

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

URT Umwelt und Recyclingtechnik

Petitioner

v.

Duesenfeld GmbH,

Patent Owner.

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

**PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO ITS
CONTINGENT MOTION TO AMEND**

TABLE OF CONTENTS

TABLE OF EXHIBITS	iii
I. PETITIONER’S EXPERT DECLARATION IS NOT CREDIBLE	1
II. THE CONTINGENT AMENDED CLAIMS ARE PATENTABLE	2
A. Petitioner has Failed to Carry its Burden with Respect to LithoRec and Perry.....	2
B. Petitioner has Failed to Carry its Burden with Respect to LithoRec and Uchida.....	10
C. Petitioner has Failed to Carry its Burden with Respect to LithoRec, Perry, and Mitsubishi.	12
CERTIFICATE OF SERVICE	14

TABLE OF EXHIBITS

Ex. 2001	U.S. Patent No. 9,843,077 (“Hayashi”)
Ex. 2002	U.S. Patent No. 9,450,277 (“Dunagan”)
Ex. 2003	DE 102012024876 A1 to Electrocyling GmbH (“Electrocyling”) (German)
Ex. 2004	DE 102012024876 A1 to Electrocyling GmbH (“Electrocyling”) (English)
Ex. 2005	Certification of Translation of the Electrocyling Patent
Ex. 2006	Gao Liu <i>et al.</i> , <i>Binder Interactions in the Electrodes of the Lithium-ion Batteries</i> , TFUG Conference, February 17, 2009
Ex. 2007	WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”) (German)
Ex. 2008	WO 2010/149611 A1 to LiMotive Company Ltd. (“LiMotive”) (English)
Ex. 2009	Certification of Translation of the LiMotive Patent
Ex. 2010	Declaration of Vani Dantam in support of Patent Owner’s Preliminary Response to the Petition
Ex. 2011	U.S. Patent No. 7,198,865 to Sloop (“Ecobat”)
Ex. 2012	Kinergy Corporation, <i>Transferring Heat with a Vibratory Bed Dryer</i> (2013) [https://web.archive.org/web/20131015131016/https://kinergy.com/uploads/documents/Transferring%20Heat%20with%20a%20Vibrating%20Fluidized%20Bed%20KDVFB-1.pdf]
Ex. 2013	MEWA User Manual (German)
Ex. 2014	MEWA User Manual (English)
Ex. 2015	Certification of Translation of the MEWA User Manual
Ex. 2016	Cross-flow hogger image [https://www.cutmetall.com/us/innovative-cross-flow-hogger-chain-head-set-p47892/] (last visited on August 17, 2024)
Ex. 2017	Commercial Air Filtration System Manual
Ex. 2018	ISO 3529-1 (1981)
Ex. 2019	ISO 3529-1 (2019)
Ex. 2020	J. West, Special Communication from the American Physiological Society, <i>Barometric Pressure on to Mt. Everest: New Data and Physiological Significance</i> at 1063 (1999) (Downloaded from journals.physiology.org/journal/jappl (075.061.098.021) on August 7, 2024)

Ex. 2021	Duesenfeld GmbH Website – Recycling (https://www.duesenfeld.com/recycling_en.html) [https://perma.cc/3CG6-BDU9]
Ex. 2022	Ascend Technology Inc. Press Release
Ex. 2023	<i>Ascend Element, Inc.’s Answer to Complaint</i> , Case No. 1-23-cv-01194 (D. Del.)
Ex. 2024	Scheduling Order in Case No. 23-1194-JFM
Ex. 2025	Declaration of Vani Dantam in Support of the Patent Owner’s Response to Petition for <i>Inter Partes</i> Review, Case No. IPR2024-00887 (“Dantam POR Decl.”)
Ex. 2026	Sinothermo website available at: https://www.sinothermo.com/product-category/ https://www.sinothermo.com/news/different-types-of-convection-dryers/ https://www.sinothermo.com/products/ribbon-conical-vacuum-dryer/
Ex. 2027	V-ECO Series Rotary Shredders Brochure by Vecoplan
Ex. 2028	Amos Manufacturing Dual Shaft Shredders Brochure
Ex. 2029	Amos Manufacturing Quad Shaft Shredders Brochure
Ex. 2030	N. Somsuk et al., <i>Design and Development of a Rotary Airlock Valve for using in Continuous Pyrolysis Process to Improve Performance</i> , 2010 International Conference on Manufacturing Science and Technology (ICMST 2010)
Ex. 2031	<i>Duesenfeld GmbH v. Ascend Elements, Inc.</i> , No. 1:23-cv-01194-JFM (D. Del. Oct. 30, 2024), ECF No. 62
Ex. 2032	Boiling point for DMC available at: https://www.univarsolutions.com/dimethyl-carbonate-5004710?srsltid=AfmBOorjj92rfTGG8ShR_L1YJ7zHq_g7jd5HIM9uvXuqBooKXSIVZw8a
Ex. 2033	Boiling point for EMC available at: https://www.msесupplies.com/products/high-purity-ethyl-methyl-carbonate-c-4-h-8-o-3-99-99-4n?srsltid=AfmBOoqUr1g_4hUH5zYLI-kjf8M3Z-cqInYULkbD2h WRok0GU30TOI
Ex. 2034	[Reserved]
Ex. 2035	Confidential Appendix C to Declaration of Vani Dantam [PROTECTIVE ORDER MATERIAL]
Ex. 2036	Confidential Appendix D to Declaration Vani Dantam [PROTECTIVE ORDER MATERIAL]

Ex. 2037	Screenshots of YouTube Duesenfeld plant video found at https://www.youtube.com/watch?v=g1Ij4Emz8XQ (“How to recycle lithium-ion batteries? – Closing the loop in e-mobility”, Dec. 6, 2023)
Ex. 2038	[Reserved]
Ex. 2039	[Reserved]
Ex. 2040	Declaration of Lydia Grote in support of Patent Owner’s Response to the Petition (“Grote POR Declaration”) [PROTECTIVE ORDER MATERIAL]
Ex. 2041	Duesenfeld GmbH Wendeburg plant processing conditions [PROTECTIVE ORDER MATERIAL]
Ex. 2042	German regulations available at https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/kreislaufwirtschaftsgesetz_en_bf.pdf (English translation)
Ex. 2043	Certification from Braunschweig State Trade Supervisory Office to Duesenfeld (German) [PROTECTIVE ORDER MATERIAL]
Ex. 2044	Certification from Braunschweig State Trade Supervisory Office to Duesenfeld (English) [PROTECTIVE ORDER MATERIAL]
Ex. 2045	Translation Certification of Certification from Braunschweig State Trade Supervisory Office to Duesenfeld
Ex. 2046	Duesenfeld GmbH Preliminary Financial Statements 2021 and 2022 (German) [PROTECTIVE ORDER MATERIAL]
Ex. 2047	Duesenfeld GmbH Preliminary Financial Statements 2021 and 2022 (English) [PROTECTIVE ORDER MATERIAL]
Ex. 2048	Translation Certificates - Duesenfeld GmbH Preliminary Financial Statements 2021 and 2022
Ex. 2049	License Agreement [PROTECTIVE ORDER MATERIAL]
Ex. 2050	License Agreement [PROTECTIVE ORDER MATERIAL]
Ex. 2051	Press Release: <i>Seval and Riplastic will be the first industrial operators in Italy for the recycling of lithium-ion batteries</i> , dated June 11, 2024
Ex. 2052	Press Release: <i>Andritz and Duesenfeld sign cooperation agreement</i>

	<i>for battery recycling</i> , dated February 10, 2025
Ex. 2053	Duesenfeld Brochure: Ecofriendly Recycling of Lithium-Ion Batteries
Ex. 2054	U.S. Application No. 15/569,484 Specification
Ex. 2055	Emails of January 29, 2025 and February 6, 2025 requesting conference prior to motion to amend
Ex. 2056	Decision of the European Patent Office in Opposition Proceeding 16 719 400.0 relating to EP 3 289 627
Ex. 2057	Machine Translation of Decision of the European Patent Office in Opposition Proceeding 16 719 400.0 relating to EP 3 289 627
Ex. 2058	Complaint for Annulment of EP 3 312 922
Ex. 2059	Machine Translation of Complaint for Annulment of EP 3 312 922
Ex. 2060	Declaration of E. Borovik in Support of Motion for <i>Pro Hac Vice</i> Admission
Ex. 2061	Transcript of Volker Spies Deposition, Volume I, dated June 13, 2025
Ex. 2062	Transcript of Volker Spies Deposition, Volume II, dated June 16, 2025

Duesenfeld GmbH (“Patent Owner”) submits this reply to URT’s Opposition to the motion to amend (“Opp.”). The invention expressed in the proposed substitute claims is an elegant solution to problems in Lithium-ion battery recycling: the inactivation of battery material, with recovery of electrolyte solvents and salts, in a manner that generates essentially no Hydrogen Fluoride (“HF”) and renders the material safe for transport. *See* Patent Owner Response (“POR”), 1, 3-7, 53-61; EX2025, ¶¶57-60, ¶¶171-178. Tellingly, the prior art references cited by Petitioner either neglect or use complex alternative methods to deal with HF—and none comes close to suggesting the ’097 patent’s solution. EX2025, ¶¶50-56, 65-89; *infra*.

I. PETITIONER’S EXPERT DECLARATION IS NOT CREDIBLE

The Board should not credit the declaration testimony of Petitioner’s expert, Mr. Spies (EX1030). Mr. Spies claimed that he wrote his own declaration (EX2062, 162:5-163:5), but during his deposition, he demonstrated little knowledge of the declaration’s contents. For example, Mr. Spies’ declaration states that temperature and pressure are “result effective variable[s]” or “outcome-effective variables” (EX1030, ¶¶22, 38), but at his deposition, Mr. Spies did not have any understanding of these terms. EX2062, 138:21-139:8. His declaration states that he used the Wayback Machine to verify publication dates (EX1030, ¶50), but at his deposition, he did not know what the Wayback Machine was. EX2062, 139:21-24. His declaration relies on LithoRec at page 98 (EX1030, ¶18), but at his deposition Mr.

Spies did not recall having relied on it, and stated that he had last read the page “maybe a year ago”. EX2061, 34:25-35:7. His declaration relies on “vacuum shelf dryers” in Perry (EX1030, ¶¶16, 21) but at his deposition, Mr. Spies testified that vacuum shelf dryers would not be used. EX2061, 67:1-21. Mr. Spies’ apparent lack of knowledge concerning his declaration, despite his claim to having written it, indicates that his opinions are unreliable.

II. THE CONTINGENT AMENDED CLAIMS ARE PATENTABLE

A. Petitioner has Failed to Carry its Burden with Respect to LithoRec and Perry.

Drying at 300 hPa or less (all claims): Petitioner’s argument that “a POSITA would have known to optimize” relevant conditions is improper. First, Mr. Spies’ declaration (EX1030) is entitled to little weight, because his opinion is a bare conclusion expressed in two sentences in ¶22, and “does not disclose the underlying facts or data on which the opinion is based.” 37 C.F.R. § 42.65(a). Although he opines that temperature and pressure are “result-effective variables”, at his deposition he did not know those terms. EX2062, 138:21-139:8. Mr. Spies also cites Mr. Dantam’s deposition testimony (EX1039, 15:15-16:13), but Mr. Dantam’s testimony was about industrial processes *in general*, was not directed to the relevant timeframe, and did not reach a conclusion that variables were always optimizable. EX1039, 15:15-16:13. *See InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (testimony not directed to the time the invention was

made does not address the relevant inquiry for obviousness).

The other evidence indicates that the alleged “optimization” problem is much more complex than Mr. Spies suggests. Even if one decided to replace LithoRec’s dryer, there were “a large number of dryers that could have been used for lithium battery recycling drying” in the relevant timeframe. EX2061, 110:19-111:3. These dryers had different capabilities (e.g., temperatures and pressures). EX2062, 137:10-138:7. Thus, the framing of the “optimization” problem is already a form of hindsight-loaded bootstrapping: one does not “optimize the pressure, temperature, and duration of the drying process” at “plant setup” (EX1030, ¶¶22, 20) without already having chosen an overall recycling framework, and a corresponding dryer.

Even if one were to assume that a POSITA would target the claims of the ’097 patent when selecting a dryer, the “optimization” is complex. First, Mr. Spies’ declaration does not indicate what to optimize *for*—in other words, what is the “result” in the “result-effective variable”? One could have optimized for throughput, safety (including flammability, toxicity of solvents, and potential HF), level of drying, the maintenance of equipment, energy, environmental impact, and electrolyte solvent recoverability—each of which was important in designing a drying process. EX2061, 98:25-101:13.

The process variables, moreover, interact in complex ways, do not push all of the results in the same direction. Lower temperatures, for example, might reduce

the flammability risk of the solvents (EX1016, 226), but so does using an inert Nitrogen atmosphere (the approach LithoRec ultimately chose). EX2061, 10:25-12:2, 19:22-20:1; EX2062, 143:24-144:12. And *higher* temperatures increase drying speed (EX2061, 106:9-108:19), making them more desirable. *See Platinum Optics Tech. Inc. v. Viavi Sols. Inc.*, IPR2021-00631, 2022 WL 5056729, at *13 (PTAB Oct. 3, 2022). The relationship between temperature and drying rate is not entirely predictable, however, and “[t]here are many more factors you have to see”. EX2061, 107:4-108:19. These include the evaporation enthalpy of the solvents involved, interactions between solvents that affect relationship between temperature and drying time, and the nature (e.g. extent) of shredding of the solids. *Id.* at 105:21-108:19. Additionally, electrolyte solvents, according to Mr. Spies, exist in “thousands” of variations, and are the industry’s “best-kept secret[s]”. *Id.* at 101:17-102:13. To quote Petitioner’s expert, “It’s really complicated”. *Id.*

The pressure only adds to the complexity. Lowering the drying pressure can increase the rate of evaporation of solvents, but also decreases their condensability (and hence recoverability), requiring lower-temperature cooling media. EX2062, 136:4-137:9. Lower pressure also increases the rate of HF evaporation. EX2061, 111:17-112:1, 115:3-116:1. The stronger outgassing of HF requires a downstream scrubber (because the HF will not condense in solvent condenser EX2061, 115:3-116:1, EX2062, 130:21-132:1), requiring additional material and energy input. *Id.*

The HF also corrodes the pump. *Id.* at 133:5-11. The *level* of vacuum also interacts with other variables: stronger vacuums take longer to establish, correspondingly increasing energy consumption and cost, and reducing throughput. *Id.* at 150:5-12. Stronger vacuums are also harder to maintain, because they cause the evaporation of more solvent (thus increasing the dryer atmosphere pressure and acting against the vacuum), and can enhance leaks and condensation. EX1006, 12-66 (left column). The complexity of the art, including the many possible objectives, the many variables involved, and the complex interactions between variables and outcomes, demands a more thorough analysis than two conclusory sentences in an expert declaration—particularly when the expert did not understand the basis for his opinion. EX2062, 138:21-139:8. *See, e.g., ModernaTx, Inc. v. Arbutus Bioph. Corp.*, 18 F.4th 1364, 1374-75 (Fed. Cir. 2021); *HZNP Med. LLC v. Actavis Labs. UT, Inc.*, 940 F.3d 680, 703-04 (Fed. Cir. 2019); *Star Sci., Inc. v. R.J. Reynolds Tobacco Co.*, 655 F.3d 1364, 1376 (Fed. Cir. 2011).

A finding of “routine optimization” would be especially inappropriate in the presence of objective evidence of non-obviousness. POR, 53-61; EX2025, ¶¶171-178. The Preliminary Guidance (“PG”) discounted evidence of unexpected results, reasoning that PO had not argued “the proposed amended claims require the absence of ‘foreign substances’”, and that Mr. Dantam “does not explain why those results would have been unexpected”. PG, n.2-3. As to the first point, there is no

requirement that the “results” that are unexpected be recited in the claims. *See Application of Merchant*, 575 F.2d 865, 869-70 (CCPA 1978); *Preemption Devices, Inc. vs. Minnesota Mining & Manufacturing Co.*, 732 F.2d 903, 907 (Fed. Cir. 1984). As to the second point, no one knew it was possible to fully inactivate comminuted Lithium-ion battery material simply using low-pressure, low-temperature drying, in a manner that would not produce HF. None of the prior art teaches this. EX2061, 95:18-96:3; EX2025, ¶172. LithoRec uses an overpressure pre-dryer process, does not specify its pre-dryer temperature, does not claim to reduce HF (and in fact requires NaOH to produce NaF out of the exhaust gas). EX1016, 190, 226-227; EX2025, ¶¶172, 93-100, 121. Uchida and Mitsubishi use very different overall processes (*see below*). Uchida *provokes* LiPF₆ decomposition EX1026, ¶0079, EX2062, 159:2-10. Mitsubishi is silent on HF, and washes whole batteries with alcohol or water to remove fluorine. (EX1032, ¶¶0018, 0025-0026, 0041). As stated in *In re Adams*, “there is not the slightest suggestion that anyone knew of the existence of this inherent superiority until [the inventors] disclosed it.” 356 F.2d 998, 1003 (CCPA 1966). Even if one *were* to deconstruct the references and assemble, from the acquired parts, a system that resembled the claims, the argument would *at best* be that advantages of the ’097 patent are achieved *inherently* in a hypothetical combination—without a POSITA intending or even realizing it.

Beyond optimization, Petitioner also argues that Perry teaches—18 years

prior to the relevant timeframe—that vacuum shelf dryers operate between 1 and 24 mm Hg, while vacuum batch rotary dryers operate above 5 mm Hg. Opp., 11. Mr. Spies admitted at his deposition, however, that vacuum shelf dryers would not be used, because they lack “agitation to keep the material moving”. EX2061, 67:1-21, 65:19-24. This is consistent with LithoRec’s teaching away (“[O]nly dryers that can ensure material transport by exciting the flow bottom are suitable.”) EX1016, 227. As for vacuum batch rotary dryers, Perry at best discloses a wide range of pressures (anything above 5 mm Hg), and so adds nothing to LithoRec alone. Perry also cautions that it is often not economical to run a strong vacuum, guiding a POSITA away from the claimed range. EX1006, 12-66.

Batch mode drying (all claims): Petitioner’s arguments concerning “batch” drying fail to address the strength of the teaching away. The teaching away is not just based on LithoRec’s choice of dryers, but its *discussion* of that choice. LithoRec states that “[i]t 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. This is not merely a problem of a throughput that is mismatched with the shredder, as Petitioner contends, but a problem that slows down the throughput *overall*. In comparison to a continuous dryer, a batch dryer must go through a series of preparatory steps that consume time that could otherwise be used for drying. As

LithoRec explains, a dryer must first have its atmosphere rendered inert to remove water and oxygen, then the dryer needs to be filled, the dryer needs to be closed, the drying is carried out, and the dryer is opened and emptied. EX2062, 151:4-152:9. Furthermore, if a vacuum process is used (as argued by Petitioner), then the dryer must also be brought to vacuum level prior to drying. *Id.* This decreases overall throughput, which is a key consideration. EX2061, 99:8-18. LithoRec follows its discussion of batch drying by noting that a vibratory fluidized bed dryer is chosen because the solvents to be evaporated adhere to the arrestor foils, and the vibratory fluidized bed dryer is “very suitable for intensive drying”. EX1016, 226. LithoRec’s teachings would have led a POSITA “in a direction divergent from the path that was taken by the applicant.” *In re Mouttet*, 686 F.3d 1322, 1333-34 (Fed. Cir. 2012).

Petitioner argues that LithoRec can accommodate a batch dryer by simply slowing down the pre-shredder, citing p. 226 of LithoRec. Opp., 8. This argument is incorrect because p. 226 does not suggest slowing down the shredder to accommodate a slow dryer, but rather changing the intensity and duration of the shredder to achieve “desired degree of digestion”. EX1016, 226. Petitioner puts forward no evidence that the desired degree of digestion can simply be changed arbitrarily to accommodate the speed of a downstream batch dryer.

Petitioner also argues (Opp., 6-7) that a POSITA would have understood from LithoRec’s relative lack of detail in Fig. G-1, that the dryer type was left open. This

argument fails, because it is unreasonable to expect a complex lithium-ion battery recycling plant to be reduced in every detail to a box diagram on a single page, nor should that override the express discussion of the process.

Petitioner further argues that “[a] POSITA would be familiar with the benefits and tradeoffs of batch and continuous drying”, citing nine lines of Mr. Dantam’s deposition. But the question posed to Mr. Dantam was not directed to battery recycling or to the relevant timeframe. *See InTouch*, 51 F.3d at 1352. The testimony that *followed* Petitioner’s citation was at times limited to 2015, but there Mr. Dantam stated that a choice of dryers depended on the specific details of the application being considered. EX1039, 21:24-23:13. And the application being considered is LithoRec’s process—for which LithoRec already says it does not use batch drying.

Petitioner’s cited cases are inapposite: most simply hold that the claimed element need not be the *best* possible choice among others in the prior art. *See, e.g., In re Fulton*, 391 F.3d 1195, 1196-98, 1200 (Fed. Cir. 2004). But here the reference actively discourages the claim limitation. And even a teaching that might not quite be a “teaching away” is still relevant to obviousness. *See Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1363 (Fed. Cir. 2017). *Celeritas* and *Kalman* (Opp., 9) add nothing because they are directed to anticipation challenges. Here, Petitioner does not assert anticipation

Petitioner’s citation to Perry does not help its case. LithoRec teaches away

from Perry's vacuum shelf dryers (EX2061, 67:1-21), and the discussion of batch vacuum rotary dryers in Perry teaches away from the claimed pressure range, as discussed above. Nor does Petitioner make clear what the proposed combination is: for example, how LithoRec would be modified to accommodate which parts of Perry, with motivation and a reasonable expectation of success. This failure alone warrants rejection of the proposed combination. *See Eli Lilly & Co. v. Teva Pharms. Int'l GmbH*, 8 F.4th 1331, 1343-44 (Fed. Cir. 2021).

B. Petitioner has Failed to Carry its Burden with Respect to LithoRec and Uchida.

Petitioner adds Uchida for its alleged teaching of batch drying, as well as pressure and temperature conditions. The arguments above apply. Petitioner seems to argue that Uchida teaches drying near 24-25 °C at 33 hPa (Opp., 15, 18), but this is incorrect. The referenced numbers (at EX1026, ¶¶0078) are data relating the boiling point of DMC and EMC, not drying conditions used. Uchida's actual drying conditions are 50 kPa (500 hPa) of pressure (¶¶0074), and a *lowest* temperature at 85 °C. EX1026, Fig. 6, ¶¶0074, 0076; EX2062, 155:14-19.

Petitioner provides no motivation to take the increased difficulties of lower pressure nor the slower drying time of lower temperatures from Uchida. Uchida operates on whole batteries, so its drying conditions could not be expected to apply to shredded batteries. EX2061, 105:21-106:8. Moreover, Uchida appears to be drying to evaporate a specific ratio of particular solvents for reusability purposes

(¶0078) rather than drying to inactivate the battery material or prevent further electrochemical reactions. Uchida also expresses no concern about HF formation, and in fact provokes LiPF_6 decomposition. EX1026, ¶0079, EX1062, 159:2-10.

Petitioner argues in the alternative that Uchida has an “overlapping” pressure range (Opp., 16), but this is legal error. The “overlapping ranges” case law applies where the prior art differs from the claims *only* because it teaches a range that is overlapping with the claimed range. *See In re Kumar*, 418 F.3d 1361, 1366 (Fed. Cir. 2005); *Pharmacyclics LLC v. Alvogen, Inc.*, 2022 WL 16943006, at *9 (Fed. Cir. Nov. 15, 2022) (not applying range law where “there are additional differences between the prior art and [the claim]”). In the present case the reference that is said to teach the overlapping range (Uchida) is radically different from the proposed substitute claims, while LithoRec teaches no pressure range, and otherwise differs from the claims in several respects (see above). Moreover, the considerations above and EX2025, ¶¶172-178 rebut any presumption. *See DuPont v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018). With respect to batch drying, it is unclear what the Petitioner is proposing. Uchida has a “vacuum heating treatment apparatus” in Fig. 5 that operates with a specific and complex set of components used to perform a specialized method. EX1026, ¶¶0072-0079. Petitioner does not say whether the combination makes use of the entirety of Fig. 5, selected portions of it, or somehow modifies LithoRec’s vibratory fluidized bed dryer to using components or abstracted

conditions from Uchida. This is indicative of hindsight. *See Medtronic, Inc. v. Teleflex Innovations S.A.R.L.*, 70 F.4th 1331, 1347 (Fed. Cir. 2023). Petitioner also provides no motivation for any specific modification to LithoRec’s dryer, nor any argument that a POSITA would reasonably have expected success. *See Lilly*, 8 F.4th at 1343-44. These arguments are always mandatory, but critical in a complex art.

C. Petitioner has Failed to Carry its Burden with Respect to LithoRec, Perry, and Mitsubishi.

Petitioner’s optimization and overlapping range arguments fail for the reasons above. Petitioner also relies on Mitsubishi only for the *pressure* and *temperature* limitations. Opp., 19-25. Petitioner, however, ignores the substantial differences between LithoRec and Mitsubishi. Like Uchida, Mitsubishi processes *whole* batteries. EX1032, ¶¶0018, Fig. 1, ¶¶0005. Mitsubishi does not dry *comminuted* material, let alone dry comminuted material until inactivated (EX2061, 91:21-93:10; EX2062, 160:5-9), but washes with alcohol or water. EX1032 ¶¶0008; 0010. Indeed, Mitsubishi describes the need for washing the interior of the whole battery “multiple times” with water after ‘drying,’ suggesting that residual solvent is present after ‘drying.’ *Id.*, ¶¶0025-0026. Nor does Mitsubishi present a situation where mere optimization of ranges is all that stands between the prior art and the claimed invention. Instead, LithoRec and Mitsubishi represent materially different processes whose various parts are not simply interchangeable.

Date: <u>June 23, 2025</u>	<u>/Matthew A Smith/ (RN 49,003)</u> Matthew A. Smith Reg. No. 49,003 SMITH BALUCH LLP 700 Pennsylvania Ave. SE, 2nd floor Washington, DC 20003 (202) 669-6207 smith@smithbaluch.com <i>Counsel for Patent Owner</i>
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing Reply to Petitioner's Opposition to Patent Owner's Contingent Motion to Amend, together with all exhibits and other documents filed therewith, were served on June 23, 2025 on Petitioner's counsel of record in the above-referenced proceeding, by electronic mail directed to:

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