UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

URT Umwelt und Recyclingtechnik GmbH,
Petitioner,

v.

Duesenfeld GmbH,
Patent Owner.

Case No. IPR2024-00887
U.S. Patent 11,050,097

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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PETITIONER'S UPDATED EXHIBIT LIST

Exhibit No.	Document
1001	U.S. Patent No. 11,050,097 to Hanisch *et al.* (the '097 patent")
1002	Prosecution History of U.S. Patent No. 11,050,097 ("Prosecution History")
1003	Declaration of Volker Spies in Support of Petition for *Inter Partes* Review of U.S. Patent No. 11,050,097 ("Spies Declaration")
1004	Arno Kwade *et al*., "LithoRec Recycling of Lithium-Ion Batteries", Culliver Verlag (2012) ("LithoRec")
1005	Declaration of Dr. Sylvia Hall-Ellis Regarding the Authenticity and Public Accessibility of LithoRec, Perry, and Din 28400 ("Ellis Declaration")
1006	"Perry's Chemical Engineers' Handbook 7th Edition". New York: McGraw-Hill, 1997. ("Perry")
1007	"Vacuum Technology; Terms and Defninitions; General Terms." DIN 28400-1, German Institute for Standards e.V., 1990. ("DIN 28400")
1008	Curriculum Vitae of Volker Spies
1009	U.S. Patent No. 8,210,456
1010	DE 4 424 825
1011	US 2003/0186110
1012	US 5,632,863
1013	WO 2013/023640 ("Hanisch")
1014	U.S. 2016/0043450
1015	CN 102496752

Exhibit No.	Document
1016	English Translation of LithoRec
1017	Certificate for English Translation of LithoRec
1018	English Translation of DIN 24800
1019	Certificate for English Translation of DIN 24800
1020	English Translation of Hanisch
1021	Certificate for English Translation of Hanisch
1022	Declaration of Volker Spies in Support of Petitioner's Reply to Patent Owner's Preliminary Response
1023	Declaration of Volker Spies in Support of Petitioner's Reply
1024	US 685,287
1025	US 5,575,083
1026	US 2008/0050295
1027	LithoRec Presentation 2013
1028	American Heritage Dictionary Second College Edition
1029	Continuous Dryer
1030	Declaration of Volker Spies in Support of Petitioner's Opposition to Patent Owner's Motion to Amend
1031	JP 2013-4299 ("Mitsubishi")
1032	English translation of JP 2013-4299
1033	Certification of English translation of JP 2013-4299
1034	English translation of LithoRec 2013 Presentation

Exhibit No.	Document
1035	Program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1036	Certification of English translation of LithoRec 2013 Presentation
1037	English translation of program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1038	Certification of English translation of program for Jahrestagung 2013 „Aufbereitung und Recycling“ conference
1039	Deposition of Dantam

I. INTRODUCTION

Patent Owner's (PO's) invention processes used batteries to recover active material for use in new batteries. POR, 3-4, 54; EX1001, 1:27-50. PO alleges its innovation lies in applying well-established vacuum drying technology to the processing of batteries to inactivate the processed material ("The inventors of the '097 patent recognized that comminuted batteries could be inactivated through a drying process by vacuum drying"). POR, 4. But the very same team described using vacuum drying to inactivate comminuted battery material years before the '097 patent in LithoRec. EX1016, 226; EX1023, ¶¶7-9. The PTAB should reject PO's approach of ignoring LithoRec's "vacuum drying" teaching and the '097 patent's lexicographic definition of "inactivated," and find all challenged claims unpatentable.

II. CLAIM CONSTRUCTION

A. Inactivate/Inactivated

The Board's construction of "inactivation" should be adopted for "inactivate/inactivated." Inst. Dec., 12-13.

"[T]he claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002).

The '097 patent clearly defines "drying" by explicitly stating, "[w]ithin the scope of the present description, the term drying should be understood particularly to mean the removal of at least one solvent in the conducting salt. In particular, the drying is executed such that dimethyl carbonate and/or ethyl methyl carbonate is removed." EX1001, 2:23-27; EX1023, ¶¶13-15. Therefore, the '097 patent specification's definition of "drying" supersedes the plain meaning of "drying."

The '097 patent also explicitly states, "[t]he drying of the comminuted material results in inactivated material." EX1001, 8:54-55. When the term "drying" is replaced with its explicit definition, this statement becomes "the removal of at least one solvent in the conducting salt such that dimethyl carbonate [DMC] and/or ethyl methyl carbonate [EMC] is removed from the comminuted material results in inactivated material." A POSITA would understand that this statement is an explicit definition of "inactivated." In other words, according to the '097 patent, comminuted material becomes inactivated when at least one solvent (DMC and/or EMC) is removed from the conducting salt. EX1023, ¶¶13-15. A POSITA would understand that the above definition also applies to the act of inactivating (i.e., removing at least one solvent (DMC and/or EMC) from the conducting salt). EX1023, ¶¶13-15.

PO asserts that the Board's construction of "inactivation" is improper because it does not distinguish between "inactivation" and "drying" and different

claim terms generally connote different meanings. POR, 9-10. But the inference that different terms have different meanings is not absolute. *Bancorp Servs., L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1373 (Fed. Cir. 2004). As discussed above, the '097 patent explicitly links these terms so that they describe the same thing, i.e., the removal of solvents from a conducting salt. EX1023, ¶¶13-15.

PO further asserts that "inactivate/inactivated" should be given its plain and ordinary meaning, which allegedly is "render/rendered safe for transport." POR, 9. PO's construction cannot be adopted because the alleged plain and ordinary meaning cannot supersede the patent's lexicographic definition. *CCS Fitness*, 288 F.3d at 1366. For that reason alone, PO's construction of "inactivate/inactivated" is improper.

Furthermore, a POSITA would not have considered "render/rendered safe for transport" to be the plain and ordinary meaning of "inactivate/inactivated." EX2023, ¶¶10-11, 15-16. "Render/rendered" safe for transport is merely one characteristic among many possible characteristics shared by several embodiments in the '097 patent. POR, 10, EX1001, 2:1-14; 4:5-7, 19-40; EX1023, ¶¶10-11. This cherry-picked characteristic should not be read into the claims. PO's alleged plain and ordinary meaning cannot be adopted simply because it is more convenient to PO's arguments, and particularly given the express definitions and originally-intended scopes of "inactivate/inactivated." EX1023, ¶¶10-16.

B. Drying Device Configured to Inactivate Comminuted Material

PO asserts that "drying device configured to inactivate comminuted material" should be construed as "a device configured to produce inactivated comminuted material as a result of drying." POR, 12. However, as discussed above, "inactivate" is the process of achieving "inactivated" material. Since the '097 patent provides an explicit definition regarding how to achieve the "inactivated" material by way of drying (i.e., by way of removing at least one solvent from conducting salt such that DMC and/or EMC is removed from the comminuted material), the above phrase should be construed as "drying device configured to remove at least one solvent from conducting salt such that DMC and/or EMC is removed from the comminuted material." EX1023, ¶¶10-11, 15-16.

C. Drying the Comminuted Material

PO asserts that "drying the comminuted material" should be construed as removing at least one solvent from the comminuted material." POR, 13. However, as discussed above, the '097 patent provides an explicit definition for "drying" (i.e., "the removal of at least one solvent in the conducting salt. In particular, the drying is executed such that dimethyl carbonate and/or ethyl methyl carbonate is removed"). There is no need to construe the term "drying" under any other construction. EX1023, ¶¶10-11, 15-16.

Of course, even if any of PO's constructions discussed above are adopted, the claims would still be unpatentable because, as shown below, drying to remove solvents would "render the material safe for transport." *See infra* §III.B; EX1023 ¶45.

III. THE PRIOR ART ANTICIPATES EVERY ELEMENT OF CLAIMS 12-13, 15-16, AND 18-19

PO's arguments against LithoRec begin with the incorrect premise that LithoRec is limited to a system that must operate at atmosphere and use a cross-flow hogger. POR, 14-38. But the Board properly found that LithoRec cannot be limited to a cross-flow hogger and cannot be limited to any process required to operate at atmosphere. Inst. Dec., 15. PO provides no valid reason to deviate from the Board's findings.

PO also ignores the Board's construction of "inactivation," instead relying on a construction at odds with the '097 patent's lexicographic definition. But that still does not help save these claims: PO's construction—"render[ing] safe for transportation"—is met by "the removal of at least one solvent, such as dimethyl carbonate or ethyl methyl carbonate, from the conducting salt." *Compare* POR, 14-38, *with* Inst. Dec., 13.

For at least the following reasons, PO's arguments fail.

A. Vacuum Installation

As evidenced by the then-applicant's remarks during prosecution, the intended scope of "vacuum installation" is anything capable of producing a vacuum in a dryer. EX1002, 157; EX1023, ¶18.

By definition, drying under vacuum requires an element connected to a dryer that can produce a vacuum in the dryer. Thus, LithoRec's statement "speak[ing] in favor of drying under vacuum" necessarily requires a "vacuum installation." EX106, 226; EX1023, ¶¶17-21. Given that claim 12 does not require any specific structure for the "vacuum installation," LithoRec discloses the "vacuum installation" of claim 12 when LithoRec describes "drying under vacuum." EX1016, 226; EX1023, ¶¶17-21.

PO argues that LithoRec's reference to drying under vacuum is speculative and lacks sufficient precision and detail to establish that a vacuum installation existed in the prior art. POR, 16. However, LithoRec's discussion of drying under vacuum is more than mere speculation.

During the investigation into the treatment and recovery of electrolytes, LithoRec's authors actually employed vacuum drying to remove electrolytes from a separator/electrode composite of a battery "at an elevated temperature in a vacuum." EX1016, 98; EX1023, ¶¶17-21. Thus, LithoRec clearly shows that it was known to use vacuum drying to evaporate electrolytes prior to the '097 patent. In

addition, LithoRec's statement "speak[ing] in favor of drying under vacuum" applies the "elevated temperature in a vacuum" technique (which utilizes a dryer with a vacuum installation) to the removal of electrolytes from the comminuted material. EX1023, ¶¶17-21. There is no doubt that LithoRec discloses a "vacuum installation," especially given the broad meaning of that term.

Finally, PO asserts LithoRec fails to disclose a "vacuum installation" because LithoRec is limited to convection dryers (particularly vibratory fluidized bed dryers), which is what is selected for the pilot plant. POR, 17-18. However, the selection of a vibratory fluidized bed dryer for the pilot plant does not somehow erase LithoRec's express teachings of other types of dryers. LithoRec discloses different viable operating options (e.g., batch mode and continuous mode). Moreover, a POSITA would consider the flow diagram illustrated in Fig. G-1 of LithoRec as being generic to (or at least compatible with) different types of dryers since Fig. G-1 lacks the specific fans that convection drying would require (i.e., forced draft and outlet fans). Instead, Fig. G-1 merely discloses a "dedusting fan" and uses the generic label for "dryer." EX1016, Fig. G-1; EX1023, ¶¶28-29.

Furthermore, as discussed above, the Board found that LithoRec's dryer is not limited to any process required to operate at atmospheric pressure. Inst. Dec., 15.

PO's focus on vibratory bed dryers over the other types of disclosed dryers amounts to a "teaching away" argument. But "teaching away" is not applicable to anticipation rejections. *Celeritas Techs. Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998) (citing *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772 (Fed. Circ. 1983)). And as shown below in §V.B.3, PO's attempted teaching away argument is incorrect.

B. Inactivation device

PO's arguments that LithoRec fails to disclose an inactivation device rest solely on a construction of "inactivation" at odds with the Board's construction. POR, 21-22. PO does not dispute that under the Board's construction of "inactivation," LithoRec discloses an "inactivation device" as recited in claim 12. And even under PO's construction of "inactivation" (rendered safe for transport), LithoRec still teaches the "inactivation device" of claim 12.

LithoRec discloses:

> The electrolytes need to be evaporated for the subsequent dry treatment processes, which are primarily aimed at extracting the active mass…. [T]his step eliminates the potential hazard of flammable solvents and … converts the active mass into the dry powder form required for dry processing.

EX1016, 226.

Since the drying process of LithoRec eliminates the "potential hazard of flammable solvents," LithoRec renders the comminuted material safe for transport. EX1023, ¶45.

PO asserts that LithoRec does not disclose an "inactivation device" as recited in claim 12 because LithoRec does not disclose a vacuum pump and because the shredder and dryer selected for the pilot plant are incompatible with vacuum drying. POR, 22-23. However, as discussed above and held by the Board, LithoRec is not limited to any device that only operates at atmospheric pressure. In addition, LithoRec clearly discloses that any type of shredder can be used, not just a cross-flow hogger ("[f]or planning based on the current state of knowledge, it seems irrelevant which [shredder] is used as the basis for planning"). EX1016, 226-227; Inst. Dec., 15; EX1023, ¶24. Furthermore, focusing on only the shredder and dryer selected for the exemplary configuration (the pilot plant) while ignoring the other types of shredders and dryers discussed by LithoRec amounts to a "teaching away" argument, which is not applicable to anticipation rejections. *Celeritas Techs.*, 150 F.3d at 1361. And of course continuous vacuum dryers were known and usable with comminution units operating at atmosphere. EX1023, ¶48. PO's unsupported arguments to the contrary lack all merit.

PO further asserts that LithoRec discloses eliminating the potential hazard of flammable solvents as a goal and does not disclose actually achieving it. In making

this argument, PO asserts that LithoRec fails to disclose any control system that ensures proper drying of the solvents and that fluidized bed dryers are incapable of rendering the comminuted material safe for transport. POR, 24.

However, claim 12 does not require a control system that ensures the proper drying of solvents. Claim 12 does not even limit itself to a particular drying time, pressure, or temperature. EX1023, ¶¶40-45; EX1039, 68:1-7.

With respect to LithoRec's dryer's alleged inability to inactivate the comminuted material, PO's "evidence" is speculative at best and provides nothing beyond the hypothetical situation discussed by PO's expert. POR, 24; EX2025, ¶119-120, 160-163. Furthermore, as discussed above, the Board held that LithoRec is not limited to systems that only operate at atmosphere. Inst. Dec., 15. To the extent that PO argues that continuous dryers cannot operate under vacuum, LithoRec is not limited to fluidized bed dryers, and any shortcomings of fluidized bed dryers identified by PO are irrelevant. EX1023, ¶¶22-30. Furthermore, many dryers (including continuous dryers) were operable under vacuum at the time of the invention (e.g., Draiswerke K-TR series dryers) and, indeed, LithoRec disclosed dryers operable under vacuum. EX2029, 1-2; EX1023 ¶¶37-38.

Furthermore, a POSITA would interpret LithoRec's "eliminates the potential hazard of flammable solvents" statement as positively disclosing the result of drying, not some hopeful goal that is unachievable. EX1023, ¶¶22-30.

C. Enablement

A prior art reference is enabling if one of ordinary skill in the art could make the invention without undue experimentation. *Impax Labs., Inc. v. Aventis Pharms. Inc.*, 545 F.3d 1312, 1314 (Fed. Cir. 2008).

PO alleges that LithoRec is not enabling because (1) only the dryer and shredder selected for the pilot plant (vibratory fluidized bed dryer and cross-flow hogger) are described in enough detail to be made without undue experimentation, and (2) vacuum drying is incompatible with the flow chart illustrated in Fig. G-1. POR, 25-38.

However, as exemplified by the existence of US 685,287 (EX1024); US 5,575,083 (EX1025); US 2008/0050295 (EX1026), shredders and vacuum dryers involve old technology and were well within the knowledge of a POSITA. The '097 patent does not describe any unconventional structure, function, or configuration relating to the shredder and vacuum dryer. Nor does claim 12 require any unique structure for the claimed dryer and comminuting device. EX1023, ¶¶49-50. Thus, a POSITA would need only a minimal amount of guidance to implement the shredder and vacuum dryer system on which claim 12 reads. EX1023, ¶¶49-50.

In addition, as discussed above, LithoRec allows for the other equipment considered by LithoRec (including equipment compatible with vacuum drying) to

be implemented in the pilot plant. Thus, the other equipment is still part of its disclosure. *See supra* §III.A. Moreover, the Board found that LithoRec cannot be limited to cross-flow hoggers (LithoRec expressly states that any type of shredder may be used) and cannot be limited to any process required to operate at atmosphere, thereby foreclosing PO's "bodily incorporation" arguments that focus only on the incompatibility of vacuum drying with certain pilot plant components. Inst. Dec., 11; EX1016, 226. PO offers nothing new that would compel a different result. *Cf.* POR, 29-34.

PO further asserts that LithoRec is directed to "speculative and future work" that has yet to be performed or reduced to practice. POR, 28-29. However, the authorities PO cites do not replace the "undue experimentation" test, nor do those cases add a "reduction to practice" requirement for prior art:

- *Apple v. Int'l Trade Comm'n*, 725 F.3d 1356, 1364 (Fed. Cir. 2013): A prior art reference was found to be non-enabling for transparent electrodes because transparent electrodes had yet to be invented and were merely a speculative idea. In contrast, vacuum dryers and shredders were well-known and widely-used pieces of industrial equipment. EX1023, ¶¶49-50.
- *Forest Lab'ys. Inc. v. Ivax Pharms., Inc.*, 501 F.3d 1263, 1268 (Fed. Cir 2007): The prior art reference was found to be non-enabling because it made an erroneous prediction with respect to how a pharmaceutical functions, which

prevented a POSITA from achieving a particular result. There are no such errors in LithoRec. EX1023, ¶48.

- *Star Sci. Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1376 (Fed. Cir. 2011): The prior art reference was found to be non-enabling for a particular result because the reference explicitly stated that the mechanisms for achieving the particular result are not fully understood. In contrast, vacuum dryers and shredders, and their mechanics, were well-known to POSITAs. EX1023, ¶¶49-50. Petitioner's expert even confirmed that the "ways and means" of dryers and comminuting units were known. EX1039, 34:3-37:19; EX1023, ¶49.

Thus, none of the authorities PO cites supports the assertion that LithoRec is non-enabling due to "speculative work" and a lack of reduction to practice.

PO further asserts that LithoRec is non-enabling in view of *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). However, the *Wands* factors support a finding of enablement.

Claim 12 recites a battery processing installation including well-known industrial equipment, including a comminution unit, an inactivation device that comprises a drying device, a filling device, and a vacuum installation connected to the drying device. Each piece had been in existence, and widely known, for decades prior. EX1023, ¶¶49-50. A POSITA would have been well-versed in how to make and operate the long-existing and well-known technology associated with

vacuum drying and comminuting. EX1023, ¶¶49-50. Given the age of the technology and how well-known it was, a POSITA could have easily predicted the results of comminuting battery material and drying such comminuted material. EX1023, ¶¶49-50.

Furthermore, a POSITA would require minimal guidance to achieve a system with a comminuting device and a vacuum dryer. LithoRec provides examples and reasons for selecting particular types of comminuting devices and dryers. EX1016, 98, 226-231; EX1023, ¶¶49-50. In addition, the tradeoffs between types of dryers were known to a POSITA, a POSITA was obligated to build the system to design specifications, and it was standard practice to optimize pressure, temperature, and duration for dryer systems. Moreover, the target material and its size were known to POSITAs, along with the thermal properties of the target material. EX1039, 15:15-16:13, 21:5-22:25; EX1034, 9; EX1037, 4; EX2032, 3-4. Thus, little experimentation is required for a POSITA to make the claimed invention based on the content of LithoRec. EX1023, ¶¶46-50.

Of course, PO concedes that its team had been working on the '097 patent's approach for years (POR, 5-6), resulting in LithoRec and other publications cited in this IPR (EX1013, EX1020, EX1027). PO never asserts the other publications are non-enabled. Thus, PO's argument would result in some art from this project being deemed enabled while LithoRec would be deemed non-enabling—even

though a POSITA would have had access to all that art (and more) at the time of the invention. The Board should not credit PO's non-enablement arguments.

D. No Rebuttal of Claim 12's Other Features, or Claims 15-16 and 18-19

PO does not challenge LithoRec's disclosure of the comminution unit and the filling device of claim 12. Nor does PO separately challenge claims 15-16 and 18-19.

E. Claim 13

PO asserts that LithoRec does not disclose that the dryer is "configured" to dry the comminuted material to an endpoint where "an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible," as recited in claim 13. According to PO, LithoRec merely discloses that this result is a goal. POR, 39. However, as previously discussed, a POSITA would interpret LithoRec's "eliminat[ing] the potential hazard of flammable solvents" statement as positively disclosing the result of drying and not some hopeful goal that is unachievable. *See supra* §III.B; EX1023, ¶¶22-30. Furthermore, LithoRec provides an example in which electrolytes were successfully removed from a separator/electrode composite at an elevated temperature under vacuum. EX1016, 98. According to PO's own remarks, completely removing an electrolyte to form a dry powder would render electrochemical reactions impossible. EX1001, 1:63-65, 2:20-22, 4:5-18; EX1023 ¶45. Claim 13 is met.

IV. LITHOREC/HANISCH RENDER CLAIM 17 OBVIOUS

PO advances no additional arguments regarding claim 17. POR, 39-40. Claim 17 thus falls with claim 12 in view of LithoRec/Hanisch. Pet., 55-57.

V. CLAIMS 1-3, 7-8, AND 10 WOULD HAVE BEEN OBVIOUS

A. Inactivating Comminuted Material

PO repeats the same arguments regarding the "inactivation device" of claim 12 for the "inactivating comminuted material" requirement in claim 1. POR, 41-42. PO's arguments are ineffective as to "inactivating comminuted material" in claim 1 for at least the reasons above. *See supra* §III.B.

B. Wherein the Drying Occurs at a Maximum Pressure of 300 hPa

1. Drying Under Vacuum

The claimed "300 hPa or less" pressure range would have been obvious over LithoRec because a POSITA—at a minimum—would have easily achieved the claimed pressure range through routine optimization of known result-effective variables. EX1023, ¶39.

As discussed above, LithoRec teaches drying under vacuum. *See supra* §III.A-C. And "vacuum" naturally encompasses a range of pressure values. EX1023, ¶¶51-55. As the Board and PO acknowledge, DIN24800 provides a glossary of vacuum-technology related terms, and a table of pressure values considered to be at vacuum. Ins. Pet. 18, POR, 45. According to PO, the pressure range of a vacuum (according to DIN24800) is 1-1000 hPa. POR, 45; EX1018.

Thus, the claimed "300 hPa or less" pressure range falls within the pressure range inherently disclosed by LithoRec. EX1023, ¶55.

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 (CCPA 1955). In addition, claimed ranges that overlap or lie inside a range disclosed by the prior art are considered to be obvious over the prior art unless the range produces unexpected results. *In re Wertheim*, 541 F.2d 257 (CCPA 1976).

Here, LithoRec discloses the general conditions recited in claim 1 (i.e., drying under vacuum). EX1023, ¶¶51-55. Furthermore, given that optimization of pressure, temperature, and duration was and is standard practice for designing drying systems, the claimed range of 300 hPa or less would have been found through routine experimentation. PO's expert conceded this point. EX1023, ¶39; EX1039, 15:15–16:20.

LithoRec teaches that drying under vacuum is preferred because it allows the drying temperature to be lowered to prevent combustion of an electrolyte such as DMC. EX1016, 100, 226. LithoRec also teaches that it is desired to minimize the release of hydrogen fluoride during the processing of the batteries. EX1016, 137. Finding a pressure that will remove an electrolyte such as DMC at a target temperature that reduces the likelihood of combustion and reduces the release of

hydrogen fluoride could have easily been accomplished by finding a phase diagram for the electrolyte and adjusting the settings of the drying device to achieve the removal of the electrolyte. Such diagrams were widely available and finding such settings would merely involve routine experimentation. EX1023, ¶53. And one would have done so for the reasons LithoRec states, limiting combustibility and lowering temperature. EX1016, 226.

PO asserts that the claimed pressure range produces unexpected results, but fails to provide any supporting evidence. PO never challenges that "300 hPa or less" is other than the mere result of routine optimization. In particular, the '097 patent discloses "It is beneficial if the drying occurs at a maximum pressure of 300 hPa, in particular a maximum of 100 hPa. At such low pressures, considerable parts of most electrolytes vaporise, especially dimethyl carbonate and ethyl methyl carbonate, and do so at temperatures of less than 80°C…. The drying preferably occurs at a maximum temperature of 80°C.: this produces almost no hydrogen fluoride." EX1001, 3:7-12, 5:7-8. Thus, the claimed range (i.e., 300 hPa or less) is merely a workable setting based on the design specifications for evaporating DMC (the very electrolyte taught by LithoRec to be evaporated under vacuum) at 80ºC (a reduced temperature that decreases the likelihood of combustion and the release of hydrogen fluoride). EX1039, 15:15-16:13, 21:5-22:25; EX1023, ¶39.

PO asserts that the solution presented in the '097 patent "took a completely different and unexpected approach...advantages and benefits of vacuum drying at pressures below 300 hPa without treating with foreign substances were superior." POR, 55. However, PO's remarks fail to show that the claimed pressure range achieves unexpected results. The approach to a solution is irrelevant to whether the results were unexpected.

In addition, PO fails to provide any evidence showing an analysis that compares vacuum drying at 300 hPa or less with the results of vacuum drying (or drying in general) above 300 hPa. Instead, PO cites its own expert's opinion, which also fails to make any comparison between the results outside of the claimed range and the results within the claimed range. PO's expert merely provides the results of the drying under vacuum at pressures below 300 hPa and declares that the results were unexpected. POR, 55; EX2025, ¶174. PO thus fails to provide any credible evidence, much less any credible evidence commensurate in scope with the claimed range.

2. PO's Reliance on Bodily Incorporation

As discussed above, the Board found that LithoRec cannot be limited to cross-flow hoggers and cannot be limited to any process required to operate at atmosphere. *See supra* §III.C. PO continues to rely on the "bodily incorporation" argument that vacuum drying is incompatible with vibratory fluidizer bed dryers

without offering any new argument or evidence. POR, 44. Accordingly, arguments about the alleged difficulty of integrating vacuum drying with a vibratory fluidized bed dryers are unpersuasive. LithoRec clearly teaches a comminuting unit working with different dryer types. Batch and continuous dryers operating at vacuum were known. EX1023, ¶¶22-39; EX1029, 1-2.

3. Batch Drying

To the extent that PO argues that LithoRec does not teach vacuum drying because LithoRec teaches away from batch drying, PO's arguments are unpersuasive. POR, 44. Not only does LithoRec **not** teach away from batch drying devices, LithoRec provides guidance for implementing batch drying devices. EX1016, 226; EX1023, ¶¶31-32.

A reference teaches away from a claimed solution when the reference discourages employing the claimed solution. The mere disclosure of alternatives does not teach away. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

LithoRec discloses "There is also the question of whether drying should also take place in a batch or continuously…It is assumed that the necessary process steps (inerting, filling, drying, emptying) of a discontinuously operating dryer require a longer work cycle in total than the pre-shredder. For this reason, batch drying is not used." EX1016, 226. Thus, the only reason LithoRec chooses continuous drying over batch drying is because the work cycle of a continuous

dryer is assumedly faster. But LithoRec teaches how a batch dryer's work cycle can be accommodated. In particular, LithoRec discloses "Whereas conventional rotor shredders only work continuously in a throughput, the cross-flow shredders are operated in sets. This batch operation allows the duration and intensity of the load (rotor speed) to be optimally adapted to the desired degree of digestion." EX1016, 226, EX1023, ¶¶31-32.

There is nothing in LithoRec that would lead a POSITA to understand that batch drying cannot be used to dry the comminuted material, let alone discourage a POSITA from using batch drying. EX1023, ¶¶31-32.

LithoRec further discloses "As some of the liquids to be vaporized are highly flammable solvents, the drying temperature should probably be severely restricted." EX1016, 226. This is the same reason provided by Perry for utilizing batch vacuum rotary dryers, i.e., batch vacuum rotary dryers are typically employed when low temperatures must be maintained if excess heat will cause oxidation or an explosive condition and/or when materials must be dried to extremely low moisture levels. EX1006, 12-65:12-66.

Contrary to PO's assertion, Perry is not just relevant to pharmaceuticals, food, and seeds (POR, 43-44); it also is relevant to the kinds of organic solvents at issue in LithoRec. Perry discloses that vacuum-shelf dryers "are particularly useful for handling small batches of materials wet with toxic or valuable solvents.

Recovery of the solvent is easily accomplished without danger of passing through an explosive range." EX1006, 12-44. Perry plainly is applicable to the '097 patent materials. EX1023 ¶61.

C. LithoRec, Perry, and DIN28400 Are Enabled

PO repeats its non-enablement arguments, asserting LithoRec, Perry, and DIN28400 are not enabled for claim 1. POR, 48. Accordingly, Petitioner's observations relating to the enablement of LithoRec above also apply with respect to claim 1. *See supra* §III.C.

D. No Rebuttal of Claim 1's Other Features, or Claims 3, 8, and 10

PO advances no additional arguments regarding claim 3, 8, and 10. POR, 48. Claims 3, 8, 10 thus fall with claim 1 in view of LithoRec/Din24800/Perry. Pet., 55-57.

E. Claims 2, 7

PO asserts that LithoRec does not disclose drying comminuted material to an endpoint where "an electrolyte content in the comminuted material is so low that an electrochemical reaction is impossible," as recited in claim 2. PO also asserts that LithoRec does not disclose drying comminuted material sufficiently so that "no flammable or explosive gas mixture is formable above the comminuted material in the transport container," as recited in claim 7.

According to PO, LithoRec merely discloses these results are goals. POR, 49-50. However, as previously discussed, a POSITA would understand LithoRec's "eliminates the potential hazard of flammable solvents" statement as positively disclosing the result of drying, not some hopeful goal that is unachievable. *See supra* §III.B; EX1023, ¶¶22-30. Furthermore, LithoRec provides an example in which electrolytes were successfully removed from a separator/electrode composite at an elevated temperature under vacuum. EX1016, 98. According to PO's own remarks, completely removing an electrolyte to form a dry powder would render electrochemical reactions impossible. EX1001, 1:63-65, 2:20-22, 4:5-18; EX1023, ¶¶22-30. In addition, since the electrolytes are removed, no flammable or explosive gas mixture would be formable above the comminuted material in the transport container. EX1001, 1:63-65, 2:20-22, 4:5-18; EX1023, ¶¶22-30.

VI. LITHOREC/PERRY/DIN28400/HANISCH RENDER CLAIM 9 OBVIOUS

As discussed above, discovering optimum or workable ranges by routine experimentation is not inventive. *In re Aller*, 220 F.2d at 456. In addition, LithoRec discloses lowering the drying temperature of an electrolyte such as dimethyl carbonate and that it is desired to minimize the release of hydrogen

fluoride. EX1016, 100, 137, 226. Hanisch discloses evaporating electrolytes for recovery at 80ºC in the context of Lithium-ion battery processing. EX1029, 6, 8.

According to PO's expert, a POSITA was obligated to build to design specifications, and it was standard practice to optimize temperature for dryer systems. Thus, it would have merely involved routine experimentation to find a temperature that would remove an electrolyte such as DMC at a target temperature that reduces the likelihood of combustion and reduces the release of hydrogen fluoride, especially since relevant data could have come from widely available phase diagrams for the target material. EX1039, 15:15-16:13, 21:5-22:25; EX1023, ¶¶53-54. 62.

In addition, PO fails to provide any evidence that the claimed temperature produces unexpected results. *See supra* §V.B.1.

VII. SECONDARY CONSIDERATIONS

A. Nexus

Nexus is presumed when the patent owner shows that the asserted objective evidence of record is tied to a certain product and that product includes the claimed features, and is coextensive with them. "Coextensiveness" does not mean that the claims broadly cover the product that is the subject of the secondary considerations. If the product includes a critical feature that is unclaimed and materially impacts the product's functionality, the claims and the product are not

coextensive. *Fox Factory, Inc. v. SRAM, LLC,* 944 F.3d 1366, 1373-1375 (Fed. Cir. 2019).

In this case, the Declaration of Lydia Grote provides pressure and temperature ranges that do not include the full extent of the claimed pressure range. In particular, [redacted] EX2040, ¶7. In addition, [redacted] EX2040, ¶7. Thus, the setpoints at which the commercial system operates ([redacted]) is not coextensive with the much larger claimed range (300 hPa or less and 80ºC or less).

No nexus can be presumed.

B. Long-Felt Need

PO asserts that companies tried and failed to develop a process for inactivating depleted rechargeable batteries for safe storage and transport. PO also asserts the Wendeburg pilot plant satisfied this long-felt need because it allegedly achieved a safer way of recovering spent batteries by inactivating electrolytes and solvents without forming hydrogen fluoride.

However, to establish long-felt need, PO must present objective evidence that others skilled in the art recognized the need. PO's subjective statements are

insufficient to establish long-felt need. *In re Gershon*, 372 F.2d 535, 538 (CCPA 1967). The long-felt need must not have been satisfied by another before the claimed invention. *Newell Companies v. Kenney Mfg. Co.*, 864 F.2d 757, 768 (Fed. Cir. 1988).

PO asserts that companies tried and failed to develop a process for inactivating depleted rechargeable batteries for safe storage and transport. PO cites Ex. 2001-2002, 2004, 2008, and 2011, but these patents merely disclose solutions to the specific problems they recognize. Therefore, either the cited references do not recognize the need identified by PO, or they previously solved it.

C. Unexpected Results

PO asserts that the claimed invention produces unexpected results because solvents can be recovered at a purity of over 99%, the requirement of energy is low, the drying time is short, no waste gas scrubbing is necessary, no toxic filter materials have to be disposed of, no chemicals are needed, and the lithium in the black mass is $LiPF_6$. POR, 55. There is no evidence to show that these purported advantages actually are unexpected. Moreover, PO asserts that only at a temperature below 80°C can the solvents of the electrolytes, the graphite, and the lithium be recovered in a purity so that they can be reused. EX2036, 6, 10. The "80°C" feature is not recited in claim 1 or 12. The alleged "unexpected results" therefore lack a nexus with claims 1 and 12.

D. Commercial Success

PO presents financial records and two agreements. See EX2046-EX2047, EX2049-EX2050. However, PO's financial success stems from the licensing of technology, and the Wendeburg pilot plant is irrelevant to PO's financial success. Furthermore, none of the licensing agreements include [redacted]. EX2049-EX2050. Thus, the evidence presented to support commercial success lacks a nexus with the '097 patent claims.

VIII. CONCLUSION

For the foregoing reasons, URT requests that the Board cancel all challenged claims.

Respectfully Submitted,

Dated: May 7, 2025

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CERTIFICATE OF WORD COUNT UNDER 37 C.F.R. § 42.24(d)

I, the undersigned, do hereby certify that the attached petition contains 5,590 words, as measured by the Word Count function of Microsoft Word. This is less than the limit of 5,600 words as specified by 37 C.F.R. § 42.24(c)(1).

Dated: May 7, 2025

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CERTIFICATION OF SERVICE

The undersigned certifies that, pursuant to 37 C.F.R. §§ 42.6(e) and 42.105, a copy of this Reply to Patent Owner's Response and supporting materials was served on the Patent Owner, via email, at the following addresses:

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