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Paper 63
Entered: August 29, 2014

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

REG SYNTHETIC FUELS, LLC,[1]
Petitioner,

v.

NESTE OIL OYJ,
Patent Owner.

Case IPR2013-00178
Patent 8,212,094 B2

Before RAMA G. ELLURU, CHRISTOPHER L. CRUMBLEY, and JON B. TORNQUIST, *Administrative Patent Judges.*

TORNQUIST, *Administrative Patent Judge*.

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

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[1] On June 24, 2014, REG Synthetic Fuels, LLC ("REG") filed updated Mandatory Notices informing the Board that it had acquired—and is the successor-in-interest to—Syntroleum Corporation, the originally-named Petitioner in this proceeding. Paper 62. REG also filed a Power of Attorney on that date, retaining the same counsel that filed the Petition on behalf of Syntroleum. Paper 61.

I. BACKGROUND

On March 8, 2013, Syntroleum Corp. ("Petitioner") filed a Petition for *inter partes* review of claims 1–20 of U.S. Patent No. 8,212,094 B2 (Ex. 1001, "the '094 patent"). On March 21, 2013, Petitioner filed a corrected Petition. (Paper 7, "Pet."). On June 14, 2013, Nestle Oil Oyj ("Patent Owner") filed a Preliminary Response (Paper 11, "Prelim. Resp."). In a Decision to Institute (Paper 22, "Dec. on Inst.") issued September 4, 2013, we instituted an *inter partes* review of claims 1–20 of the '094 patent.

Patent Owner did not file a Patent Owner Response, and chose instead to file a Motion to Amend (Paper 38, "Mot."). Petitioner filed an Opposition to the Motion to Amend (Paper 42, "Opp."), and Patent Owner filed a Reply (Paper 46, "PO Reply"). We held an oral hearing on April 1, 2014, and a transcript of the oral hearing (Paper 60, "Tr.") is included in the record.

Both Petitioner and Patent Owner presented declaration testimony in support of their respective positions. With its Petition, Petitioner provided a declaration from Edward L. Sughrue II, PhD. (Ex. 1002). With its Motion to Amend, Patent Owner provided a declaration from Michael T. Klein, Sc.D. (Ex. 2019). With its Opposition, Petitioner provided a second declaration from Dr. Sughrue (Ex. 1040), and with its Reply, Patent Owner provided a second declaration from Dr. Klein (Ex. 2041).

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, addresses issues raised during trial.

In its Motion to Amend, Patent Owner requests cancellation of claims 1–20 and substitution of those claims with proposed claims 21–30. For the reasons discussed below, we determine that Patent Owner has not met its burden to prove

by a preponderance of the evidence that the proposed substitute claims are patentable. Accordingly, Patent Owner's Motion to Amend is *granted* with respect to the cancellation of claims 1–20 and *denied* with respect to the substitution of claims 21–30.

A. *The '094 Patent*

The '094 patent relates to a process for the manufacture of diesel range hydrocarbons from renewable sources, such as plant and animal oils or fats. Ex. 1001, 5:22–24. In the '094 patent, a two-step process comprising a hydrodeoxygenation, or HDO, step and an isomerization step is used to convert the fatty acids and fatty acid derivatives in the fresh feed stream into branched n-paraffin reaction products suitable for blending with diesel fuel. *Id.* at 5:22–39, 6:27–30, 10:8–20. In the HDO step, a stream of hydrogen and fresh feed is introduced on catalyst beds. *Id.* at 6:17–24. As the hydrogen and fresh feed pass over the catalyst beds, "oxygen from organic oxygen compounds" is removed as water. *Id.* at 4:48–50. "[I]n the isomerization step, isomerization is carried out which causes branching of the hydrocarbon chain and results in improved performance of the product oil at low temperatures." *Id.* at 10:9–13.

In the process of the '094 patent, the HDO step is performed at a "temperature between 200 and 400 °C, preferably between 250 and 350 °C, and most preferably between 280 and 340 °C." *Id.* at 9:4–8. Because the HDO step is highly exothermic, a hydrocarbon diluting agent is introduced during the HDO step to limit the temperature rise in the reactor. *Id.* at 1:66–2:8, 5:65–6:7. The diluting agent may be a separate hydrocarbon or recycled product from the HDO step that has been cooled using a heat exchanger. *Id.* at 6:42–48, 7:13–16. "[T]he ratio of the dilution agent/fresh feed is 5-30:1, preferably 10-30:1, most preferably 12-25:1." *Id.* at 8:65–67.

B. *Instituted Challenges*

In the Decision to Institute, we considered Petitioner's and Patent Owner's arguments for and against the patentability of claims 1–20 and instituted *inter partes* review of the '094 patent on the following grounds:

1) Claims 1, 4, 7, and 9–20 as anticipated by Jakkula;[2]

2) Claims 1–7 and 9–20 as having been obvious over Jakkula;

3) Claim 8 as having been obvious over Jakkula and Monnier;[3] and

4) Claims 5 and 6 as having been obvious over Jakkula and Harrison.[4]

Dec. on Inst. 24.

Patent Owner did not file a Patent Owner response addressing the patentability of claims 1–20, nor did Patent Owner provide additional reasoning or argument to support the patentability of these claims in the Motion to Amend.

C. *Illustrative Claims*

In its Motion to Amend, Patent Owner proposes to add substitute claims 21–30. Mot. 2. Substitute claims 21 and 30 are illustrative of the proposed substitute claims and are reproduced below:[5]

21. (Substitute for Original Claims 1, 3, 4, and 7) A process for the manufacture of diesel range hydrocarbons comprising:

combining a fresh feed stream of biological origin <u>containing more than 5 wt-% of free fatty acids</u> and a stream of diluting agent containing hydrocarbons <u>of biological origin</u> to form a total feed stream,

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[2] EP Pub. App. 1396531 A2 (Ex. 1006) ("Jakkula").
[3] U.S. Patent No. 5,705,722 (Ex. 1031) ("Monnier").
[4] U.S. Patent No. 5,093,535 (Ex. 1014) ("Harrison").
[5] Subject matter deleted from original claim 1 is enclosed by brackets; subject matter added to that claim is underlined.

introducing the total feed stream to a hydrodeoxygenation step, hydrodeoxygenating the total feed, in the hydrodeoxygenating step, at a reaction temperature between 280-330 ºC to form a hydrodeoxygenated product containing n-paraffins in the diesel range and less than 1 wt-% of high molecular weight hydrocarbons,

introducing the hydrodeoxygenated product to an isomerization step, and isomerizing the hydrodeoxygenated product in the isomerization step to form isoparaffins in the diesel range,

wherein the total feed stream contains less than [10] 1 w-ppm alkali and alkaline earth metals, calculated as elemental alkali and alkaline earth metals, less than [10] 1 w-ppm other metals, calculated as elemental metals, and less than [30] 5 w-ppm phosphorous, calculated as elemental phosphorous.

30. (New) The process according to claim 21, wherein the hydrodeoxygenating step is at a reaction temperature between 280-305 ºC.

Dependent claims 22–29 are proposed substitutes for original claims 5, 6, and 8–13 of the '094 patent. Mot. 4–5. These proposed substitute claims differ from the original claims only in that they recite dependency from newly proposed claim 21, instead of original claim 1. *Id*.

II. DISCUSSION

A. *Claim Construction*

Neither party challenges the claim constructions provided in the Decision to Institute. Accordingly, to the extent that they are necessary for assessing Patent Owner's Motion to Amend, those previous constructions are adopted for purposes of this final decision. *See* Dec. on Inst. 8–13.

With respect to the newly added limitations, Patent Owner submits proposed constructions for the terms: *reaction temperature*, *n-paraffins*, *high molecular weight hydrocarbons*, and *isoparaffins*. Mot. 7–8.

1. *Isoparaffins and n-Paraffins*

Patent Owner argues that *isoparaffins* "should be construed to mean alkanes having one or more C1-C9, typically C1-C2 alkyl side chains, typically mono-, di-, tri-, or tetramethylalkanes" and *n-paraffins* "should be construed to mean normal alkanes or linear alkanes that do not contain side chains." Mot. 8. Petitioner does not dispute these proposed constructions. As Patent Owner's proposed constructions mirror the express definitions provided in the patent, we construe the terms in a manner consistent with Patent Owner's proposals. *See* Ex. 1001, 5:12–16.

2. *Reaction Temperature and High Molecular Weight Hydrocarbons*

Patent Owner asserts that *reaction temperature* should be construed to mean "the temperature at which a hydrodeoxygenation reaction occurs" and *high molecular weight hydrocarbons* should be construed to mean "hydrocarbons having a molecular weight double or more of the feed," which "are not in the boiling range of diesel fuel." Mot. 8; Ex. 2019 ¶¶ 36, 38. In its Opposition, Petitioner asserts that *reaction temperature* should be construed as the "temperature of the HDO reactor" and that the term *high molecular weight hydrocarbons* is indefinite. Opp. 1.

At oral argument the parties conceded that their respective written description and patentability arguments did not rely on the construction of either term. Tr. 8:10–17, 11:12–20, 61:2–9, 62:19–63:3. As our decision in this case, likewise, does not turn on a particular construction for these terms,

we decline to provide an express construction for *reaction temperature* and *high molecular weight hydrocarbons*.

B. *The Motion to Amend*

An *inter partes* review is more adjudicatory than examinational. *See generally Abbott Labs. v. Cordis Corp*., 710 F.3d 1318, 1326 (Fed. Cir. 2013). Unlike examination, entry of the proposed substitute claims in an *inter partes* review is not automatic. Patent Owner must establish that it is entitled to the requested relief. *See* 37 C.F.R. § 42.20(c).

In its Motion to Amend, Patent Owner bears the burden to show, *inter alia*, that a reasonable number of substitute claims are proposed, that these claims are adequately supported by the written description of the application as originally filed, and that the proposed claims are patentable over the prior art. *See* 37 C.F.R. § 42.121; *Idle Free Sys. Inc. v. Bergstrom, Inc.*, Case IPR2012-00027, slip op. at 5–6 (PTAB June 11, 2013) (Paper 26). We address each of these requirements in turn.

1. *Reasonable Number of Substitute Claims*

A patent owner may propose a reasonable number of substitute claims for each challenged claim. 35 U.S.C. § 316(d)(1). Absent special circumstances, it is presumed that only one substitute claim is needed to replace each challenged claim. 37 C.F.R. § 42.121(a)(3). This presumption may be rebutted by showing that the substitute claims are patentably distinct from each other. *Idle Free*, Paper 26, 8–9. To the extent that no patentable distinction is shown, we may deny entry of the excess claims or group them together for purposes of considering patentability over prior art. *See id.*

In its Motion to Amend, Patent Owner proposes to add claim 21 as a substitute for original claims 1, 3, 4, and 7. Mot. 3. Patent Owner also

proposes to add "new" substitute claim 30, which depends from claim 21 and is directed to HDO temperatures in the range of 280–305 °C. Mot. 5, 7. Claim 30 is not identified as a substitute for any original claim and, as it depends from claim 21, contains all of the limitations of that claim. Accordingly, claims 21 and 30 are both considered substitutes for original claims 1, 3, 4, and 7. *See Idle Free*, Paper 26, 8. As more than one substitute claim is proposed for a single original claim, for example, both claim 21 and claim 30 substitute for claim 1, Patent Owner must establish a need for new claim 30. *Id.*

Patent Owner argues that claim 30 is needed because its temperature range of 280–305 °C is "narrower and distinct from the 280–330 °C range of proposed substitute claim 21," further distinguishing the claim from the prior art. Mot. 17; Tr. 66:1–15. Although we agree that the temperature range of 280–305 °C is narrower than 280–330 °C, Patent Owner has not established that this narrower range renders claim 30 *patentably* distinct from claim 21. Mot. 17; Ex. 2019 ¶ 78; Ex. 2041 ¶ 59. We, therefore, are not persuaded that Patent Owner has satisfied its burden to show a need for substitute claim 30. Instead of denying entry of claim 30, however, we exercise our discretion to group claim 30 with claim 21 for purposes of considering patentability of the claims over prior art. *See Idle Free*, Paper 26, 8–9.

2. *Written Description Support*

Patent Owner bears the burden to show written description support in the original disclosure for each proposed substitute claim. 37 C.F.R. § 42.121(b)(1); 37 C.F.R. § 42.20(c). The test for written description support is "whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the

claimed subject matter as of the filing date." *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010).

Substitute claim 21 recites obtaining an HDO product having "less than 1 wt-% of high molecular weight hydrocarbons" using "a stream of diluting agent." Proposed substitute claims 22 and 23, which depend from claim 21, further require the diluting agent be in a ratio of 5–30:1 and 10–30:1, respectively. Thus, claim 21 presumptively encompasses the use of dilution ratios outside a 5–30:1 ratio. *See Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) ("[T]he presence of a dependent claim that adds a particular limitation raises a presumption that the limitation in question is not found in the independent claim.")

Patent Owner argues that obtaining "less than 1 wt-% high molecular weight hydrocarbons" using an unbounded dilution ratio is supported by the reported experimental results and the disclosure that product recycle dilution can prevent or remarkably decrease the reactions between free fatty acids and the formation of high molecular weight compounds during hydrotreating. *See* Mot. 6–7; PO Reply 3; Ex. 2017 ¶ 64.

We are not persuaded by this argument. The reported "surprising[]" experimental results, including the ability to "prevent or remarkably decrease" the formation of high molecular weight hydrocarbons, are directly tied to a dilution ratio of "at least 5:1":

> It was surprisingly observed in examples that product recycle dilution can prevent or remarkably decrease the reactions between free fatty acids and the formation of high molecular weight compounds during hydrotreating, *when at least* 5:1 (product recycle):(fresh oil)-ratio was used.
> . . .

> In the examples it was be (sic) seen that the ratio of *at least* 5:1 (recycle:fresh) significantly decreased the formation of high molecular weight products, when the feedstock contains 10 wt-% of free fatty acids (calculated from fresh oil) is used. Using *at least* 5:1 recycle ratio and reduced reaction temperature, free fatty acids can be processed without the need for deacidification. High quality hydrocarbons are obtained, suitable for the diesel fuel pool with high yield.

Ex. 2017 ¶¶ 64, 73 (emphases added). Moreover, throughout the '094 patent specification, the dilution ratio is described as "5-30:1, preferably 10-30:1, most preferably 12-25:1." *Id.* ¶¶ 38, 43, 56, 62.

In its reply, Patent Owner points to several paragraphs of the '094 patent disclosure that describe the invention without mentioning a 5-30:1 dilution ratio, and argues that "[t]he examples, which use a 5:1 ratio of product recycle/fresh feed, do not diminish" these "broader statements nor suggest that this is the only ratio possible." PO Reply 2; Mot. 7; Ex. 2017 ¶¶ 2, 23, 24, 37, 64, 72, 73, 84; Ex. 2041 ¶ 19. We are not persuaded by this argument. First, several of the identified disclosures indicate that the dilution level is "high," not unbounded.[6] Ex. 2017 ¶¶ 2, 72. Second, even if other dilution ratios are "possible," the general descriptions identified by Patent Owner do not establish that these alternate dilution ratios would achieve a product having "less than 1 wt-% of high molecular weight hydrocarbons." *See* Ex. 2041 ¶ 19; Opp. 5. For example, paragraphs 2, 23, 24, 37, and 72 of the '094 patent specification merely suggest that the level of high molecular weight compounds may be "reduced" or "decreased," and

[6] At his deposition, Dr. Klein testified that a "high product recycle/fresh oil ratio" encompasses any dilution ratio. Ex. 1088, 63:22–64:19; Paper 46, 5 (Patent Owner's Reply to Petitioner's Motion for Observations). This reading, however, would render the term "high" in the '094 patent specification superfluous.

not that the specific level of "less than 1 wt-%" may be achieved. *See* Ex. 2017 ¶¶ 2, 23, 24, 37, 72. And paragraphs 64, 73, and 84 of the '094 patent specification do not support Patent Owner's argument as they are each directly tied to the use of at least a 5:1 dilution ratio. *Id.* ¶¶ 64, 73, 84.

Patent Owner also asserts that an unbounded dilution ratio is adequately supported because the "same language appeared in original application claim 1." PO Reply 2. We agree that original application claim 1 discloses using a "stream of diluting agent," as does proposed claim 21. Original claim 1 does not recite, however, the quality of the resulting product, much less a product having "less than 1 wt-% high molecular weight hydrocarbons." Ex. 2017, 28 (claim 1). We, therefore, are not persuaded that original claim 1 provides sufficient written description support for proposed claim 21. *See Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1346 (Fed. Cir. 2005) (noting that, in order to provide adequate written description support for later claims, the original claim must actually support the limitation at issue).

Based on the foregoing, we are not persuaded that Patent Owner has met its burden to show adequate written description support for obtaining a product having "less than 1 wt-% high molecular weight hydrocarbons" using an unbounded dilution ratio, as recited in proposed substitute claim 21 and proposed dependent claims 24–30.

3. *Patentability over the Prior Art*

In the Motion to Amend, Patent Owner combines in substitute claim 21 the limitations from claims 1, 3, 4, and 7, and argues that these limitations now "distinguish the claims over the prior art." Mot. 17–18. Patent Owner does not address, however, why these claim limitations, either

in isolation or as combined in substitute claim 21, would render the claim non-obvious. *See* Mot. 18. Nor does Patent Owner meaningfully discuss the knowledge, skill, and creativity of one of ordinary skill in the art with respect to these limitations. *Id.* Accordingly, we are not persuaded that Patent Owner has carried its burden to show that the limitations contained in original claims 1, 3, 4, and 7, either alone or in combination, patentably distinguish claim 21 from the prior art.

We focus, therefore, as have both of the parties, on whether the two newly added limitations—an HDO reaction temperature of 280-330 °C and a hydrodeoxygenated product containing "less than 1 wt-% of high molecular weight hydrocarbons"—render claim 21 patentable over the prior art. *See* Mot. 3, 10–17.

a. *Prior Art (Jakkula)*

Jakkula relates to a process for producing hydrocarbons from biological raw materials that are suitable as diesel fuel. Ex. 1038 ¶¶ 1, 12. Like the '094 patent, Jakkula utilizes a two-step process comprising a HDO step and an isomerization step. In the HDO step, "the structure of the biological component is decomposed, oxygen, nitrogen, phosphorus and sulfur compounds, and light hydrocarbons as gas are removed, and the olefinic bonds are hydrogenated." *Id.* ¶ 16. In the isomerization step, the product of the HDO step is passed over an isomerization catalyst to initiate branching of the hydrocarbon chains, thereby improving the performance of the product at low temperatures. *Id.*

In Jakkula, the HDO step is performed at temperatures between 200 and 500 °C, and preferably in the range of 300–400 °C. *Id.* ¶ 20. To control the "exothermal character of the reactions" in the HDO step, Jakkula

discloses that the hydrocarbon reaction products may be recycled back to the reaction chamber as a diluent. *Id.* ¶¶ 19, 24, 61.

In Jakkula, "it was surprisingly found that the problems of the prior art processes may be avoided or at least substantially reduced by the process of the invention having at least two steps." *Id.* ¶ 16. For example, Jakkula reports that it was surprisingly found "that the use of a biological feed stock in the processes is possible" and that "the composition of the feed may vary considerably without affecting the quality of the end product." *Id.* ¶ 65. Jakkula further reports that the properties of the resulting product are "excellent" and "very suitable as a component in diesel fuels without any blending restrictions." *Id.* ¶ 73. Jakkula reports no issues with the formation of high molecular weight hydrocarbons or with plugging within the system. *See id.* ¶¶ 70–73.

b. *280-330 °C*

The proposed 280-330 °C temperature range of claim 21 is fully encompassed by Jakkula's disclosed 200-500 °C range, and partially overlaps the preferred temperature range of 300-400 °C. When a claimed range is encompassed by, or overlaps with, a prior art range, the claimed range is presumed to be obvious. *See In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003). "This presumption can be rebutted if it can be shown that the prior art teaches away from the claimed range, or the claimed range produces new and unexpected results." *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311 (Fed. Cir. 2006).

Patent Owner argues that the presumption of obviousness is rebutted in this case because a prior art patent to Craig et. al. (U.S. Patent No. 4,992,605, Ex. 1013, "Craig") allegedly teaches away from the use of HDO

temperatures below 350 °C. Mot. 11. Craig, which issued in 1995, discloses a series of bench top HDO experiments using various feedstocks. Ex. 1013, 4:3–10, Table 8. Craig reports that at HDO reaction temperatures below 350 °C "the product collection system was plugged with a solid margarine-like material," and concludes that "350 °C was the lower limit for trouble-free operation." Ex. 1013, 7:11–13, 9:39–10:16; Ex. 2041 ¶¶ 29–30. Patent Owner asserts that, because Craig, unlike Jakkula, conducted a series of experiments to identify the working temperatures for the HDO step, and because Craig allegedly conducted these experiments using similar feedstocks, pressures, and catalysts as Jakkula, one of ordinary skill in the art would have given Craig's teachings more weight and would have avoided HDO temperatures below 350 °C. Mot. 11–14; PO Reply 3–4; Ex. 2041 ¶¶ 29–32, 35, 41.

"A reference may be said to teach away when a person of ordinary skill in the art, upon reading a 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). "[I]n weighing the suggestive power of each reference, [the Board] must consider the degree to which one reference might accurately discredit another." *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991). When two references do not use directly comparable techniques or operating conditions, the impact of an allegedly discrediting reference may be significantly reduced. *See id.* at 592.

Dr. Sughrue testifies that one of ordinary skill in the art would have understood that the "different reactor configurations and catalysts" used in Jakkula "*could and would* lead to differing optimal temperatures from those reported in

Craig." Ex. 1040 ¶ 36 (emphasis added). For example, Dr. Sughrue testifies that one of ordinary skill in the art would have understood that reduced temperatures, as well as dilution—which was used in Jakkula but was not studied as an operating variable in Craig—could "greatly reduce the rate of dimerization and oligomerization of free fatty acids" and would lead to lower levels of high molecular weight hydrocarbons. Ex. 1040 ¶¶ 42, 60, 90; Ex. 1013, 4:11–13. Dr. Sughrue also provides evidence that in the years after the publication of Craig "the activity of hydroprocessing catalysts increased dramatically," permitting lower reaction temperatures in the HDO step. *Id.* ¶¶ 31, 33. In light of these differences, Dr. Sughrue concludes that one of ordinary skill in the art "would not have been dissuaded from considering HDO reaction temperatures at or near the low end of the preferred temperature range taught in [Jakkula], e.g., 300 °C, or even lower temperatures within the more broadly taught range of 200-500 °C." Ex. 1040 ¶ 37.

We find Dr. Sughrue's testimony persuasive. In particular, in light of Jakkula's disclosed successful results, we are persuaded that one of ordinary skill in the art would not have viewed Craig's 350 °C minimum temperature for "trouble-free operation" as a line not to be crossed, but would have understood that the optimal and minimum temperatures for the HDO step would vary depending on the particular reactor configuration and operating conditions used. *See In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) ("Discovery of an optimum value of a results effective variable in a known process is ordinarily within the skill in the art."). Although Dr. Klein presents an opposing view from that of Dr. Sughrue, upon review of both expert declarations and their corresponding depositions, on balance, we find that Dr. Sughrue's testimony more persuasively considers not only the express teachings of Craig and Jakkula, but also the timing of the two disclosures, the differences in reactor configuration and operating conditions, and

the knowledge, skill, and reasoning ability of one of ordinary skill in the art. *Syntex (U.S.A.) LLC v. Apotex, Inc.*, 407 F.3d 1371, 1380 (Fed. Cir. 2005) ("What a reference teaches or suggests must be examined in the context of the knowledge, skill, and reasoning ability of a skilled artisan.")

We, therefore, are not persuaded that Patent Owner has carried its burden to show that Craig sufficiently teaches away from, or discredits, the lower end of Jakkula's preferred temperature range to rebut the presumption of obviousness.

c. *Less Than 1 wt-% of High Molecular Weight Hydrocarbons*

Patent Owner asserts that it would not have been obvious to obtain an HDO product having "less than 1 wt-% of high molecular weight hydrocarbons." Mot. 15. According to Patent Owner, because one of ordinary skill in the art would not have appreciated "the problem of high molecular weight hydrocarbon formation when hydrodeoxygenating feedstocks containing free fatty acids, no reason existed at the time of the '094 invention to optimize the prior art HDO processes to minimize the negative effects" of such compounds. *Id.* In support of this argument, Dr. Klein testifies that "[t]o my knowledge no publication before the '094 patent identified that the presence of free fatty acids in a biological feedstock was a recognized source of problems in hydrodeoxygenation." Ex. 2019 ¶ 11; Ex. 2041 ¶ 60.

In its Opposition, Petitioner argues that Patent Owner and Dr. Klein "are flat wrong when they claim that no one before the '094 patent recognized that the processing of streams containing [free fatty acids] could promote the formation of [high molecular weight hydrocarbons]" as the propensity for free fatty acids to form high molecular weight compounds has been "well-known and well-studied in the art for decades," and was

expressly acknowledged during prosecution of the ’094 patent. Opp. 11–12; Ex. 1040 ¶¶ 39–41.

We find Petitioner’s argument persuasive. In particular, during prosecution of the parent application to the ’094 patent, the patentee repeatedly asserted that one of ordinary skill in the art would understand that operating an HDO process on biologic feedstocks with high levels of free fatty acids would result in the formation of high molecular weight hydrocarbons. For example, it was argued in a March 17, 2008, Amendment in response to an Office Action that it was known in the art that free fatty acids contributed to the formation of high molecular weight compounds:

> As is known in the art, several problems arise during processing of bio-oils and fats, including general deoxygenation activity, potential side reactions, catalyst deactivation due to free fatty acids and high hydrogen consumption in the hydrotreatment step. *Side reactions in the hydrotreatment step, resulting in the formation of heavy molecular weight compounds, are significantly increased, due to the presence of free fatty acids and/or their derivatives in the feed*.

Ex. 1052, 9 (emphasis added). Likewise, in a declaration submitted by Jukka Myllyoja—a common inventor on both the ’094 patent and Jakkula—it was asserted that “[a] man skilled in the art would expect to encounter problems when a feed containing high amounts of free fatty acids is hydroprocessed on an industrial scale,” including “[t]he formation of high molecular weight compounds.” Ex. 1048, 3.

In light of the assertions made during prosecution, we are not persuaded that the propensity for free fatty acids to promote the formation of high molecular weight hydrocarbons was unknown prior to the ’094 patent. *See also* Ex. 1040 ¶¶ 38–61 (asserting that the

dimerization of unsaturated free fatty acids was well-known in the art from as early as 1984 and was disclosed in Jakkula (Ex. 1038 ¶ 21)).

Patent Owner further argues that "each part of the claimed process—the low HDO reaction temperature, the dilution, and the low metallic and phosphorus contaminant levels—is needed to achieve" less than 1 wt-% high molecular weight hydrocarbons using feedstock with more than 5 wt-% free fatty acids. Mot. 15. According to Patent Owner, because the synergy of these reaction parameters was not known prior to the '094 patent, one of skill would not have been able to optimize the Jakkula process to achieve the claimed results. *Id.*; Ex. 2019 ¶ 79; Tr. 31:22–32:6.

Patent Owner identifies Example 5 as alleged support for its argument that all three elements (temperature, dilution, and low levels of impurities) are required to achieve "less than 1 wt-% high molecular weight hydrocarbons." Mot. 15. Patent Owner does not establish sufficiently, however, that the combination of purified rapeseed oil and stearic acid used in Example 5 was within the purity limitations of proposed substitute claim 21. Ex. 1088, 76:13–24; Ex. 1040 ¶ 73; Ex. 2019 ¶¶ 22, 34, 84. Moreover, Dr. Sughrue testifies that in Figure 5, which represents an experiment run with a feedstock containing high levels of impurities, the level of high molecular weight hydrocarbons was kept below 1 wt-% for at least 8 days. *See* Ex. 1040 ¶ 90. We agree with Dr. Sughrue that "Figure 5 thus illustrates that the combination of a low HDO temperature, dilution, and feeds having low impurities is not necessary to achieve the allegedly surprising result." *Id*. Accordingly, we are not persuaded that Patent Owner has established that each of the claimed limitations is necessary to achieve an HDO product containing "less than 1 wt-% high molecular weight hydrocarbons," or that

one of ordinary skill in the art could not optimize reaction conditions to minimize the level of "high molecular weight hydrocarbons" without the disclosure of the '094 patent.

Based on the foregoing, Patent Owner has not met its burden to demonstrate that claim 21 is patentable. As claim 30 is grouped with claim 21 for purposes of analyzing the patentability of the claims over the prior art, we are also not persuaded that claim 30 is patentable. Moreover, even if we were to address claim 30 individually, Patent Owner has not demonstrated that this claim is patentable, as Patent Owner relies upon essentially the same teaching away argument for claim 30 that we rejected for claim 21.

d. *Proposed Substitute Claims 22–30*

Patent Owner also argues that it would not have been obvious from the combined teachings of Jakkula and Harrison to obtain the dilution ratios of substitute claims 22 and 23:

> Although Harrison uses dilution to control the temperature of hydrogenation reactions (Ex. 1014 at 10:66-11:2), it provides no reason to adjust the dilution ratio in combination with a low reaction temperature and low metallic and phosphorus contaminant levels to achieve less than 1 wt-% high molecular weight hydrocarbons in an HDO reaction, as claimed.

Mot. 16.

Patent Owner's argument, however, is limited to the grounds of unpatentability asserted by Petitioner, and does not address the "prior art known to the patent owner." *See Idle Free*, Paper 26, 7. Patent Owner also does not address the patentability of claims 22 and 23 with respect to the knowledge and skill of an ordinary artisan. As noted above, the propensity for free fatty acids to form high molecular weight hydrocarbons was known. Dr. Sughrue testifies that, because these reactions are generally second

order, one of ordinary skill in the art would have understood that dilution should significantly reduce the formation of these high molecular weight hydrocarbons. Ex. 1040 ¶¶ 41–42, 51, 88; Opp. 12. Dr. Sughrue further testifies that one of ordinary skill in the art would be able to determine the optimal dilution ratio while working within the dilution ratios set forth in the prior art. Ex. 1040 ¶¶ 39–42, 90, 93; Ex. 1014, 14:22–39 (disclosing dilution ratios between 1:3 to 1:99); Ex. 1008, 2 (disclosing dilution ratios between 5:1 to 200:1). In light of this testimony, and Patent Owner's failure to specifically address the knowledge and skill of an ordinary artisan in the Motion to Amend, we are not persuaded that Patent Owner has established that claims 22 and 23 are patentable.

Patent Owner does not individually address the patentability of claims 24–29, relying instead on its arguments with respect to substitute claim 21. As Patent Owner has not carried it burden to show that claim 21 is patentable, we are not persuaded that Patent Owner has carried its burden to show that claims 24–29 are patentable.

For all the foregoing reasons,[7] Patent Owner has not, in its Motion to Amend, demonstrated the patentability of proposed substitute claims 21–30 to the '094 patent.

III. CONCLUSION

Patent Owner has not demonstrated by a preponderance of the evidence that proposed substitute claims 21–30 are patentable. Therefore,

[7] Petitioner also argues that claims 21-30 are indefinite. Opp. 2-3. In light of our determination that Petitioner has not shown by a preponderance of the evidence that claims 21-30 satisfy the written description and other requirements for patentability, we decline to address Petitioner's indefiniteness argument.

we deny the Motion to Amend with respect to the substitution of claims 21–30. We grant the Motion to Amend solely with respect to Patent Owner's non-contingent request to cancel claims 1–20.

IV. ORDER

In consideration of the foregoing, it is

ORDERED that Patent Owner's Motion to Amend is *granted* with respect to the cancelation of claims 1–20;

FURTHER ORDERED that Patent Owner's Motion to Amend is otherwise *denied*; and

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

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