004 at 71:5-13; *see also*, EX2002, ¶ 113). Additionally, Petitioner's "reasonable expectation of success" disintegrates as it overlooked the fact that "the converting step of *Harrison* to *Masayuki*" causes significant disruption to *Masayuki* due to *Masayuki*'s desire to (1) allow dissolved organics to remain in the aqueous phase and (2) specifically dispose of sodium chloride (i.e., no regeneration). (EX1005 at 9:15-27, 11:9-14.) It is apparent that neither Petitioner, nor its expert, considered these necessary facets of *Masayuki*, as Dr. Manzer made it clear that he did not perform any modeling or consider any concentration of materials. (EX2005 at 232:12-21.) Petitioner is without a tool to fix this oversight.

Instead of the conclusory and unsupported motivation to combine alleged by Petitioner, the art upon which Petitioner relies teaches away from the use of KOH as a dehydrohalogenating agent. (EX2002, ¶ 117.) Specifically, the addition of the slaked lime from *Harrison* to the slurry tank of *Masayuki* while utilizing KOH, as proffered by Petitioner, would render the process inoperable for its purpose because the reaction would be unstable and would result in failure of the process. (*Id.*, at ¶

120.) That is, the combination of Smith, Masayuki, and Harrison with KOH as the dehydrohalogenating agent fails because the solubility of KOH and KF are similar at temperatures above 40°C. (*Id.*, at ¶ 123.)

Masayuki teaches the concentration of the alkali metal hydroxide back to the starting concentration of alkali metal hydroxide for the purpose of further precipitating out the alkali chloride. (EX 1005 at 10:25-26 and 11:5; *see also*, EX2002, ¶ 122.) In Example 1 set forth in Masayuki, the starting concentration is 50%. If KOH is utilized in the concentration step of Masayuki rather than the NaOH, as is proposed by Petitioner and as set forth in the example, the process will be unstable because one would not be able to selectively remove the KF from the KOH due to their similar solubilities. (EX2002, ¶ 123.) Accordingly, the KF would remain in the aqueous phase. (*Id.*) Assuming 50% utilization of the KOH during the dehydrohalogenation step, the amounts of KOH and KF in the aqueous phase would be approximately the same. (*Id.*) As such, if the enricher 21 performs as Masayuki teaches, and there is no assertion by the Petitioner or its expert that it does not, then concentrating the aqueous phase back to 50% KOH would result in that same phase having 50% KF. (EX2002, ¶ 124.) This would result in a mixture comprising KF and KOH precipitate. Accordingly, the combination would be inoperable because there would be insufficient water to keep the KOH and KF in solution, let alone react with the solid slaked lime purportedly added in the

Masayuki slurry tank. (*Id.*) Petitioner's expert, Dr. Manzer did not even consider the concentrations of the components when considering the application of Masayuki to the combination of Smith, Masayuki, and Harrison. (*See* EX2004 at 132:14-133:11 and EX2005 at 183:23-184:10.)

As confirmed by Dr. Manzer, it would be logical to use higher concentrations of KOH. (*See* EX2004 at 129:24-131:11 and EX2005 at 217:1-13; *see also*, EX2002, ¶ 121.) Moreover, even if a starting concentration of KOH lower than 50% were used, assuming reasonable economic utilization rates (i.e., at least 50%,) the process still would be unstable and becomes inoperable. (EX2002, ¶ 125.) That is, the concentration of starting KOH would continue to exponentially rise after each recycle iteration until the process resulted in an inoperable concentration. (*Id.*, at ¶¶ 125-128.)

Thus, Petitioner's reliance on Masayuki is the fundamental flaw as it is being used to apply to multiple alkali metal hydroxides, when in actuality, Masayuki only purportedly provides an operable process with regards to sodium hydroxide (NaOH). (*Id.*, at ¶ 129.) Indeed, Petitioner and Dr. Manzer never even considered the solubility of KOH and KF in their use of KOH in the asserted combination. (*See* EX2004 at 85:4-8 and EX2005 at 206:6-207:2.) As shown above, Masayuki fails when used with potassium hydroxide (KOH), as proposed by Petitioner in its combination of Smith, Masayuki, and Harrison. (EX2002, ¶ 129.) Accordingly, the

art of record specifically relating to KOH teaches an inoperable process when combined as asserted by Petitioner.

ii. The addition of Harrison to the Concentrated KOH Solution of Masayuki Would Render Masayuki Inoperable

Petitioner's further reliance on Harrison is also flawed due to the concentration step of Masayuki. Harrison is directed to a process for the preparation of calcium fluoride (CaF_2) from industrial waste waters which comprises, among other steps, treatment of the waste waters with potassium hydroxide followed by lime precipitation. (EX1006 at Abstract; *see also*, EX2002, ¶ 132.) The POSITA reading Harrison would understand that the concentrations of both potassium hydroxide and potassium fluoride must be sufficiently low, and the amount of water must be sufficiently high (i.e., 80% water or higher), for the recited reaction to occur. (EX2002, ¶ 133.) For example, Harrison recites "[t]his aqueous solution contains about 15 to 20 weight percent potassium fluoride and 3 to 5 percent unreacted potassium hydroxide." (EX1006 at 3:3-5.) While such ranges are recited, the examples of Harrison illustrate less than 5 "weight percent fluoride combined as potassium fluoride." (EX1006 at 4:20-5:46.) Even in these instances, Harrison itself illustrates that at such low percentages of potassium fluoride, a mud is created, thus, requiring significant amounts of water. (*Id.*)

As set forth above, if one were to start with 50% KOH as suggested by

Masayuki and to concentrate back to 50% KOH after the dehydrofluorination reaction (50% utilization) via the enricher, both KF and KOH would precipitate out. (EX2002, ¶ 134.) That is, by following the explicit teachings of Masayuki and concentrating to 50% KOH, there would be insufficient water resulting in a mixture comprising KF and KOH precipitate. (*Id.*) A POSITA would not look to add the teachings of Harrison at this point (and indeed would be dissuaded from doing so), because the addition of lime as taught by Harrison would be useless. (*Id.*, ¶ 135.) That is, only KF and KOH precipitate would be present in Slurry Tank 24 and it would be non-sensical to a POSITA to add a solid to a solid. (*Id.*)

Indeed, even if one were to start with 30% KOH as suggested by Smith and to concentrate back to 30% KOH after the dehydrofluorination reaction (50% utilization) as taught by Masayuki, there would be, at best, a 60% mixture of KF/KOH in solution (at the border of solubility) plus a precipitate of KOH and KF salts in Slurry Tank 24. (EX2002, ¶ 136.) A POSITA would not look to add the teachings of Harrison at this point, because the addition of lime as taught by Harrison would result in a wet cement-like mixture. (*Id.*, ¶ 137.) A POSITA would not be motivated to work with such a cement-like mixture as it would not be very efficient. (*Id.*) Some fraction of the KF may convert to KOH but much of the KOH would be trapped in solid precipitate and would not be able to be recovered as taught by Masayuki without additional extraction processes which are not contemplated by the

prior art references. (*Id.*)

Accordingly, the addition of solid lime as suggested by Harrison to the combination of Smith and Masayuki would result in an inoperable system due to the concentration loop required by Masayuki when utilizing KOH. (*Id.*, at ¶ 139.) Dr. Manzer failed to even consider the efficiency of such a combination. EX2005 at 207:25-208:14. In order to even utilize the teachings of Harrison with Smith and Masayuki with KOH, one would have to ignore the concentration steps explicitly taught by Masayuki. (EX2002, ¶ 140.) Thus, contrary to Petitioner's assertion that "applying the converting step of Harrison to Masayuki to be straightforward, causing little to no disruption to the process of Masayuki" (Petition at p. 34), the POSITA would understand that in order for the combination to operate, Masayuki would require a substantial reconstruction and redesign of the elements shown in Figure 1 as well as a change in the basic principle under which the Masayuki process was designed to operate, namely with an enricher to concentrate the alkali metal hydroxide along with the dissolved organics so as to prevent polymerization. (EX2002, ¶ 141.)

During the deposition, Dr. Manzer attempted to change his position on the combination by arguing that all of the aforementioned issues with regard to the combination would be solved by removing the enricher. (EX2005, 233:21-234:7.) Modification or removal of the Masayuki enricher is not found in Dr. Manzer's

declaration or part of the Petitioner's prima facie case and thus not properly added at this stage. *See* IPR2014-00963, paper 31 slip op. at 10. (Alternative prima facie case is not proper if first presented in a reply). Additionally, Dr. Manzer attempted to argue that the Harrison lime would be added as a slurry, again he confirmed he was simply wrong. (EX2005 at 236:2-14.)

During his deposition, Dr. Manzer undercut Petitioner's position, specifically admitting that the addition of Harrison would result in disruption to the combination. (EX2005 at 235:5-6.) Dr. Manzer stated that he had formed no opinions with regards to the operations of Masayuki. (EX2005 at 235:7-14.) Dr. Manzer did not even look at Masayuki in detail. (*Id.*) Indeed, Dr. Manzer performed no analysis or modeling. (EX2005 at 232:12-21.) Petitioner cannot fix this glaring oversight at this stage of the proceeding.

Irrespective, removing the enricher (as Dr. Manzer now requires for the combination to be operative) is contrary to the express teachings of Masayuki. (*Id.* at 234:8-235:14.) Masayuki's express purpose is to prevent organics from polymerizing, which it accomplishes by way of the enricher. (*Id.* at 195:7 – 196:7.) Indeed, by removing the enricher as proposed by Dr. Manzer, the basic principles under which Masayuki's construction was designed to operate are changed. *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999) (citation omitted); *see also In re Fritch*, 972 F.2d 1260, 1265-66 n.12 (Fed. Cir. 1992); *In re*

Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984); *In re Ratti*, 270 F.2d 810, 813 (CCPA 1959) (no motivation to make suggested combination because it “would require a substantial reconstruction and redesign of the elements shown in [the prior-art reference] as well as a change in the basic principles under which [that reference’s] construction was designed to operate”). Other than hindsight reasoning, Dr. Manzer and the petition, fail to provide any reason for modifying Masayuki in such a way, other than by stating that the POSITA would have an expectation of success. *See Plantronics v. Aliph, Inc.*, 724 F.3d 1343, 1355 (Fed. Cir. 2013).

iii. **The POSITA Would Have Had No Reason to Look at the Teachings of Harrison because Masayuki Does Not Produce Waste Water**

Masayuki specifically states that part of the object of the invention is to “not produce wastewater during the dehydrochlorination process.” (EX1005 at 6:10-11.) Harrison is directed to “[a] process for the preparation of calcium fluoride *from industrial waste waters*.” (Ex. 1006 at Abstract.)(emphasis added) Thus, Masayuki teaches away from the production of waste waters, which are necessarily required for Harrison. As such, a POSITA would not look to Harrison in combination with Smith and Masayuki. (EX2002, ¶ 144.)

B. Smith is Not Prior Art to the ’282 Patent

Smith is not prior art to the claims of the ’282 Patent because the inventors of the ’282 Patent conceived of the invention before the dates of the alleged prior art

Smith reference, and Patent Owner exercised reasonable diligence to reduce the invention to practice. The declarations of Dr. Lousenberg, Mr. Tung, Mr. Morris, Mr. Bradford, Mr. Merkel, Ms. Goodie, Mr. Posillico, and Ms. Overton, filed herewith, and the corroborating evidence contained therein, clearly establish that Smith is not prior art. As a result, Arkema's Petition should be dismissed.

1. Applicable Law

A patent owner may establish an earlier date of invention, and thereby antedate prior art references, by showing an earlier conception followed by diligence in reducing the invention to practice. *See Singh v. Brake*, 317 F.3d 1334, 1340 (Fed. Cir. 2003). Conception and reduction to practice are questions of law based on an underpinning of factual findings. *Cooper v. Goldfarb*, 154 F.3d 1321, 1327 (Fed. Cir. 1998). Conception is the formation of “a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice.” *Burroughs Wellcome Co. v. Barr Labs, Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994) (citation omitted). “An idea is sufficiently definite for conception ‘when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan he hopes to pursue.’” *Spansion, Inc. v. Int’l Trade Comm’n*, 629 F.3d 1331, 1356 (Fed. Cir. 2010).

The Federal Circuit defines “reasonable diligence” as continuous activity toward reduction to practice so that the invention’s conception and reduction to

practice are substantially one continuous act. *Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1577 (Fed.Cir. 1996). Reasonable diligence need only be shown during the critical time period between the date prior to the competing reference and reduction to practice. *Monsanto Co. v. Mycogen Plant Science, Inc.*, 261 F.3d 1356, 1362-63 (Fed. Cir. 2001) (citing *Mahurkar*, 79 F.3d at 1577) (internal marks omitted) (“The time period for which diligence must be shown by the party first to conceive is ‘from a date just prior to the other party’s conception to . . . the date of reduction to practice by the party first to conceive.’”).

Reduction to practice encompasses two related concepts: constructive reduction to practice and actual reduction to practice. Filing of a patent application constitutes constructive reduction to practice. 35 U.S.C. §§ 119-121. To show an actual reduction to practice, the inventor must demonstrate that he (1) constructed an embodiment or performed a process that met all the claim limitations and (2) determined that the invention would work for its intended purpose. *Fox Group, Inc. v. Cree, Inc.*, 700 F.3d 1300, 1305 (Fed. Cir. 2012) citing *Teva Pharm. Indus. Ltd. v. AstraZeneca Pharms. LP*, 661 F.3d 1378, 1383 (Fed. Cir. 2011). “Once the invention has been shown to work for its intended purpose, reduction to practice is complete.” *Loral Fairchild Corp. v. Matsushita Elec.*, 266 F.3d 1358, 1362-63 (Fed. Cir. 2001) (citing *Mahurkar*, 79 F.3d at 1578).

2. Honeywell's Conception

To establish conception, Honeywell submits that the Lousenberg and Tung Declarations establish an invention date that precedes the effective date of Smith. The evidence, specifically, the March 26, 2008 email and attachments prepared by inventor Haluk Kopkalli (“Kopkalli Email dated March 26, 2008 and associated attachments”) (EX2007), overwhelmingly demonstrate conception of the inventions claimed in the '282 Patent at least as early as March 26, 2008, more than one year before the alleged prior art date of Smith (EX2002, ¶¶ 145-147; EX2006, ¶ 11.) The Kopkalli Email dated March 26, 2008 and associated attachments demonstrate that the ideas for the complete invention of the '282 Patent were definite and provided a particular solution to the problem at hand at least as early as March 26, 2008. (*Id.*) Accordingly, the conception date of the claims of the '282 Patent is at least as early as March 26, 2008.

3. Honeywell's Constructive Reduction to Practice of Claims 1-20

The constructive reduction to practice of Claims 1-20 is evidenced by the filing of the provisional patent application on October 21, 2010, which led to the issuance of the '282 Patent. The claims of the '282 Patent are supported by the provisional as the non-provisional and provisional are substantially similar. (*See, e.g.,* EX1011, Claims 1-43.) For example, the provisional recites hydrogenating a starting material (*see e.g., id.* at ¶¶ 0055-0058); dehydrofluorinating, in the presence

of a dehydrohalogenating agent (*see e.g., id.* at ¶¶ 0059-0063); withdrawing from a dehydrofluorinated product stream (*see e.g., id.* at ¶¶ 0064-0065, 0083); recovering spent dehydrohalogenating agent (*see e.g., id.* at ¶¶ 0066, 0084). Petitioner confirms that the '282 Patent is supported by the provisional application and cannot challenge such a priority date at this stage in the proceeding. (Petition at 8.)

4. Honeywell was diligent in reducing its invention to practice

(a) Diligence From March 26, 2008 to October 21, 2010

Smith is entitled to a prior art date of no earlier than May 15, 2009, as admitted by Arkema. (Petition at 20.) Accordingly, Honeywell need only show conception prior to May 15, 2009, and reasonable diligence from before that date until its constructive reduction to practice on October 21, 2010, in order to remove Smith as a prior art reference. *See Mahurkar*, 79 F.3d 1572 at 1577.

As discussed above, the inventors conceived of the invention of claims 1-20 of the '282 Patent at least as early as March 26, 2008. The inventors realized at least as early as August 21, 2009 that a complete process would include hydrogenation of HFP with H₂ and/or 1225ye to produce 236ea and/or 245eb. (*See* EX2007.)

Dr. Tung, as the Director of Technology of Fluorine Products, leads the development of the manufacturing technology of 1234yf. The Tung Declaration demonstrates that after conception of the invention at least as early as March 26, 2008, Dr. Tung worked with Dr. Selma Bektesevic to further evaluate utilizing a

caustic reaction for the dehydrofluorination steps in producing 1234yf. (EX2006, ¶ 14.) On July 10, 2008, in preparation of such evaluation, Dr. Bektesevic submitted a Project Permit Change Form (Exhibit 2008) to Permit #626, indicating that new chemicals 236ea, 245eb, 1234yf, 1225yeZ, and 1225yeE would be introduced into the existing apparatus. (*Id.*, at ¶¶ 16-17.) “The reaction proceeds by reacting organic chemicals with KOH to form salts in addition to new chemicals.” The two reactions proposed to be carried out include: $236ea + KOH \rightarrow 1225ye + KF$ and $245eb + KOH \rightarrow 1234yf + KF$. (*Id.*, at ¶ 18.)

In July 2008, Dr. Bektesevic prepared experiments to begin investigating the “[a]pplication of [Continuously Stirred Tank Reactor] CSTR concept on reaction between G-245eb and KOH” to yield 1234yf, as reflected in her monthly technology report for July 2008. (EX2010 at 1; *see also*, EX2006 ¶ 21.) In doing so, Dr. Bektesevic provided instructions to lab technicians in order to carry out experiments related to caustic dehydrofluorination utilizing KOH on at least July 16, July 29, and July 30, 2008. (EX2006, ¶¶ 22, 27; *see also* EX2037, ¶¶ 4, 5.)

Dr. Tung testifies that during the period of July – September 2008 he instructed Dr. Bektesevic “to begin investigating the “[a]pplication of [Continuously Stirred Tank Reactor] CSTR concept on reaction between G-245eb and KOH” to yield 1234yf.” (EX2006, ¶ 21.) As a result, he testified that “Dr. Bektesevic instructed the lab technicians to start the pumps in order to flow 245eb and KOH

into the CSTR. According to the July 29 Instructions, the experiments were run in a “semi-continuous mode” wherein the 1234yf vapor product was constantly removed from the CSTR and the stirrer was stopped periodically and spent KOH was withdrawn from the reactor via a dip tube.” (EX2006, ¶ 28, *see also id.* at ¶¶ 29-39 (confirming further experiments in August and September 2008); EX2012.) “Dr. Bektesevic also instructed the lab technician to discharge spent KOH from the CSTR and collect the spent KOH in scrubber product collection cylinders (“scrubber PCCs”) containing methylene chloride (“MeCl₂”).” (EX2006, ¶ 23, *see also* EX2011.) Angela Goodie, the lab technician testifies that she performed certain experiments during this time period, these experiments included “caustic dehydrofluorination experiments utilizing KOH” whereby “the discharged spent KOH [were placed]in two scrubber PCCs prefilled with MeCl₂ in order to separate and recover spent KOH from everything else withdrawn.” (EX2037, ¶ 4; *see also id.* at ¶ 5-6 (confirming caustic dehydrofluorination experiments utilizing KOH were performed whereby spent KOH was withdrawn and separated).) Dan Merkel confirms that he witnessed the performance of the caustic dehydrofluorination experiments utilizing KOH, whereby the KOH was withdrawn and recovered, demonstrating actual reduction of practice. (EX2038, ¶ 4.)

Dr. Tung further testified that Dr. Bektesevic performed dehydrohalogenating a haloalkane in the presence of KOH to produce a haloalkene “in true continuous

mode” wherein “[b]oth organic and spent KOH were taken constantly.” (EX2006, ¶ 29.) That is, the experiment included both the withdrawing and recovering claimed as outlet valves were opened in order to remove spent KOH from the reactor and collect the spent KOH in a scrubber PCC. (EX2006, ¶¶ 30-32.) Dr. Tung clarified that the scrubber PCC separated the spent KOH from everything else coming out of the outlet valve, i.e., the dissolved organics. (*Id.*) Angela Goodie testifies that she performed the experiments described by Dr. Tung. (EX2037, ¶ 5.) Dr. Tung further testified: “Dr. Bektesevic and her lab technicians conducted an experiment . . . wherein spent KOH was taken out of the reactor intermittently using a 5-inch dip tube. The withdrawn spent KOH was then collected in a scrubber PCC pre-filled with MeCl₂ in order to separate and recover spent KOH from everything else withdrawn.” (EX2006, ¶¶ 34-39.) Angela Goodie testifies that she performed the experiments described by Dr. Tung. (EX2037, ¶ 6.) As evidenced by Dr. Bektesevic’s August 2008 Monthly Technology Report (“Bektesevic August 2008 Report”), several 1234yf experiments were conducted as well as experiments which reflected the CSTR concept being further applied to the reaction of 236ea and KOH to form 1225ye. (EX2006, at ¶¶ 29-32.)

The inventors continued in September 2008, as they further evaluated the dehydrofluorination reaction pathway, specifically with respect to the use of 236ea. (*Id.*, ¶ 34.) Indeed, Dr. Bektesevic had an experiment run on September 15, 2008

(which continued until September 19, 2008) wherein spent KOH was taken out of the reactor intermittently using a 5-inch dip tube and she provided instructions to lab technicians to perform additional caustic dehydrofluorination experiments utilizing KOH, including instructions for HCl titration. (*Id.*, at ¶¶ 36-37; *see also* EX2037, ¶ 6.) It was in September 2008, as a result of the experiments, that the “[p]reliminary results demonstrated that CSTR is a feasible option for commercial operation.” (EX2006, ¶¶ 39-40; *see also* EX2017.) Dr. Tung declared that “based on my years of experience in this field and single-pass conversion and selectivity, I understood that there was commercial utility in (i) using a caustic for the dehydrofluorination steps of the HFP process for manufacturing 1234yf and 1225yf; and (ii) withdrawing and recovering the spent dehydrofluorination agent from the reaction.” (EX2006, ¶ 40; *see also* EX2017.)

As is typically done in an attempt to place the project in the best position for plant design by the engineering team, further experiments and analysis were performed in order to improve the quality of the experimental data and to complete mass balance. (EX2006, ¶ 41.) Such further experiments and analysis included fine-tuning residence times, reaction temperatures, agitator speeds, conversion of reaction products, and kinetics of the reaction, as can be seen in Dr. Bektsevich’s monthly reports between October 2008 and March 2009. (*Id.*, at ¶¶ 41-51; *see also* EX2018, EX2019, EX2021, EX2022; EX2024; EX2026.)

At the conclusion of the kinetics studies, Dr. Bektesevic and her lab technicians began conducting experiments related to the investigation of other pathways for manufacturing 1234yf via HFP. (EX2006, at ¶ 52.) On May 13, 2009, Dr. Bektesevic gave a presentation at the Project Apollo Technology Meeting related to the caustic dehydrofluorination experiments she had conducted, wherein she discussed the kinetics of the reactions, agitator speeds, temperatures, activation energy, conversion, reaction times, and possible solutions for addressing unreacted KOH in the plans for commercial scale-up. (*Id.*, at ¶ 53.)

Simultaneous to the aforementioned work, Honeywell was pursuing commercialization and development of 1234yf globally. A substantial portion of those efforts was developing a commercial plant and addressing the short, middle, and long range volume commitments. *See Scott v. Koyama*, 281 F.3d 1243, 1248-49 (Fed. Cir. 2002) (activities directed at building a plant to practice the claimed process of producing tetrafluoroethane on a large scale constituted efforts toward actual reduction to practice, and thus were evidence of diligence. The court distinguished cases where diligence was not found because inventors either discontinued development or failed to complete the invention while pursuing financing or other commercial activity.) The Declaration of Thomas Morris outlines representative activities that Honeywell was performing in furtherance of such development: (1) preparing and submitting a Forward Engineering Request Form in

April 2009 to obtain approval to spend additional resources on engineering of the manufacturing plant for 1234yf (EX2036, ¶ 5); (2) establishing a path for a decision on a manufacturing plan for 1234yf, including pursuing converting an existing manufacturing facility that was owned by a major manufacturer of chemical products in May 2009 (*id.*, at ¶ 6); (3) visiting the potential site outside the U.S. to investigate options for the manufacture of 1234yf in June 2009 (*id.*); (4) working on developing sales specifications and sales presentations during June and July 2009 (*id.*, at ¶ 7); (5) drafting recommendations for the safe use of, and handling procedures for, 1234yf in automotive air conditioning systems in August 2009 (*id.*, at ¶ 8); and (6) developed a working draft of a Whitepaper to brief Honeywell top executives regarding 1234yf and to obtain approval for business decisions related to the manufacture of 1234yf in September 2009 (*id.*, at ¶ 9).

Consistent with Honeywell procedure, the invention disclosure form was submitted to the Honeywell Worldwide Invention Disclosure System (“WIDS”) by the inventors on August 21, 2009, and was scheduled for review during the next patent committee (“PC”) meeting. (EX2041, ¶¶ 7-8.) Thereafter, the Fluorocarbon Process Technology (4511) group held its next PC meeting on January 11, 2010. During this meeting, the PC requested that Dr. Bektsevich draft a detailed disclosure for the invention entitled “Integrated Continuous Process for Dehydrofluorination of 236ea and 245eb.” (*Id.*, ¶ 10.) The detailed disclosure was received from Dr.

Bektesevic on February 10, 2010. (*Id.*)

At the subsequent quarterly PC meeting held on April 5 and 13, 2010, the PC requested that Mr. Bradford, in-house intellectual property counsel for Honeywell, review the invention disclosure form and the detailed disclosure prepared by Dr. Bektesevic with an eye to filing, as is customary for an intellectual property attorney at Honeywell. (*Id.*, ¶ 11.) Based on his review of the disclosures and consultation with business and technology leaders, Mr. Bradford's recommendation for the next quarterly PC meeting, held on July 12, 2010, was that Honeywell proceed with filing a provisional patent application for the invention. (*Id.*) At the July 12, 2010 meeting, the PC requested that Mr. Bradford send the invention disclosure form and detailed disclosure to outside counsel for filing. (*Id.*, ¶ 12; *see also* EX2042.)

Mr. Bradford's paralegal prepared the minutes from the meeting, which were then approved by Mr. Bradford, and circulated to the business and patent services department. (*Id.*, ¶ 13.) This approval process normally takes approximately two weeks. (*Id.*) Mr. Bradford and his paralegal both took vacation between July 26, 2010 and August 1, 2010, while the approval process was ongoing. After holding a meeting with his paralegal on August 2, 2010 immediately upon return from vacation, Mr. Bradford instructed his paralegal to proceed with the instructions outlined in the minutes in the ordinary course and in line with his other responsibilities. (*Id.*, ¶ 14.) Mr. Bradford's paralegal attended to these instructions

in line with his responsibilities, which included assisting Mr. Bradford with at least two technology transactions, and negotiating licensing and supply agreements. (*Id.*)

Thereafter, the invention disclosure form, supporting documentation, and a cover letter were emailed from Mr. Bradford's paralegal to Honeywell's outside counsel, Mr. Posillico, on August 19, 2010, with instructions for preparing a new disclosure for filing. (EX2043, ¶ 4; *see also* EX2041, ¶ 15.) Upon receipt of the email with instructions, Mr. Posillico instructed Eric Sumner to review the invention record and provide input on budget and timing. (EX2043, at ¶ 8.) Mr. Posillico further recollects that he would have asked Mr. Sumner to "prioritize the drafting of this patent application consistent with his other tasks but with a target filing date of September 30, 2010" as requested by Honeywell and that he would have expected the drafting of an application to have taken approximately 8 weeks or more given both Mr. Sumner's and Mr. Posillico's workloads at the time. (*Id.*) As such, Mr. Sumner would have gotten to the project in turn accounting for the period between August 19, 2010 and September 22, 2010.

Mr. Posillico's review of the time records indicate that Mr. Sumner picked up the drafting of the application in turn on September 22, 2010, and that the Fox attorneys devoted approximately 18 hours drafting the provisional application between September 22 and September 29, 2010. (*Id.*, ¶ 9.) Mr. Posillico confirms that Mr. Sumner had a full docket of matters at the time. (*Id.*, ¶ 10.)

Mr. Sumner completed the first draft of the application on September 29, 2010. (*Id.*, ¶ 11.) After Mr. Posillico reviewed it, Mr. Sumner provided the initial draft of the application to the inventors on September 29, 2010, and asked them to review the draft and provide any comments. (*Id.*) The draft patent application was with the inventors from September 29, 2010 to October 12, 2010. This time period is not an unreasonable time period for the inventors to review the patent application, given the weekend and their general work requirements. (EX2006, at ¶ 59.) On October 12, 2010, Mr. Posillico received an email from Dr. Bektesevic which indicated that the inventors had discussed the application and that it was “OK to file invention [sic] as is.” (*Id.*, ¶ 12.) The provisional application was filed that day.

By all accounts, Honeywell worked diligently during this legally relevant time period of March 26, 2008 to October 21, 2010 to prepare the provisional patent application for filing. Petitioner does not dispute, and cannot now dispute, that the claims of the '282 Patent are entitled to a priority date of October 12, 2010, the filing date of provisional application no. 61/392,242. (Petition at 4-6.)

Because the invention date of the '282 Patent predates the alleged priority date of Smith, Smith is not prior art under 35 U.S.C. § 102, and thus, cannot form the basis for an obviousness determination under § 103, and the asserted ground of rejection, which relies on Smith, cannot succeed.

VI. CONCLUSION

Arkema's Petition should be denied at least because: (i) it fails to provide the existence of each element of each challenged claim in Smith, Masayuki, and Harrison, alone or in combination; (ii) it fails to prove that a POSITA would have been motivated to look beyond Smith; (iii) a POSITA would not and could not consider the proposed combination of Smith, Masayuki, and Harrison; and (iv) Smith is not prior art to the claims of the '282 Patent because the inventors of the '282 Patent conceived of the invention prior to the effective prior art date of Smith, and Patent Owner exercised reasonable diligence during the legally relevant period to reduce the invention to practice.

Dated: January 22, 2015

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned hereby certifies that, on January 22, 2015, a true copy of the foregoing **PATENT OWNER'S RESPONSE PURSUANT TO 37 C.F.R. § 42.120** and its respective exhibits, was served by electronic mail on:

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