

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PROFRAC HOLDING CORPORATION
and
U.S. WELL SERVICES, LLC,
Petitioners,

v.

HALLIBURTON ENERGY SERVICES, INC.,
Patent Owner.

Case PGR2023-00023
Patent No. 11,373,058

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Patent Trial and Appeal Board
U.S. Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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PATENT OWNER'S SUR-REPLY

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2001	Memorandum from Director Katherine K. Vidal on Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022).
2002	U.S. District Courts – Federal Court Management Statistics (March 31, 2023) (W.D. Texas), <i>available at</i> https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0331.2023.pdf
2003	Dkt. 79, Agreed Amended Scheduling Order, <i>Halliburton Energy Servs., Inc. v. U.S. Well Servs., LLC</i> , No. 6:22-cv-00906-ADA-DTG (W.D. Tex. May 31, 2023)
2004	Dkt. 64, Order Setting <i>Markman</i> Hearing, <i>Halliburton Energy Servs., Inc. v. U.S. Well Servs., LLC</i> , No. 6:22-cv-00906-ADA-DTG (W.D. Tex. Mar. 27, 2023)
2005	Defendants’ Preliminary Invalidity Contentions, <i>Halliburton Energy Servs., Inc. v. U.S. Well Servs., LLC</i> , No. 6:22-cv-00906-ADA-DTG (W.D. Tex. Jan. 17, 2023)
2006	2019 Revised Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019)
2007	USPTO, <i>October 2019 Update: Subject Matter Eligibility</i> (Oct. 17, 2019), published at https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_update.pdf
2008	USPTO, <i>Appendix 1 to the October 2019 Update: Subject Matter Eligibility Life Sciences & Data Processing Examples</i> (Oct. 17, 2019), available at https://www.uspto.gov/sites/default/files/documents/peg_oct_2019_app1.pdf

2009	Website Printout from the Internet Archive – <i>Hydraulic fracturing</i> , SCHLUMBERGER OILFIELD GLOSSARY (Jul. 11, 2018), https://web.archive.org/web/20180711054502/http://www.glossary.oilfield.slb.com/Terms/h/hydraulic_fracturing.aspx
2010	Website Printout from the Internet Archive – <i>Stimulation</i> , SCHLUMBERGER OILFIELD GLOSSARY (Jul. 9, 2018), https://web.archive.org/web/20180703103747/http://glossary.oilfield.slb.com/en/Terms/s/stimulation.aspx
2011	Excerpts (pdf) of <i>Sequence</i> , NEW OXFORD AMERICAN DICTIONARY (3d ed. 2010).
2012	Excerpts (pdf) of <i>Sequence</i> , AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE (5th ed. 2016).
2013	Declaration of Dr. Robert A. Durham
2014	Transcript of Deposition of Dr. Michael Nikolaou (January 10, 2024)
2015	U.S. Patent No. RE44,973 E to Richardson et al. (Reissued July 1, 2014)
2016	Excerpts (pdf) of <i>Select</i> , MERRIAM-WEBSTER’S COLLEGIATE DICTIONARY (11th ed. 2014).
2017	Excerpts (pdf) of <i>Select</i> , THE AMERICAN HERITAGE DICTIONARY OF THE ENGLISH LANGUAGE (5th ed. 2016).
2018	Cambridge Dictionary, “Linear Equation,” available at https://dictionary.cambridge.org/dictionary/english/linear-equation (last visited February 12, 2024)
2019	Cambridge Dictionary, “Partial Differential Equation,” available at https://dictionary.cambridge.org/dictionary/english/partial-differential-equation (last visited February 12, 2024)
2020	Cambridge Dictionary, “Integral,” available at https://dictionary.cambridge.org/dictionary/english/integral (last visited February 12, 2024)

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<i>Ultramercial, Inc. v. Hulu, LLC</i> , 772 F.3d 709 (Fed. Cir. 2014)	6
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I. INTRODUCTION

Petitioners have not shown by a preponderance of the evidence that Claims 1-20 are unpatentable.

II. GROUND 5: THE CHALLENGED CLAIMS ARE PATENT-ELIGIBLE

A. Guidance Step 2A / Alice Step One.

1. The Reply demonstrates that the Petition’s alleged abstract idea is untethered to the claim language.

The Petition argued that Claim 1 is “directed to” the alleged abstract idea of selecting a plan for a desired result based on information received in response to one or more inquiries. Paper 2 (“Petition”), 87. Petitioners’ Reply now argues that “[t]he claims here are directed to mere automation of known fracturing steps.” Paper 16 (“Reply”), 16. Thus, the Reply confirms that the Petition’s alleged abstract idea—which does not even mention fracturing (or automation)—is “untethered to the invention as claimed.” *Mentone Sols. LLC v. Digi Int’l Inc.*, 2021 WL 5291802, at *6 (Fed. Cir. Nov. 15, 2021).

The Reply’s argument that the Petition’s alleged abstract idea is “not ‘untethered’ from the claims” because of the “parenthetical language” in the Petition is unavailing. Reply, 15. Petitioners provided similar parenthetical language purporting to map the same alleged abstract idea to the wholly unrelated technologies of allergy skin tests and wireless probe messages, which demonstrates

Petitioners’ failure to account for the specific requirements of Claim 1’s method for controlling electrical fracturing pumps. Petition, 87-88. When characterized at a high enough level, all claimed inventions “embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas.” *In re TLI Commc’ns LLC Patent Litg.*, 823 F.3d 607, 611 (Fed. Cir. 2016). For this reason, “[t]he Step 1 ‘directed to’ analysis ... depends on an accurate characterization of what the claims require and of what the patent asserts to be the claimed advance.” *TecSec, Inc. v. Adobe Inc.*, 978 F.3d 1278, 1294 (Fed. Cir. 2020). The Petition’s step one analysis, based on inaccurate characterizations of both, fails to meet Petitioners’ burden.

The Federal Circuit’s precedential opinion in *TecSec* contradicts Petitioners’ assertion that “[t]he Federal Circuit has repeatedly endorsed characterizing abstract ideas broadly.” Reply, 15. *Plotagraph Inc. v. Lightricks Ltd.*, 2024 WL 223185 (Fed. Cir. Jan 22, 2024), does not support Petitioners’ position. There, the abstract idea at issue was not “animation” as Petitioners state. Reply, 16. Rather, the district court found the claims “directed to the abstract idea of ‘shifting pixels to create the illusion of movement within an image[.]’” *Plotagraph*, 2024 WL 223185, at *2. The Federal Circuit accepted this characterization because it captured the steps involving shifting pixels recited in the claims and the specification “unambiguously describe[d] pixel-shifting as a way to create the illusion of movement.” *Id.* at *3. Similarly, in *In re Killian*, a claim reciting “a computerized method for determining

overlooked eligibility for social security disability insurance (SSDI)/adult child benefits” was found to be directed to the abstract idea of “a search algorithm for identifying people who may be eligible for SSDI benefits they are not receiving.” 45 F.4th 1373, 1378 (Fed. Cir. 2023). In both *Plotagraph* and *Killian*, the alleged abstract idea accurately characterized what the claim required and what the patent asserted to be the claimed advance. *See TecSec*, 978 F.3d at 1294. The alleged abstract idea in the Petition does neither.

2. Petitioners improperly shift theories.

In the Reply, Petitioners essentially abandon their argument that Claim 1 is directed to the alleged abstract idea relied upon in the Petition, arguing instead that the claims are “directed to mere automation of known fracturing steps.” Reply, 16; *see also* Reply 1, 13 (contending that “Claim 1’s focus on automating this process makes it an abstract idea”). This shift in theories in reply is improper and should not be considered. Consolidated Trial Practice Guide (Nov. 2019) (“CTPG”), 74 (A reply may not “proceed in a new direction with a new approach as compared to the positions taken in a prior filing.”).

Indeed, the Reply relies on fifty pages of new testimony from Dr. Nikolaou and seventeen new exhibits to support this previously undeveloped argument at *Alice* Step One/Guidance Step 2A. However, it is “improper for a reply to present new evidence (including new expert testimony) that could have been presented in a prior

filing[.]” CTPG at 74. In contrast, the Petition’s argument that the ’058 claims are directed to the alleged abstract idea of selecting a plan for a desired result relied solely on the ’058 Patent’s Background to argue that “[t]he claims are not directed to any improvements in computers *per se*, but merely to using computers to automate a process that the ’058 Patent ***admits*** was typically performed manually[.]” Petition, 90. The Board correctly rejected the Petition’s argument in the Institution Decision. Paper 9 (“Decision”), 23 n.4 (agreeing that “the Background does not support” Petitioners’ position and “does not appear to teach selecting a representative system model based on the sequence of stimuli”).

3. The Reply’s new Step One arguments fail to prove that the claims are directed to an abstract idea.

Even if considered, the Reply’s new arguments lack merit. First, Petitioners’ argument that “Claim 1’s focus on automating this process makes it an abstract idea” is conclusory and unsupported. Reply, 13. “[A]utomation alone is not necessarily abstract.” *EcoServices, LLC v. Certified Aviation Services, LLC*, 830 Fed. App’x. 634, 645 (Fed. Cir. 2020). Even if Claim 1 automates a known process (which is not the case), “automation of a task previously performed by humans ... does not mean the claimed system is necessarily directed to an abstract idea.” *Id.* at 643.

Petitioners cite *Chamberlain Grp. v. Techtronic Indus. Co.*, 935 F.3d 1341, 1346 (Fed. Cir. 2019) and *cxLoyalty, Inc. v. Maritz Holdings Inc.*, 986 F.3d 1367, 1377 (Fed. Cir. 2021) to support their argument that “Claim 1’s focus on automating

this process makes it an abstract idea.” Reply, 13. Neither case supports Petitioners’ position. *Chamberlain* did not involve “automation” or “automating” an alleged manual process. Rather, the court noted that the only difference between the prior art and the claimed system described in the specification “is that the status information about the system is communicated wirelessly” (instead of using physical signal paths). *Chamberlain*, 935 F.3d at 1346. This supported the conclusion that the claim was directed to “wirelessly communicating status information about a system[.]” *Id.* In *cxLoyalty*, the claims were abstract because they were “directed to transfers of information relating to a longstanding commercial practice[.]” 986 F.3d at 1377. Neither case supports a finding that the ’058 Patent claims related to controlling an electrical fracturing pump for fracturing a well are abstract.

“The second problem with [Petitioners’] position is that the subject matter eligibility analysis under section 101 is separate and apart from the novelty and obviousness considerations of sections 102 and 103.” *Dynaenergetics Europe GmbH v. Qinetiq Ltd.*, PGR2023-00003, Paper 19 at 18-19 (P.T.A.B. Apr. 11, 2024). Thus, Petitioners’ thirteen pages of new Step One argument purporting to show that each step of Claim 1 was, individually, conventional (Reply, 1-13) is irrelevant at *Alice* Step One / Guidance Step 2A and does not establish that Claim 1 is directed to an abstract idea. *See, e.g., Bilski v. Kappos*, 561 U.S. 593, 625 (2010) (explaining that novelty and obviousness are not relevant to a section 101 analysis);

Intellectual Ventures I LLC v. Symantec Corp., 838 F.3d 1307, 1315 (Fed. Cir. 2016) (explaining that the “novelty” of any element or steps in a process is not relevant in determining whether the claim falls within the § 101 categories of patentable subject matter); *Ultramercial, Inc. v. Hulu, LLC*, 772 F.3d 709, 715 (Fed. Cir. 2014) (“[A]ny novelty in implementation of the idea is a factor to be considered only in the second step of the *Alice* analysis.”); MPEP § 2106.04(d)(I) (“Step 2A specifically excludes consideration of whether the additional elements represent well-understood, routine, conventional activity”); Paper 14 (“POR”), 35-36.

A third problem with Petitioners’ new Reply arguments is that they address the claim elements individually, instead of considering the claim as a whole, and fail to address the specific requirements of the claim and the claimed advance. Thus, Petitioners have not proven the basis for their argument that Claim 1 is abstract (i.e., that Claim 1 merely automates a known process).

Petitioners acknowledge that Claim 1 “requires ‘selecting a representative system model based on the received formation response data **and** sequence of stimuli.’” Reply, 6 (emphases added). Petitioners’ eligibility arguments—in the Petition and the Reply—fail to address this aspect of the claimed invention. There is no counterpart for selecting the model based on the sequence of stimuli in the Petition’s alleged abstract idea. Petition, 87. The Reply similarly fails to address this specific requirement. Reply, 6-10. Rather, the Reply merely argues that

“[s]electing models ***based on response data*** from an injection test was also well-known and conventional.” *Id.* at 6-7.¹

Selecting the model based on both the formation response data and sequence of stimuli is part of the claimed advance of the '058 Patent. POR, 12-18. Petitioners' failure to account for this aspect of the claims in either the Petition's or the Reply's articulation of the alleged abstract idea confirms that both are “untethered” from the specific requirements of the claims. *Mentone Sols.*, 2021 WL 5291802, at *6 (rejecting challenge where the alleged abstract idea “fail[ed] to mention” key aspect of the claim).

Petitioners have not provided any analysis that supports reading this aspect of the invention out of the claims in the eligibility analysis. The plain language recites “selecting a representative system model based on the received formation response data and sequence of stimuli[.]” EX1001, 11:63-65; *see also Biogen Idec, Inc. v. GlaxoSmithKline LLC*, 713 F.3d 1090, 1094-95 (Fed. Cir. 2013) (recognizing the presumption of plain and ordinary meaning, considered in view of the intrinsic

¹ In contrast, Petitioners purport to map separate aspects of *Pankaj*'s disclosure to the claimed “formation response data” and “sequence of stimuli” in Ground 1. *See, e.g.*, Reply, 30, 32. Petitioners provide no such mapping to the new evidence relied upon in the Reply's Step One argument.

evidence). The plain and ordinary meaning of “and” is conjunctive. *See, e.g., Comaper Corp. v. Antec, Inc.*, 596 F.3d 1343, 1348 n.2 (Fed. Cir. 2010); *TIP Sys., LLC v. Phillips & Brooks/Gladwin, Inc.*, 529 F.3d 1364, 1376 (Fed. Cir. 2008) (affirming construction requiring connection “to **both** the said phone line **and** said electronic circuit board” based on claim’s conjunctive use of “and”). The specification further describes that:

Response variables (e.g., **responsive sensor data values**) **and** **respective stimuli** (e.g., experimental data) can be used to select, define, and/or construct a representative system model. For example, **stimuli and response combination** can be mapped to respective system models maintained in an accessible data store.

EX1001, 3:44-49 (emphases added).² Had the patentee intended to claim selecting a model based only on the received formation response data, it could have left out

² Although not discussed in the Reply, Petitioners cite paragraph 20 of Dr. Nikolaou’s supplemental declaration. Reply, 7 (citing “EX-1050, ¶¶20-30”). Dr. Nikolaou opines that a “POSITA would have understood that the representative system models are selected based on the formation response data received in response to the sequence of stimuli[.]” EX1050, ¶20. Like Petitioners, Dr. Nikolaou ignores the plain language of the claim and relevant evidence in the intrinsic record. *See* EX1001, 3:44-49.

the “and sequence of stimuli” language.

Accordingly, the Reply, like the Petition, fails to show that “each claim 1 step was well-known and conventional” or that the “focus” of Claim 1 is merely the automation of a known process. Reply, 13.

4. The Reply arguments confirm Claim 1 integrates the Petition’s alleged abstract idea into a practical application.

Petitioners’ new arguments and new evidence demonstrate that the elements of Claim 1, considered as a whole, integrate the Petition’s overbroad alleged abstract idea into a practical application of that idea. Petitioners present thirteen pages of argument that highlights the practical, real-world application of the claimed technology in the oil and gas industry. Petitioners’ new evidence regarding step-rate tests and “mini-frac” testing—neither of which were mentioned in the Petition—merely goes to show that there is nothing abstract about altering pump rates, determining a well’s response, and controlling a fracturing pump to fracture a well.

Rather, stimulating a well using a sequence of stimuli (e.g., varying pump rate) to generate a response from the formation and controlling electrical fracturing pumps based on a representative system model are “events that take[] place in the 3-dimensional physical world. It is not merely an output or display of information. It is something more substantial than mere insignificant extra-solution activity.” *Dynaenergetics*, PGR2023-00003, Paper 19 at 21. Claim 1 is directed to an improved approach for controlling electrical fracturing pumps for fracturing a well,

which is “a practical application of the abstract ideas” allegedly encompassed by selecting a plan for a desired result based on information received in response to one or more inquiries. *Id.* at 21-22. Accordingly, Claim 1 is eligible.

Moreover, Petitioners’ Reply does not substantively dispute that the claimed invention improves fracturing operations as explained in the POR. POR, 28-35. Rather, the Reply merely argues that there is no improvement or practical application at Step 2A, Prong 2, “because the limitations were well-known and used in their conventional manner.” Reply, 19. As noted above, however, “Step 2A specifically excludes consideration of whether the additional elements represent well-understood, routine, conventional activity.” MPEP § 2106.04(d)(I); *see also* MPEP § 2106.04(d)(I) (“well-understood, routine, conventional activity may integrate a recited judicial exception into a practical application”). Even if some elements were known, the claim as a whole is “directed to a specific combination of” steps “configured in a certain way to create technical improvements to systems for” controlling electric fracturing pumps. *EcoServices*, 830 Fed. App’x. at 643.

Petitioners rely on *Ex Parte Fung*, 2019 Pat. App. LEXIS 3189, *31 (PTAB May 1, 2019), and *Ex Parte Allen*, 2022 Pat. App. LEXIS 2811, *16 (PTAB May 26, 2022), to argue that the claims do not integrate the alleged abstract idea into a practical application. Reply, 19. Those cases are distinguishable. In *Ex Parte Fung*, the only additional elements were “(1) *computer-implemented* method; (2)

performing various steps “*by one or more processors*”; and (3) “*providing ... the near-well unstructured grid to a parallel reservoir simulator[.]*” 2019 Pat. App. LEXIS 3189, *26. As to (1) and (2), the Board found that they apply the abstract idea on a computer. *Id.*, *31. As to (3), the Board found that providing the unstructured grid to a simulator was “ancillary to the claimed invention,” which focused on “generating a near-well unstructured grid[.]” *Id.*, *33. *Ex Parte Allen* similarly involved “a processor, communication interface, and memory” that “did not improve the functioning of computers or technology.” 2022 Pat. App. LEXIS 2811, *16.

The additional elements in ’058 Patent Claim 1 go well beyond those in *Ex Parte Fung* and *Ex Parte Allen*. As the Board recognized, “[t]he Petition does not characterize ‘[t]he claimed steps of applying a sequence of stimuli and receiving sensor data’ as part of the abstract idea[.]” Decision, 21. Furthermore, the real-world step of “controlling an electrical fracturing pump based on the representative system model” in Claim 1 is not merely ancillary to the claim’s focus of improved

control of electrical fracturing equipment for fracturing a well. EX1001, 11:54-67.³

5. Petitioners fail to distinguish the cases supporting the eligibility of the '058 Patent's claims.

The Reply argues that Patent Owner's "case law is distinguishable," but its arguments amount to little more than pointing out that some cases involved technology from different fields. Reply, 14. The reasoning underlying the decisions, which Petitioners do not meaningfully engage with, supports a finding that the '058 Patent claims are eligible.

Petitioners' suggestion that *Diamond v. Diehr*, 450 U.S. 175 (1981), is inapt because the '058 Patent's claims do not transform uncured synthetic rubber into a different state reflects too narrow a reading of that case. Reply, 14. The claims of the '058 Patent similarly solve a practical problem—control of electrical fracturing pumps to effectively fracture a well—that transforms not only the way the electrical fracturing pump is operated, but also involves physical transformation of the formation (e.g., the generation of fractures) through a sequence of stimuli applied to the well environment. *Diamond* thus supports a conclusion that such an industrial

³ Contrary to Petitioners' assertions, the '058 Patent claims do more than merely limit the field of use of the abstract idea to a technological environment. Reply, 14. The claims do not merely recite the abstract idea of selecting a plan for a desired result on a generic computer.

process is eligible.

Petitioners fail to distinguish the '058 Patent claims from the eligible claim in *EcoServices*, 830 Fed. App'x at 636. Reply, 16. Petitioners do not dispute that each element of '058 Patent Claim 1 has a clear analogue in the claim in *EcoServices*. POR, 37-39. Rather, Petitioners cite the patentee's (not the court's) characterization of the claims as “directed to systems that use certain hardware in a non-conventional manner” and suggest that '058 Patent Claim 1 is distinct because it is a method and not a system. Reply 16. The recitation of “a washing unit,” “an information detector,” and “a control unit” does not meaningfully distinguish the *EcoServices* claim from '058 Patent Claim 1—the claims are analogous for the reasons explained in the POR. POR, 37-38. And *EcoServices* contradicts Petitioners' argument that Claim 1 is abstract because it allegedly automates known fracturing steps. 830 Fed. App'x. at 643 (“[T]he fact that the claims require an ‘information unit’ that can be a computer and that, therefore, the system provides an improvement over human-operated engine washing does not necessarily mean the claims are directed to an abstract idea.”).

Claim 1 is also distinguishable from the claim in *Ficep Corp. v. Peddinghaus Corp.*, 2023 WL 5346043 (Fed. Cir. Aug 21, 2023). In *Ficep*, the focus of the claimed advance was “automating a previously manual process of transferring information [intersection parameters] from a CAD design model to a manufacturing

machine” to reduce human error, and the claim did not require any “novel means of garnering the intersection parameters[.]” *Id.* at *3-4. Here, in contrast, Claim 1 does not seek to merely reduce human error, but rather to improve fracturing operations by using a representative system model that more accurately reflects the well to which it is deployed. POR, 12-18, 28-35. Claim 1 does not merely automate a previously manual process. *Supra*, §II.A.3; POR, 25-26; Decision at 23, n. 4. Furthermore, unlike *Ficep*, Claim 1 uses a novel approach to select the representative system model (*i.e.*, “based on the received formation response data ***and sequence of stimuli***”).

Finally, Petitioners’ argument that Claim 1 is akin to the claim in *Automated Middleware Solutions* merely highlights Petitioners’ failure to consider the claim as a whole. Petitioners’ isolated focus on the control command and operating a motion control device overlooks that the claims in *Automated Middleware Solutions* were directed to the abstract idea of a middle translating layer, which has no analogue in ’058 Patent Claim 1. POR, 43-44.

A. The challenged claims are eligible at Guidance Step 2B / Alice Step Two.

It was Petitioners’ burden to prove, in the Petition, that the claims fail to recite an inventive concept. 35 U.S.C. § 326(e). The POR explained how the Petition failed to meet its burden to show that the claim elements (alone and in combination) recite no more than conventional activity. POR, 51-58. For Claim 1, the POR

explained how neither *Pankaj* (EX1005) nor *Gottumukkala* (EX1014) disclosed generating a sequence of stimuli for application to a well environment as claimed. POR, 51-54. The POR also explained how Petitioners introduced no evidence that it was conventional to select a representative system model based on both a particular sequence of stimuli applied to the well and the formation response data. POR, 54-55.

In the Reply, Petitioners do not respond by explaining how the evidence relied upon *in the Petition* demonstrates that the claimed elements were conventional. Instead, Petitioners rely on fifty pages of new expert testimony and seventeen new exhibits, which only highlight the gaps in the Petition. For example, rather than attempt to show how *Gottumukkala*'s manipulation of flow control valves discloses generating a sequence of stimuli as alleged in the Petition, Petitioners rely on at least ten new exhibits describing step-rate and mini-frac tests—which were never raised in the Petition. *See, e.g.*, Reply, 1-5, 18 (citing Reply, 1-13 in Step-Two analysis).

It is “improper for a reply to present new evidence (including new expert testimony) that could have been presented in a prior filing ... to ‘gap-fill’ by teaching a claim element that was not present in the prior art presented with the petition.” CTPG at 74-75; *see also id.* at 74 (“Examples of indications that a new issue has been raised in a reply include new evidence necessary to make out a *prima facie* case for the patentability or unpatentability of an original or proposed substitute

claim[.]”). Accordingly, Petitioners’ reliance on new evidence in Reply is improper, and merely goes to show that Petitioners failed to meet their burden in the Petition.

Despite Petitioners’ new evidence, Petitioners still fail to show that the additional elements of Claim 1 were conventional. Petitioners’ eligibility analysis never even attempts to show that it was well understood, routine, and conventional to select a representative system model based on the received formation response data ***and sequence of stimuli*** as claimed. At Step Two, Petitioners cite the Reply’s Step One analysis and allege that “myriad art show[s] that models are selected exactly this way.” Reply, 18 (citing Reply, 6-10). But the Step One analysis, which relies entirely on new evidence, conclusory assertions and unexplained excerpts, purports to show little more than “model selection based on sensor data[.]” Reply, 8, 6-10.

Thus, the Reply does not remedy the Petition’s failure to show that the additional limitations were conventional and do not constitute inventive concepts. Moreover, the Reply, like the Petition, merely addresses each element individually, which highlights Petitioners’ continued failure to consider the claims as an ordered combination. *See Intermix Media, LLC v. Bally Gaming, Inc.*, CBM2015-00154, Paper 10 at 7-8 (PTAB Jan. 20, 2016).

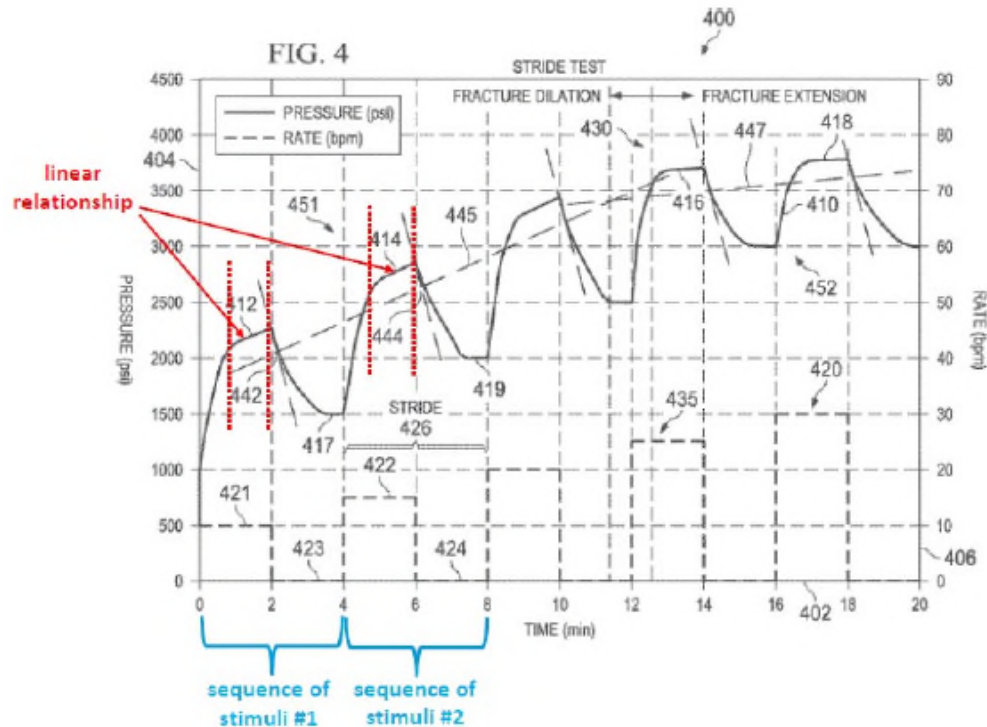
1. The Reply fails to remedy the Petition’s deficiencies with respect to the dependent claims.

Claims 2, 10, 17. The Reply does not dispute that the reference relied upon

in the Petition (Rashid (EX1018)) does not teach retrieving a representative system model from a data store based on received formation response data. POR, 55-57; EX2014, 72:5-75:7. Rather, the Reply cites its discussion of the new evidence relied upon for the “selecting” step of Claim 1 and asserts in conclusory fashion that “[t]he references discussed herein confirm that retrieving models from memory ‘based on’ sensor data was known and conventional.” Reply, 19 (citing Reply, 6-10). At no point, however, does the Reply’s discussion of the “selecting” step address how a model is retrieved from memory, let alone establish that it was conventional to do so “based on sensor data” as claimed.

Claims 4, 12, 19. The POR explained how the Petition failed to show that the additional elements in these claims were conventional. POR, 57. The Reply does not defend the Petition’s evidence (*Pankaj* (EX1005) and *Husen* (EX1013)), but instead relies on new evidence and a new theory based on step-rate tests raised for the first time in the Reply, which should not be considered. Reply, 20-23.

Nevertheless, Petitioners still fail to meet their burden. Petitioners argue that “[i]njection tests plot the relationship between pump rate(s) and the measured pressure, and repeatedly update the relationship based on multiple changes (“iterations”) of the pump rate.” See, *e.g.*, Reply, 20-21. Petitioners rely on annotated Figure 4 of new EX1038 (shown below):



Reply, 22. At a minimum, Petitioners’ argument fails because the claims require “updating the one of the linear or the non-linear relationship based on multiple iterations of *the* generated sequence of stimuli.” EX1001, 12:12-14. The plain and ordinary meaning of “iteration” is “repetition of an action or process[.]”⁴ As shown in the annotated figure above, Petitioners rely on the combination of an injection period and a shut-in interval (e.g., injection period 421 and shut-in interval 423) as disclosing the “sequence of stimuli.” However, the pump rate of injection period 421 (relied upon as part of “sequence of stimuli #1”) is *different* from the pump rate in injection period 422 (relied upon as part of “sequence of stimuli #2”). EX1038,

⁴ See Oxford English Dictionary (available at <https://www.oed.com/search/dictionary/?scope=Entries&q=iteration>)

Fig. 4; Reply, 22. Because the pump rates are different, there is no teaching of updating “based on multiple iterations of the generated sequence of stimuli” (i.e., the same sequence of stimuli). The cited portions of the other new references Petitioners cite (EX1033, EX1043) merely disclose plotting injection rates and corresponding pressure, with no explanation (in the references or Reply) regarding how this teaches updating any relationship based on multiple iterations of the generated sequence of stimuli.

Claims 5, 13. Petitioners have not shown that it was conventional to use the data from the one or more downhole sensors or surface sensors to “determine changes in flow distribution in response to a diverter drop, the changes in flow distribution used to determine the representative system model as claimed.” EX1001, 12:15-19. Similar to the Petition, the Reply attempts to cobble together various portions of different new references to arrive at these claims. Reply, 23-27. This obviousness-type analysis fails to show that these claims were conventional for purposes of an eligibility analysis.

Moreover, the Reply merely purports to show that it was known to measure the pressure response to diverters, not “determine changes in flow distribution in response to a diverter drop” and use “the changes in flow distribution ... to determine the representative system model.” Reply, 26; EX1001, 12:15-19. The ’058 Patent distinguishes between pressure and flow distribution. EX1001, 2:33-37 (describing

“response variables (e.g., responsive sensor data values such as pressure or flow distribution or microseismic events or strain events)”). Dr. Nikolaou’s original declaration provides no support for Petitioners’ conclusory assertion that “[a] POSITA would have recognized that these pressure changes before and after a diverter represent ‘changes in flow distribution[.]’” Petition, 103 (citing EX1003, ¶¶192-193). Petitioners have not met their burden with respect to Claims 5 and 13.

III. PETITIONERS HAVE NOT SHOWN THAT THE CHALLENGED CLAIMS WOULD HAVE BEEN OBVIOUS

A. Claims 1, 9, and 16

1. Limitations [1A], [9A], and [16A]

Petitioners argue the language “for application to a well environment” is intended use language and not entitled to patentable weight. But the two cases Petitioners cite both address intended use language in preambles and different language than at issue here. And notably, “application to a well environment” is a fundamental characteristic and the essence of the claimed invention of the ’058 Patent thus making it a limitation. *See Vizio, Inc. v. Int’l Trade Comm’n*, 605 F.3d 1330, 1340 (Fed. Cir. 2010) (“[T]he ‘for decoding’ language ... is properly construed as a claim limitation, and not merely a statement of purpose or intended use for the invention, because ‘decoding’ is the essence or a fundamental characteristic of the claimed invention.”); *see also In re Jasinski*, 508 Fed. App’x. 950 (Fed. Cir. 2013). Moreover, the phrase provides context for understanding the

generation of a sequence of stimuli limitation – namely that the sequence is generated before any application.

Petitioners newly identify Table 1 of *Pankaj* as allegedly showing limitation [1C]. But this table shows input wellsite data for a **fracture simulator**. EX1005, [0116]. It does not describe generation of a sequence of stimuli upon which formation response data from downhole or surface sensors is received for selection of a representative system model and controlling a fracturing pump.

2. Limitations [1C], [9C], and [16C]

Petitioners argue PO’s references to the specification are improper when addressing the meaning of “selecting a representative system model.” But the Board is to construe claims “by taking into account the claim language itself, **the specification**, the prosecution history of the patent, and extrinsic evidence, among other things, as briefed by the parties.” 83 Fed. Reg. 51340, 51343; *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

Recognizing its problem that relying on *Pankaj*’s updated mechanical earth model cannot satisfy the limitation requiring “selecting” a representative system model, Petitioners argue that its original theory was that the limitation would have been obvious and suggests that *Pankaj*’s models are “built-in” and predetermined. Reply, fn. 7. First, Petitioners explicitly stated limitation [1C] was disclosed – and not rendered obvious – by *Pankaj*. Petition, 45 (“Pankaj discloses this.”), 48 (“[A]

POSITA would have understood that these disclosures teach the updated mechanical earth model is selected”). Second, Petitioners’ footnote reference to “built-in” models citing the portion of the Petition addressing Claim 2 is still insufficient. In this portion the Petition quotes *Pankaj*’s statement that “[s]imulators . . . may have built-in unconventional hydraulic fracture models like UFM (or other unconventional fracture models)” Petition, 53 (citing EX1005, [0075]). But a UFM is not a model, let alone a representative system model selected as claimed. It is a software simulator. EX1005, [0031]; EX2014, 49:24-50:11; EX2013, ¶ 71. Moreover, any reliance on a “built-in” model in *Pankaj* is inconsistent with Petitioners’ theory that it is *Pankaj*’s updated mechanical earth model that is selected and upon which the pump is controlled to satisfy limitation [1D]. Petition, 48; Decision, 11. *Pankaj* only discloses use of the *updated* model for steps 1180 and 1182 on which Petitioners rely for limitation [1D].

B. Claims 2, 10, and 17

In its Reply, Petitioners assert that in *Pankaj* the model is provided based on *Pankaj* “describing a UFM as being modeled from wellsite data.” Reply, 33. This does not align with Petitioners’ invalidity theory. First, as noted above a UFM is a software simulator and not a model. *See, supra*, III.A.1. Second, Petitioners’ invalidity theory relies on the “updated mechanical earth model” allegedly being selected to satisfy limitation [1D]. Petition 48, Decision 11. The portion of *Pankaj*

referenced in the Reply stating a model is “provided” relates to *existing* MEMs, and not the *updated* mechanical earth model on which Petitioners’ theory relies. Reply, 33 (citing EX1005, [0099]).

Petitioners also assert that *Pankaj*’s “MEM is selected based on wellsite data” and references pages 45-47 of the Petition. Reply, 33. But in these pages Petitioners assert *Pankaj* discloses selecting *existing* models. Again, Petitioners’ invalidity theory replies on *Pankaj*’s use of the “updated” mechanical earth model and not any “existing” model. This is because, as noted above, *Pankaj* only discloses use of the *updated* model for steps 1180 and 1182 on which Petitioners rely for limitation [1D].

C. Claims 4, 12, and 19

The Reply’s discussion of Claim 4 is all attorney argument without any expert support. Petitioners continue to refer to equations (1)-(5) as “linear” without any support and without responding to PO’s and Dr. Durham’s explanation as to why the equations are not linear. Reply, 33. Subsequently, Petitioners suggest that if the equations are not linear then they are non-linear and fall within scope of the claim. Reply, 35. Petitioners, however, cannot reverse their invalidity theory in the Reply. 37 CFR 42.104(b)(4); *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1357 (2018); CTPG, 74.

In response to PO’s showing that there is no disclosure in *Pankaj* of any relationship between formation response data and the sequence of stimuli as

required, the Reply suggests that the equations show a relationship “between a flow rate (*‘sequence of stimuli’*) and wellsite data (*‘formation response data’*).” But as explained by Dr. Durham (and not disputed by Petitioners’ expert), the flow parameter of the equations is flow inside a fracture and not sequence of stimuli or pump rate. EX2013, ¶¶115-117.

The Reply’s arguments regarding the “updating” limitation of Claim 4 fail to explain how the *Pankaj* disclosures upon which the Petition relies for this limitation relate to equations (1)-(5) relied on for determining a linear relationship between the sequence of stimuli and received formation response data. Petitioners instead appear to present a new theory based solely on attorney argument. Moreover, Petitioners’ reliance on Figure 4.2 is misplaced as it shows use of “simulations to design operations” as opposed to updating the relationship between the sequence of stimuli and the actually received formation response data based on multiple iterations.

D. Claims 5 and 13

Petitioners and their expert argued that it would be obvious to combine *Dawson* with *Pankaj* to allow for a more effective assessment of a diverter or to more accurately represent a well with a diverter. Petition, 66-67; EX1003, ¶154-55. As explained in the POR, these reasons to combine do not withstand scrutiny given *Pankaj* does not even use a diverter. Petitioners’ Reply does not address or explain why it would be obvious to more effectively assess a diverter or more accurately

represent a well with a diverter in a system without a diverter. Reply, 36-37. The Reply, relying only upon attorney argument and without expert support, merely suggests that a diverter could be used in *Pankaj*'s operation. *Id.* Petitioners have not shown dependent Claims 5 and 13 would have been obvious.

IV. CONCLUSION

Patent Owner respectfully requests that the Board uphold the validity of the Challenged Claims.

Date: July 3, 2024

Respectfully submitted,
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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing **PATENT OWNER'S SUR-REPLY** contains 5,591 words, exclusive of the exempted portions provided in 37 C.F.R. § 42.24(c), as measured by the word-processing system used to prepare this paper, and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(c)(4).

Dated: July 3, 2024

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CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 3rd day of July, 2024, a complete and entire copy of PATENT OWNER'S SUR-REPLY was served on Petitioners via electronic mail at the following addresses:

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