

NOTE: This disposition is nonprecedential.

**United States Court of Appeals
for the Federal Circuit**

ECOSERVICES, LLC,
Plaintiff-Appellee

v.

CERTIFIED AVIATION SERVICES, LLC,
Defendant-Appellant

2019-1602

Appeal from the United States District Court for the
Central District of California in No. 5:16-cv-01824-RSWL-
SP, Senior Judge Ronald S.W. Lew.

Decided: October 8, 2020

JONATHAN WEINBERG, King & Spalding LLP, Washing-
ton, DC, argued for defendant-appellant. Also represented
by STEPHEN ERIC BASKIN, DARA KURLANCHEEK, JESSE
SNYDER.

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DC, argued for plaintiff-appellee. Also represented by
MYOMI TSE COAD, PATRICK MCCARTHY.

Before DYK, SCHALL, and O'MALLEY, *Circuit Judges*.

Opinion for the court filed by *Circuit Judge* SCHALL.

Opinion concurring-in-part and dissenting-in-part filed by
Circuit Judge DYK.

SCHALL, *Circuit Judge*.

This is an appeal from a final judgment of the United States District Court for the Central District of California in a patent infringement case. EcoServices, LLC (“EcoServices”) sued Certified Aviation Services, LLC (“CAS”) in the district court for infringement of two patents pertaining to washing airplane engines: U.S. Patent No. 9,162,262 (“the ’262 patent”) and U.S. Patent No. 5,868,860 (“the ’860 patent”). Following a trial, the jury returned a verdict (1) that CAS infringed claims 1, 9, and 14 of the ’262 patent; (2) that claims 1, 9, and 14 of the ’262 patent are not invalid; and (3) that CAS willfully infringed claims 1 and 2 of the ’860 patent, which expired on May 31, 2016, before trial. The jury awarded EcoServices damages in the amount of \$1,949,600. In due course, the district court denied various post-trial motions by CAS pertaining to the eligibility for patenting of the asserted claims of the ’262 patent under 35 U.S.C. § 101 and pertaining to the validity and infringement of those claims. The court also denied CAS’s post-trial motions arguing that claims 1 and 2 of the ’860 patent, the patent’s sole claims, are indefinite¹ and were not infringed. Finally, the court denied CAS’s challenge to the damages awarded by the jury and its challenges to the court’s supplemental damages award of \$175,000 and the ongoing royalty rate set by the court for the ’262 patent. Following the entry of judgment, CAS

¹ Even though the ’860 patent has expired, when referencing it, we use the present tense.

timely appealed. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

For the reasons stated below, we hold that claims 1, 9, and 14 of the '262 patent are eligible for patenting, that the district court did not err in its construction of the term "information detector" appearing in those claims, and that those claims are not invalid and were infringed. We therefore *affirm* the judgment of infringement of claims 1, 9, and 14 of the '262 patent. For the reasons stated below, we also hold that claims 1 and 2 of the expired '860 patent are not indefinite and were infringed. We therefore *affirm* the judgment of infringement of the '860 patent.² We also hold, however, that the district court abused its discretion in awarding supplemental damages and an ongoing royalty based upon a rate of \$400 per infringing engine wash. Accordingly, we *vacate* the district court's supplemental damages award and its determination as to an ongoing royalty. The case is *remanded* to the district court for a redetermination of the proper supplemental damages and ongoing royalty.

BACKGROUND

I.

After a jet engine is operated for an extended period of time, foreign particles and/or contaminants build up inside the engine. '262 patent col. 1 ll. 52–54. This results in less engine power output; to compensate, the engine has to work harder and burn more fuel, which increases its internal temperature, shortens engine life, costs more, and produces more greenhouse gases. The '262 patent and the '860 patent are directed to systems used to wash the inside of a jet engine to remove contaminants.

² CAS has not challenged the jury's verdict that CAS's infringement of the '860 patent was willful.

The '262 patent is titled “Automated Detection and Control System and Method for High Pressure Water Wash Application and Collection Applied to Aero Compressor Washing” and issued on October 20, 2015. The '262 patent describes a system for automatically controlling a washing procedure according to the requirements of the particular engine being washed. *Id.* at col. 5 ll. 18–22, col. 6 ll. 35–46. According to the '262 patent, it is disadvantageous for a human operator to manually set up the cleaning system and control its operation because “the human factor jeopardizes the result.” *Id.* at col. 3 ll. 44–58. This is particularly so, the '262 patent explains, because “many engine washing operations are performed during night-time when the operators may not be fully alert.” *Id.* at col. 3 ll. 58–60. The specification explains that “[i]t would therefore be beneficial for such a closed loop washing process if the influence of the human factor is minimized as much as possible.” *Id.* at col. 3 ll. 65–67. Independent claim 1 of the '262 patent recites:

1. A system for washing turbine engines comprising:
 - a washing unit for providing a washing liquid to the turbine engines;
 - an information detector configured to gather information related to engine type; and
 - a control unit configured to accept the information related to engine type from the information detector and to determine a washing program to be used as a function of the information relating to engine type from a set of preprogrammed washing programs, and further configured to regulate the washing unit according to washing parameters associated with the washing program used.

Id. at col. 8 ll. 35–47. Claim 9 depends from claim 1 and additionally requires that “the information provided by the information detector is used by the control unit to regulate a washing time.” *Id.* at col. 9 ll. 11–13. Independent claim

14 is similar to claim 1, but recites that the information detector can provide information “identifying at least one of washing unit and engine type.” *Id.* at col. 10 ll. 14–26.

The ’860 patent, titled “Method of Washing Objects, Such as Turbine Compressors,” is directed to a method of washing turbine compressors using small quantities of finely-divided liquid that are sprayed through the engine. Independent claim 1 recites:

1. A method of washing turbine compressors, which operate with large quantities of air and therefore become internally soiled by and coated with contaminants carried by the air, therewith giving rise to greater fuel consumption, higher temperatures and higher emissions with substantially impaired efficiency as a result thereof, wherein small quantities of finely-divided liquid are sprayed onto and through the turbine compressors, characterized by running the turbine compressors and spraying the finely-divided liquid quantities through at least one nozzle towards and through the turbine compressor at an overpressure within the range of 50–80 bars and at a liquid particle size in the range of 250–120 μ m, and with a total volumetric flow through the nozzle or nozzles within the range of 0.5–60 l/min., and with a liquid particle velocity of 100–126 m/sec., whereby the liquid is finely-divided to a degree at which the particles of liquid will follow the same routes through the turbine compressor as those previously taken by the air-borne contaminants, when spraying said liquid onto and through said turbine compressor.

’860 patent col. 3 l. 17–col. 4 l. 16. Dependent claim 2 requires “using a total volumetric liquid flow within the range of 2–60 l/min.” *Id.* at col. 4 ll. 17–18.

II.

EcoServices sued CAS in the Southern District of Florida for infringement of the '262 and '860 patents through CAS's use of the Cyclean® Engine Wash system ("Cyclean®"), which was developed by Lufthansa Technik AG. The case was later transferred to the Central District of California.

In its claim construction order, the district court rejected CAS's proposed construction of the '262 patent claim term "information detector" that required that the "information detector" must receive information from an "information unit," such as an RFID chip. Order re: Claim Construction of Disputed Terms, *EcoServices, LLC, v. Certified Aviation Servs. LLC*, 16-1824-RSWL-SPx, Dkt. No. 80 (May 18, 2017), at 10–12. In doing so, the court stated it was "declin[ing] to import a limitation into the claims from a preferred embodiment." *Id.* at 12. Instead, the court accepted EcoServices' proposed construction, which was to use the term's plain and ordinary meaning. *See id.* The district court also determined that CAS had failed to prove by clear and convincing evidence that the '860 patent claim term "small quantities of finely-divided liquid" was indefinite. *Id.* at 10.

A jury trial began on June 26, 2018. As noted, in its July 2, 2018 verdict, the jury concluded that (1) CAS infringed claims 1, 9, and 14 of the '262 patent, (2) claims 1, 9, and 14 of the '262 patent were not invalid, and (3) CAS willfully infringed claims 1 and 2 of the '860 patent. The jury awarded EcoServices damages of \$1,949,600 for the infringement of both patents, which corresponded to \$400 per engine wash that CAS had performed through the end of December of 2017, the parties' original trial date. After the verdict, in an October 26, 2018 Order, the court denied motions by CAS to: (1) declare the claims of the '262 patent ineligible under 35 U.S.C. § 101; and (2) declare the claims of the '860 patent indefinite. Order, *EcoServices, LLC, v.*

Certified Aviation Servs. LLC, 16-1824-RSWL-SP, Dkt. No. 293 (Oct. 26, 2018), at 12–21, 24–29 (“*Post-Verdict Order*”).

In its eligibility analysis under § 101, the district court analyzed claims 1, 9, and 14 of the ’262 patent using the two-step framework set forth in *Alice Corp. Pty. v. CLS Bank, Int’l*, 573 U.S. 208, 217–18 (2014). The court noted that, as was the case in *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299, 1314 (Fed. Cir. 2016), “the [asserted] claims of the ’262 patent seek to automate a task previously done by humans.” *Post-Verdict Order* at 17. Accordingly, “the question is whether the automation provides an improvement to the relevant technology used in airline engine wash systems.” *Id.* The court held that the control unit’s “specific configurations to regulate the washing unit” provided such an improvement over human operation, similar to how the claims in *McRO* focused on “specific rules.” *Id.* at 18. Accordingly, the court held the asserted claims were not directed to an abstract idea under step one of *Alice*, but instead were patent eligible “because they are directed to improving the process of washing turbine engines.” *Id.* at 20. The court reasoned that “while it is undisputed that there is some level of automation in the ’262 Patent, . . . the claimed process does not use a computer to implement an abstract idea, but rather it uses technology to improve the narrow industry of turbine engine wash systems to ensure quality, performance, and safety.” *Id.* at 14–15.

The district court’s analysis of whether the ’860 patent was invalid due to indefiniteness was directed to the claim term “at a liquid particle size in the range of 250–120 μ m.” CAS had argued that the ’860 patent “fails to identify how many particles must fall within the claimed range to infringe.” *Id.* at 26–27. The district court pointed to testimony by EcoServices’ expert indicating that at least 35% of the droplets used in CAS’s system fell within the claimed range. *Id.* at 28. The court found CAS had failed to put forth clear and convincing evidence that one skilled in the

art would not know the boundaries of the claims. Accordingly, it denied CAS's motion to declare the claims of the '860 patent indefinite. *Id.* at 29.

In the *Post-Verdict Order*, the district court also denied EcoServices' motion for a permanent injunction. Instead, the court ordered that the parties negotiate an ongoing royalty rate for CAS's continued infringement of the '262 patent that was not less than the \$400 per engine wash rate awarded by the jury. *Id.* at 31–45. In addition, the district court awarded EcoServices supplemental damages of \$175,000, or \$400 per engine wash, for the 314 engine washes CAS performed in the period between the parties' original trial date and the jury verdict. *Id.* at 58–60. Thus, exclusive of the ongoing royalty, the total damages award to EcoServices was \$2,124,600 (\$1,949,600 in damages awarded by the jury, plus supplemental damages of \$175,000 awarded by the court).

On May 7, 2019, the district court denied CAS's Motion for Post-Judgment Relief. *See Order, EcoServices, LLC, v. Certified Aviation Servs. LLC*, 16-1824-RSWL-SP, Dkt. No. 315 (May 17, 2019) ("*Post-Judgment Order*"). As relevant to this appeal, in the *Post-Judgment Order*, the district court (1) denied CAS's motion to amend the judgment as to the eligibility of the '262 patent under § 101; (2) denied CAS's motions for renewed judgment as a matter of law or a new trial as to infringement and invalidity of the '262 patent; (3) denied CAS's motion for renewed judgment as a matter of law or a new trial as to infringement of the '860 patent; (4) denied CAS's motion to amend the judgment as to the indefiniteness of the '860 patent; and (5) denied CAS's motion to amend the judgment or for a new trial as to the ongoing royalty rate.

CAS had argued that the court's eligibility analysis in its *Post-Verdict Order* had improperly relied upon unclaimed components of the claims as construed by the court's Markman order. Rejecting CAS's argument, the

district court stated that that its prior *Post-Verdict Order* regarding eligibility under § 101 “was primarily based on how the ’262 patent’s claims as a whole improve on prior art by eliminating human error.” *Post-Judgment Order* at 12.

In rejecting CAS’s motions for renewed judgment as a matter of law or a new trial as to infringement of the ’262 patent, the district court rejected CAS’s argument that the record lacked substantial evidence that Cycleclean® includes the claimed “information detector.” Specifically, the district court pointed to EcoServices’ expert’s testimony that a keypad used by Cycleclean® satisfies this claim element and CAS’s expert’s testimony that Cycleclean®’s keypad sends signals to the control unit to initiate the program for a wash. *Id.* at 14–15.

In denying CAS’s motions for renewed judgment of law or a new trial for invalidity of the ’262 patent, the district court rejected CAS’s arguments that claims 1, 9, and 14 are invalid as obvious under 35 U.S.C. § 103(a) in view of the combination of two prior art references, Leusden³ and Hansen.⁴ The district court noted that the parties’ experts

³ Christoph Pels Leusden, et al., *Performance Benefits Using Siemen’s Advanced Compressor Cleaning System*, J. of Eng’g for Gas Turbines & Power (Oct. 2004), J.A. 2050–56. Leusden describes the operational performance of a cleaning system, the “Advanced Compressor Cleaning System,” that was pre-installed in a land-based gas turbine engine. J.A. 2050.

⁴ U.S. Patent App. Publ. No. 2006/0180647 A1 (Aug. 17, 2006). Hansen describes “specific applications of RFID technology,” including a “car wash” application where “[a]n RFID reader . . . reads the RFID device before the vehicle 200 enters the car wash” and “[a] computerized control system 220 receives information from the RFID reader 210,

provided conflicting testimony, but that the jury was free to find EcoServices' expert more credible. *Id.* at 16–18.

Addressing CAS's challenge to the court's minimum ongoing royalty rate of \$400 per wash, the court stated that it had provided the parties the opportunity to meet and to confer and agree upon an ongoing royalty rate and that it would not now reconsider the minimum rate it had previously set. Further, the court pointed to evidence in the form of EcoServices' expert's testimony that he had "consider[ed] the economic life of both . . . patents" when providing his \$400 per wash rate. *Id.* at 35.

DISCUSSION

I.

We review denials of post-trial motions for judgment as a matter of law and for a new trial under regional circuit law. *TEK Global, S.R.L. v. Sealant Sys. Int'l*, 920 F.3d 777, 783 (Fed. Cir. 2019) (citation omitted). The Ninth Circuit reviews an order denying judgment as a matter of law *de novo*; the district court's determination must be affirmed if substantial evidence supports the jury's verdict. *Id.* (citation omitted). The Ninth Circuit views the evidence in the light most favorable to the nonmoving party, here EcoServices, and draws all reasonable inferences in that party's favor. *See Josephs v. Pac. Bell*, 443 F.3d 1050, 1062 (9th Cir. 2006) (citing *Reeves v. Sanderson Plumbing Prods., Inc.*, 530 U.S. 133, 149 (2000)). "The test applied is whether the evidence permits only one reasonable conclusion, and that conclusion is contrary to the jury's verdict."

and processes that information . . . [and] makes use of information obtained from . . . database 240 to set carwash variables in the carwash 260." *Id.* at ¶¶370–440. Hansen also describes using RFID tags to label aircraft components to facilitate aircraft repair and reconstruction after a crash. *Id.* at ¶¶145–49.

Id. (citing *Pavao v. Pagay*, 207 F.3d 915, 918 (9th Cir. 2002)). The district court may not reject the jury’s verdict simply because another appears preferable. *McEwin v. Crown Equipment Corp.*, 328 F.3d 1028, 1037 (9th Cir. 2003).

The Ninth Circuit reviews an order denying a new trial for abuse of discretion. *Tek Global*, 920 F.3d at 783 (citation omitted). The denial is “irreversible unless the record contains no evidence in support of the verdict or the district court committed legal error.” *Id.* (citation omitted).

We review questions of law, including patent eligibility, claim construction, obviousness, and indefiniteness determinations, de novo; we review subsidiary factual findings for clear error if performed by the court and for substantial evidence if performed by a jury. See *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 427 (2007); *Berkheimer v. HP Inc.*, 881 F.3d 1360, 1363, 1365, 1368 (Fed. Cir. 2018); *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1337 (Fed. Cir. 2015) (citing *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 574 U.S. 318, 326–27 (2015)); *Pfizer, Inc. v. Ranbaxy Labs., Ltd.*, 457 F.3d 1284, 1288 (Fed. Cir. 2006) (citation omitted). We review the district court’s methodology for calculating damages, including supplemental damages, and an ongoing royalty, for an abuse of discretion. *XY, LLC v. Trans Ova Genetics*, 890 F.3d 1282, 1297 (Fed. Cir. 2018) (citing *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1332 (Fed. Cir. 2012)); *Hologic, Inc. v. Minerva Surgical, Inc.*, 957 F.3d 1256, 1272 (Fed. Cir. 2020). “A district court abuses its discretion by making a clear error of judgment in weighing relevant factors or in basing its decision on an error of law or on clearly erroneous factual findings.” *Mentor Graphics Corp. v. Quickturn Design Sys., Inc.*, 150 F.3d 1374, 1377 (Fed. Cir. 1998) (citing *A.C. Aukerman Co. v. R.L. Chaides Const. Co.*, 960 F.2d 1020, 1039 (Fed. Cir. 1992), *abrogated on other grounds by SCA Hygiene Prod. Aktiebolag v. First Quality Baby Prod., LLC*, 137 S. Ct. 954 (2017)).

CAS challenges the district court's rulings with respect to claims 1, 9, and 14 of the '262 patent on eligibility, claim construction, obviousness, and infringement. CAS also challenges the district court's rulings with respect to the definiteness and infringement of claims 1 and 2 of the '860 patent. Last, CAS challenges the district court's award of supplemental damages and a reasonable royalty. We address each issue in turn.

II.

A.

The Supreme Court has deemed certain categories of subject matter, including abstract ideas, ineligible for patent protection under 35 U.S.C. § 101. *Alice*, 573 U.S. at 216–18; *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 70 (2012). “The ‘abstract ideas’ category embodies the longstanding rule that an idea of itself is not patentable.” *Alice*, 573 U.S. at 218 (internal quotation marks and citation omitted). To determine whether claimed subject matter is patent-eligible, we apply the two-step framework set forth in *Alice*. First, we “determine whether the claims at issue are directed to a patent-ineligible concept,” such as an abstract idea. *Id.* Second, if the claims are directed to a patent-ineligible concept, we “examine the elements of the claim to determine whether it contains an ‘inventive concept’ sufficient to ‘transform’ the claimed abstract idea into a patent-eligible application.” *Id.* at 221 (quoting *Mayo*, 566 U.S. at 72).

B.

CAS contends that our step one analysis of what the claims of the '262 patent are “directed to” should be guided by our decisions in *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759 (Fed. Cir. 2019), *cert. denied*, 140 S. Ct. 983 (2020), and *Chamberlain Group, Inc. v. Techtronic Indus. Co.*, 935 F.3d 1341 (Fed. Cir. 2019), *cert. denied*, 2020 WL 5882260 (Oct. 5, 2020). Specifically, citing *Chargepoint*,

CAS argues that we should look to the specification of the '262 patent to understand “the problem facing the inventor.” Appellant’s Br. 24 (quoting 920 F.3d at 767). CAS contends that here this “problem” was human error in the conventional engine washing process. *Id.* In addition, pointing to *Chamberlain*, CAS urges us to consider how the '262 patent specification describes differences over the prior art. *Id.* (quoting 935 F.3d at 1346–48). The only difference over the prior art set forth in the '262 patent, CAS argues, is that the claimed invention uses a generic computer instead of a human operator. *Id.* Accordingly, CAS contends that claims 1, 9, and 14 of the '262 patent are “directed to the abstract idea of using a generic computer to automate the conventional washing process traditionally performed by human operators” and that the claimed invention “is simply the idea of using a computer to replace human operators in a known process.” *Id.* at 30–31. This is abstract, CAS argues, because under *OIP Technologies, Inc. v. Amazon.com Inc.*, 788 F.3d 1359 (Fed. Cir. 2015); *Intellectual Ventures I LLC v. Capital One Bank*, 792 F.3d 1363 (Fed. Cir. 2015); and *Bancorp Services, LLC v. Sun Life Assurance Co. of Canada*, 687 F.3d 1266 (Fed. Cir. 2012), reliance on a computer to perform routine tasks more quickly or more accurately does not render a patent claim eligible for patenting. Appellant’s Br. 23–27.

CAS next contends that claims 1, 9, and 14 of the '262 patent do not recite any inventive concept under step two of *Alice*. Specifically, CAS argues that the claims do not recite either an inventive function or an inventive structure, since they merely recite the use of a generic washing unit, a human machine interface (information detector), and a computer (control unit). Appellant’s Br. 31–35.

Regarding step one of *Alice*, EcoServices responds that the district court properly found the claims of the '262 patent not to be directed to abstract subject matter. EcoServices urges that the claims are “directed to systems that use certain hardware in a non-conventional manner to

reduce errors and create a technologically improved turbine engine washing system.” Appellee’s Br. 33. This is patent eligible, EcoServices contends, just as “systems and methods that use inertial sensors in a non-conventional manner to reduce errors” in calculating the location and orientation of an object were held patent eligible in *Thales Visionix Inc. v. United States*, 850 F.3d 1343, 1347 (Fed. Cir. 2017). Appellee’s Br. 28–33.

EcoServices also contends that the claims embody an inventive concept under *Alice* step two. This is so, EcoServices urges, because the components are not generic but are instead configured in an “inventive combination.” *Id.* at 35. Moreover, EcoServices argues, CAS did not present evidence at trial to establish that the claim elements at issue were well-understood, routine and conventional. *Id.* at 36.

C.

At step one of the *Alice* framework, “we look to whether the claims ‘focus on a specific means or method that improves the relevant technology or are instead directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery.’” *Cardionet, LLC v. Infobionic, Inc.*, 955 F.3d 1358, 1368 (Fed. Cir. 2020) (quoting *McRO*, 837 F.3d at 1314). We also consider the patent’s written description, as it is “helpful in illuminating what a claim is ‘directed to.’” *Id.* (quoting *Chamberlain*, 935 F.3d at 1346); *ChargePoint*, 920 F.3d at 766.

As noted, CAS contends that claims 1, 9, and 14 of the ’262 patent are “directed to the abstract idea of using a generic computer to automate the conventional washing process traditionally performed by human operators” and that the claimed invention “is simply the idea of using a computer to replace human operators in a known process.” We disagree. We conclude that, when considered as a whole, and in light of the written description, claims 1, 9, and 14 of the ’262 patent are directed to an improved system for

washing jet engines and not to an abstract idea. In our view, the claims are directed to a specific system that improves jet engine washing; the claims are not directed to “a result or effect that itself is the abstract idea” of, e.g., automated jet engine washing. In other words, the claims of the ’262 patent do not recite the mere desired result of automated jet engine washing, but rather, recite a specific solution for accomplishing that goal. *See Koninklijke Kpn N.V. v. Gemalto M2M GMBH*, 942 F.3d 1143, 1151 (Fed. Cir. 2019) (“Importantly, the claims do not simply recite, without more, the mere desired result of catching previously undetectable systematic errors, but rather recite a specific solution for accomplishing that goal—i.e., by varying the way check data is generated by modifying the permutation applied to different data blocks.”); *see also Core Wireless Licensing S.A.R.L. v. LG Electronics, Inc.*, 880 F.3d 1356, 1362 (Fed. Cir. 2018) (“Although the generic idea of summarizing information certainly existed prior to the invention, these claims are directed to a particular manner of summarizing and presenting information in electronic devices.”); *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299, 1305–06 (Fed. Cir. 2018) (“The asserted claims are . . . directed to a non-abstract improvement in computer functionality, rather than the abstract idea of computer security writ large”); *Thales*, 850 F.3d at 1348–49 (“These claims are not merely directed to the abstract idea of using mathematical equations for determining the relative position of a moving object to a moving reference frame, Rather, the claims are directed to systems and methods that use inertial sensors in a non-conventional manner to reduce errors in measuring the relative position and orientation of a moving object on a moving reference frame.”) (internal quotation marks omitted).

The systems of the claims at issue achieve a level of automation that provides an improvement over the prior art human-operated washing systems. This improvement, as set forth in the specification of the ’262 patent, provides

such advantages as “a higher degree of quality of an engine washing procedure,” a “minimize[d] risk of wrongly operat[ed] equipment,” “a higher degree of safety,” and “cost efficien[cy] and reliab[ility].” ’262 patent col. 4 ll. 12–14, 42–46, 47–49. These described advantages are important to our determination that the claims provide a technical improvement to jet engine washing, much as the advantages gained by the elements recited in the claimed device in *Cardionet* were considered to be important to the determination that the claims there were drawn to an improved cardiac monitoring device, not an abstract idea. 955 F.3d at 1368. In reaching this conclusion in *Cardionet*, we noted that the claimed device “more accurately detects the occurrence of atrial fibrillation and atrial flutter” and “allows for more reliable and immediate treatment of these two medical conditions.” *Id.* at 1368–69.

Contrary to CAS’s arguments, the 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. Indeed, we addressed whether “claims simply use a computer as a tool to automate conventional activity” in the context of *Alice* step one in *McRO*. 837 F.3d at 1314. In *McRO*, the representative claim was directed to “[a] method for automatically animating lip synchronization” that used “rules” to perform animation. We held that the claim was not directed to an abstract idea. *Id.* at 1316. In reaching that conclusion, we noted that the claim did not use a computer as a tool to automate conventional activity and instead employed a computer “to perform a distinct process to automate a task previously performed by humans.” *Id.* at 1314. Here, as the specification makes clear, human operators were washing aircraft engines before the patented invention. That the claimed system achieves automation of a task previously performed by humans, however, does not mean the claimed system is necessarily directed to an

abstract idea. The claims of the '262 patent are directed to a specific combination of a type of washing unit, information detector, and control unit, configured in a certain way to create technical improvements to systems for washing jet engines. In our view, the claims of the '262 patent thus present an even stronger case for eligibility than the representative method claim in *McRO*.⁵

⁵ We recognize that “the mere recitation of a generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention.” *Alice*, 573 U.S. at 223. In cases from our court addressing the eligibility of claims directed to various ways to manipulate data using a computer, we have similarly stated that an underlying abstract idea cannot be “saved” from its abstractness through either (1) the use of the computer as a tool or (2) another component that merely provides a generic environment in which to carry out the abstract idea. *Customedia Techs. v. Dish Network Corp.*, 951 F.3d 1359, 1364–65 (Fed. Cir. 2020) (“[I]t is not enough, however, to merely improve a fundamental practice or abstract process by invoking a computer merely as a tool. . . [T]he claimed invention is at most an improvement to the abstract concept of targeted advertising wherein a computer is merely used as a tool.”); *BSG Tech LLC v. Buyseasons, Inc.*, 899 F.3d 1281, 1286–87 (Fed. Cir. 2018) (holding that the claims at issue were directed to the abstract idea of considering historical usage information while inputting data and that the claims’ recitation of a specific database structure merely “provides a generic environment in which the claimed method is performed” and “does not save the asserted claims at [*Alice*] step one.”); see also *Bozeman Fin. v. Fed. Reserve Bank of Atlanta*, 955 F.3d 971, 979–80 (Fed. Cir. 2020) (holding the claims at issue to be “directed to the abstract idea of collecting and analyzing information for financial transaction

fraud or error detection,” and stating that “the use of well-known computer components to collect, analyze, and present data, in this case to verify financial transactions, does not render these claims any less abstract.”); *Credit Acceptance Corp. v. WestLake Servs.*, 859 F.3d 1044, 1055 (Fed. Cir. 2017) (rejecting as patent ineligible claims where the “focus . . . [was] on [a] method of financing, and [where] the recited generic computer elements [were] invoked merely as a tool”) (internal quotation marks and citation omitted); *Fairwarning IP, LLC v. Iatric Sys., Inc.*, 839 F.3d 1089, 1093–94 (Fed. Cir. 2016) (holding that claims “directed to collecting and analyzing information to detect misuse and notifying a user when misuse is detected” were “directed to a combination of . . . abstract-idea categories” despite the claims’ recitation of a computer); *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 611 (Fed. Cir. 2016) (“While [representative] claim 17 requires concrete tangible components such as ‘a telephone unit’ and a ‘server,’ the specification makes clear that the recited physical components merely provide a generic environment in which to carry out the abstract idea of classifying and storing digital images in an organized manner.”); *Content Extraction & Trans. v. Wells Fargo Bank*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) (holding that although the claims at issue recited a scanner in addition to a computer, the claims were “drawn to the abstract idea of 1) collecting data, 2) recognizing certain data within the collected data set, and 3) storing that recognized data in a memory”); *Intellectual Ventures I LLC v. Erie Indem. Co.*, 711 Fed. Appx. 1012, 1015 (Fed. Cir. 2017) (concluding that claims directed to a “computer-implemented method” “are directed to the identification of unwanted files in a particular field (i.e., a computer network) and otherwise concern data collection related to such identification, such that they are directed to an abstract idea under our precedent”).

The precedential cases from this court upon which CAS relies: *OIP Technologies*, *Intellectual Ventures I*, and *Bancorp*, all address the use of a computer in the context of analysis under *Alice* step two, not in the context of analysis under *Alice* step one. Specifically, in *OIP Technologies*, we stated that “relying on a computer to perform routine tasks more quickly or more accurately is insufficient to render a patent claim eligible.” This, however, was after we had determined the claims at issue were “directed to” the abstract idea of a fundamental economic concept. 788 F.3d at 1363. Likewise, in *Intellectual Ventures I*, we stated “our precedent is clear that merely adding computer functionality to increase the speed or efficiency of the process does not confer patent eligibility on an otherwise abstract idea.” 792 F.3d at 1370. That sentence, however, was preceded by a sentence stating: “Turning to the second step of *Alice*, here there is no inventive concept that would support patent eligibility.” *Id.*; see also *id.* at 1367 (“Nor, in addressing the second step of *Alice*, does claiming the improved speed or efficiency inherent with applying the abstract idea on a computer provide a sufficient inventive concept.”). Finally, in *Bancorp*, while we stated that “the fact that [the required calculations] could be performed more efficiently via a computer does not materially alter the patent eligibility

Unlike the claims in these cases, the claims of the ’262 patent are not directed to various ways to manipulate data using a computer. Rather, they are directed to a specific system that improves jet engine washing. Just as the inclusion of a computer cannot “save” an abstract idea, it cannot convert a non-abstract idea into an abstract one. *Diamond v. Diehr*, 450 U.S. 173, 187 (1981) (“A claim drawn to subject matter otherwise statutory does not become non-statutory simply because it uses a mathematical formula, computer program, or digital computer.”); see also *Alice*, 573 U.S. at 223 (discussing *Diehr* in the context of step two).

of the claimed subject matter,” that statement was made after we had concluded that the patent was directed to the abstract idea of managing a stable value protected life insurance policy. 687 F.3d at 1278 (applying *Bilski v. Kappos*, 561 U.S. 593 (2010)).

As noted, CAS contends we should narrow our focus to the “automation” of the claims under *Chargepoint* and *Chamberlain*. In *Chargepoint*, we held that the claims at issue were directed to the abstract idea of communicating over a network. 920 F.3d at 770. We determined that, despite the recitation of tangible features pertaining to vehicle charging stations, the “focus” of the claims “was on the abstract idea of network communication for device interaction.” *Id.* In reaching this conclusion, we found it “notabl[e]” that “the specification never suggest[ed] that the charging station itself is improved from a technical perspective, or that it would operate differently than it otherwise could.” *Id.* at 768. Similarly, in *Chamberlain*, we found claims reciting a “movable barrier operator” to be directed to wirelessly communicating status information about a system because “[t]he only described difference between the prior art movable barrier operator systems and the claimed . . . system is that the status information about the system is communicated wirelessly, in order to overcome certain undesirable disadvantages of systems using physical signal paths.” 935 F.3d at 1346. Significantly, there was no dispute in *Chamberlain* that wireless communication was previously well known and we noted its similarity to ideas previously found to be abstract. *Id.* at 1345, 1346.

The facts here are different from those of *Chargepoint* and *Chamberlain*. Here, as discussed above, we do not have the situation where there was a pre-existing system being used to which only a known feature, similar to features previously determined to be abstract, was added. Instead, here, the system itself is new. *See Research Corp. Techs. v. Microsoft Corp.*, 627 F.3d 859, 869 (Fed. Cir. 2010)

("[I]nventions with specific applications or improvements to technologies in the marketplace are not likely to be so abstract that they override the statutory language and framework of the Patent Act."). Moreover, as we have previously stated, automation alone is not necessarily abstract. *McRO*, 837 F.3d at 1313. Specifically, as we have stated, "processes that automate tasks that humans are capable of performing are patent eligible if properly claimed." *Id.* The system claims at issue provide examples of such proper claiming.

In sum, when we consider the claims at issue "in their entirety," we conclude that "their character as a whole" is not directed to an abstract idea. *McRO*, 837 F.3d at 1312 (citing *Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343, 1346 (Fed. Cir. 2015)). To conclude otherwise would be to oversimplify the claims, which we have cautioned against. *See McRO*, 837 F.3d at 1313. Having so concluded, we need not reach *Alice* step two and the arguments the parties make with respect thereto. *See id.* at 1316.

We turn next to the issues of claim construction and infringement of claims 1, 9, and 14 of the '262 patent.

III.

A.

Claim terms are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art at the time of invention in light of the claim language, the specification, and prosecution history. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005). "A claim term should be given its ordinary meaning in the pertinent context, unless the patentee has made clear its adoption of a different definition or otherwise disclaimed that meaning." *Ancora Techs., Inc. v. Apple, Inc.*, 744 F.3d 732, 734 (Fed. Cir. 2014). When a patentee "unequivocally and unambiguously disavows a certain meaning to obtain

a patent, the doctrine of prosecution history disclaimer narrows the meaning of the claim consistent with the scope of the claim surrendered.” *Biogen Idec, Inc. v. GlaxoSmithKline LLC*, 713 F.3d 1090, 1095 (Fed. Cir. 2013) (citing *Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323, 1326 (Fed. Cir. 2003)).

B.

On appeal, CAS maintains its argument that the district court’s claim construction was erroneous because it did not require the “information detector” to read from an “information unit.” CAS argues that the ’262 patent specification exclusively discloses an information detector that reads an information unit such as an RFID chip or a bar code label. Appellant’s Br. 18–20 (citing ’262 patent col. 5 ll. 32–35, 38–61, col. 6 ll. 35–43). An amendment made during prosecution supports its claim construction, CAS contends. This is so because an earlier version of claim 1 recited detecting the engine type using an “information node.” The patent examiner rejected the “node” language as lacking written description, and pointed out that the application used the term “detector,” which is “a device or instrument designed to detect the presence of something, [whereas] a node is a central or connecting point.” J.A. 160–61. CAS urges that when the applicant amended the claim to recite “information detector,” the applicant disavowed a broader claim scope for components that do not “detect the presence of something” (i.e., an information unit). Even if not rising to the level of a disavowal, CAS argues, the amendment reinforces the proposition that an information detector must detect an information unit. Under a proper construction of the term, CAS asserts, the accused devices do not infringe because EcoServices did not argue or present evidence that Cyclean® includes an “information detector” that requires reading an information unit. Instead, the keypad of the Cyclean® devices is a manual entry device, CAS states.

EcoServices responds that the district court properly refused to import the term “information unit” into the asserted claims. EcoServices argues that other claims of the ’262 patent that are not at issue in this case require an “information unit,” thereby confirming that CAS’s construction is incorrect under the principle of claim differentiation. Appellee’s Br. 20–21. Responding to CAS’s argument directed to the specification, EcoServices argues that the embodiment CAS relies on is merely exemplary. *Id.* at 21–23. And as to prosecution history, EcoServices responds by noting that the amendment adding “information detector” was in the context of a written description rejection, and that the examiner did not reference the “information unit” in making his rejection. *Id.* at 23–25.

C.

We agree with EcoServices that the district court’s claim construction was proper.

Beginning with the claims, nothing in the language of claim 1, 9, or 14 of the ’262 patent indicates or implies that the “information detector” should be required to read an “information unit.” Further, unasserted claim 6, which ultimately depends from claim 1, recites that the “information detector comprises an information detector for reading information provided by [an] information unit, and for providing said information to the control unit.” ’262 patent col. 9 ll. 1–4. Thus, to construe “information detector” as CAS would have us do would “render the term redundant and offend[] principles of claim differentiation.” *Trebro Mfg. Inc. v. Firefly Equip., LLC*, 748 F.3d 1159, 1167 (Fed. Cir. 2014) (holding that the district court erred in construing a term in an independent claim to include a requirement recited in a dependent claim that also recited other features).

Although certain statements in the specification do suggest that an “information detector” is used when an “information unit” is used, *see* ’262 patent col. 5 ll. 55–61, col.

6 ll. 35–43, the disclosure of a single, exemplary embodiment does not necessarily limit the claimed invention to that embodiment. *Continental Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019) (“[D]isclosing only the ProbelecXB 7081 embodiment, without more, does not result in a clear disavowal of claim scope.”). Further, the specification does not go so far as to suggest that an information detector could not be used without an information unit. See ’262 patent col 5 ll. 24–61. We thus do not have the situation where the “preferred embodiment is described as the invention itself,” such that “the claims are not entitled to a broader scope than that entitlement.” *SciMed Life Systems, Inc. v. Advanced Cardiovascular Systems, Inc.* 242 F.3d 1337, 1341 (Fed. Cir. 2001) (concluding that the patentee disclaimed a dual lumen configuration for balloon dilation catheters where the patent described both a dual lumen (side-by-side) and coaxial lumen configuration, but the specification disparaged the dual lumen design, described the coaxial lumen design as “the present invention,” and explained that the coaxial lumen design was the structure “for all embodiments of the present invention contemplated and disclosed herein”).

We also disagree with CAS that the amendment the applicant made during prosecution of the ’262 patent supports CAS’s construction. The examiner defined a “detector” to be “a device or instrument designed to detect the presence of something.” J.A. 161. He did not go so far, however, as to require that the information detector read from “an information unit.” The amendments made thus cannot be said to constitute an unequivocal and unambiguous disavowal of a device that does not read from “an information unit.” See *Biogen*, 713 F.3d at 1095.

Accordingly, the district court did not err when it construed the claim term “information detector.” CAS’s non-infringement position depends on its argument that the court’s claim construction was incorrect. Accordingly, we affirm the court’s denial of CAS’s motions for renewed

judgment as a matter of law or a new trial as to infringement of claims 1, 9, and 14 of the '262 patent.

We next address CAS's challenge to the validity of claims 1, 9, and 14 of the '262 patent under 35 U.S.C. § 103.

IV.

A.

A patent claim is unpatentable when “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” 35 U.S.C. § 103(a).⁶ Obviousness is a question of law based on underlying findings of fact. *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000). The underlying factual findings include (1) “the scope and content of the prior art,” (2) “differences between the prior art and the claims at issue,” (3) “the level of ordinary skill in the pertinent art,” and (4) the presence of secondary considerations of nonobviousness such as, e.g., “commercial success, long felt but unsolved needs, [and] failure of others.” *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17 (1966).

B.

CAS contends that the district court erred when it submitted to the jury, without proper instruction, the issue of obviousness. Specifically, CAS takes issue with the court's

⁶ Congress amended § 103 when it passed the Leahy-Smith America Invents Act (“AIA”). Pub. L. No. 112-29, § 3(c), 125 Stat. 284, 287 (2011). However, because the application that resulted in the '262 patent was filed before March 16, 2013, the pre-AIA version of § 103(a) applies. *See id.* § 3(n)(1), 125 Stat. at 293; *Redline Detection, LLC v. Star Envirotech, Inc.*, 811 F.3d 435, 449 n.7 (Fed. Cir. 2015).

inference in the *Post-Judgment Order* that the jury had found no motivation to combine Leusden's engine washing system and Hansen's RFID technology ("information detector"), given that the jury was not provided an instruction regarding motivation to combine. Further, CAS argues that a finding of no motivation to combine would not be supported by substantial evidence or would be at least against the great weight of the evidence, since CAS provided evidence of the "reason" to combine the references via its expert's testimony on increased automation.

EcoServices responds that the jury instructions listed the *Graham* factors and contends that this encompasses motivation to combine.

C.

Patent claims are presumed valid. 35 U.S.C. § 282. "At trial, the party challenging validity must prove that the claims are invalid by clear and convincing evidence." *Polaris Eng'g Inc. v. Campbell Co.*, 894 F3d 1339, 1348 (Fed. Cir. 2018) (citation omitted).

Although there was no specific jury instruction directed to motivation to combine, the jury was directed to consider: (1) "the scope and content of the prior art relied upon by CAS," (2) "the difference or differences, if any, between each Asserted Claim that CAS contends is obvious and the prior art," (3) "the level of ordinary skill in the art at the time the inventions of the asserted patents were made," and (4) "additional considerations, if any, that indicate that the invention was obvious or not obvious." J.A. 655. The first three of these factors track the first three factors set forth in *Graham*. The fourth jury factor the jury was to consider, "additional considerations, if any, that indicate that the invention was obvious or not obvious" is noticeably broader than the secondary considerations of nonobviousness set forth in *Graham*, and encompasses the motivation to combine evidence put forth by both parties during trial. The jury was entitled to credit EcoServices'

expert's testimony over the limited testimony it heard from CAS's expert. Moreover, CAS does not argue before us, nor did it argue before the district court, that the jury instruction was legally erroneous. Viewed in the light most favorable to EcoServices, the evidence does not permit only one reasonable conclusion that is contrary to the jury's verdict. *See Josephs*, 443 F.3d at 1062. This is particularly the case since, as the patent challenger, CAS needed to establish obviousness by clear and convincing evidence. Accordingly, it was not error for the district court to deny judgment as a matter of law, nor was it an abuse of discretion for the court to deny a new trial on invalidity.

We now turn to the '860 patent.

V.

A.

A patent must “conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as the invention.” 35 U.S.C. § 112(b).⁷ “A claim fails to satisfy this statutory requirement and is thus invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, ‘fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.’” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1369–70 (Fed. Cir. 2014) (quoting *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014)). To meet this standard, claims including a term of degree “must provide

⁷ Like § 103, § 112 was amended when Congress passed the AIA. Pub. L. No. 112-29, § 4(c), 125 Stat. at 296–97. However, because the application that resulted in the '860 patent was filed before September 16, 2012, the pre-AIA version of § 112 applies. *See id.* § 4(e), 125 Stat. at 297; *Knowles Elecs. LLC v. Cirrus Logic, Inc.*, 883 F.3d 1358, 1365 (Fed. Cir. 2018).

objective boundaries for those of skill in the art.” *Id.* at 1370–71.

B.

CAS contends that the claims of the ’860 patent are either indefinite or are not infringed. CAS maintains its argument that the claim term “at a liquid particle size in the range of 250–120 μ m” is indefinite because a skilled artisan would not know with reasonable certainty what it means for a washing liquid to be sprayed “at a liquid particle size in the range of 250–120 μ m.” Nothing in the intrinsic record, CAS argues, informs an artisan what percentage of a spray’s particles must be within the recited range to achieve the claimed objective of being “finely-divided to a degree at which the particles of liquid will follow the same routes through the turbine compressor as those previously taken by the air-borne contaminants” or to achieve the objectives set forth in the specification of “overcoming the centrifugal effect,” washing “effectively with far less quantities of liquid,” and reducing strain on the engine. Appellant’s Br. 48–54 (quoting ’860 patent col. 4 ll. 12–15, col. 1 ll. 28–50, col. 2 ll. 14–18). If the claims do provide such an objective boundary and are therefore definite, CAS contends, then substantial evidence does not support the infringement verdict because the trial record does not identify that objective boundary. Rather, CAS argues, the infringement verdict relies upon the theory that only one particle must fall within the claimed range. *Id.* at 54–56.

EcoServices responds that claim 1 is definite because it “specifies a series of parameters and the result that following those parameters achieves, . . . i.e., ‘the liquid particles are given a size and velocity which together overcome the centrifugal effect,’ so that ‘all accessible surfaces of the object will be cleaned effectively and efficiently.’” Appellee’s Br. 49–50 (quoting ’860 patent col. 4 ll. 4–15 & col. 2 ll. 15–18). According to EcoServices, “[t]he evidence that a particular spray within the defined parameters achieves the

objectives of the invention—i.e., that droplets follow the gas path—is the same evidence that enables a skilled artisan to determine whether an accused product infringes.” *Id.* at 50. According to EcoServices, testing performed by its expert showed that 10–35% of liquid particles produced by the nozzles were within the claimed range. *Id.* at 52–55. EcoServices also asserts that CAS’s own documentation shows the functional limitations of the claim were met. *Id.* at 48, 53. This constitutes substantial evidence to sustain the jury’s infringement verdict, EcoServices urges. EcoServices disputes that it argued that having one particle in the range would infringe. Rather, so long as “small quantities” are sprayed through the compressor within the claimed parameters and “thereby” follow the gas path through the compressor, it doesn’t matter if other quantities also follow that path. *Id.* at 50.

C.

We agree with EcoServices that the claim term at issue relating to particle size is not indefinite. As EcoServices argues, claim 1 of the ’860 patent requires more than just “at a liquid particle size in the range of 250–120 μ m.” Instead, the claim recites:

A method of washing turbine compressors . . . wherein small quantities of finely-divided liquid are sprayed onto and through the turbine compressors, characterized by running the turbine compressors and spraying the finely-divided liquid quantities through at least one nozzle towards and through the turbine compressor . . . at a liquid particle size in the range of 250–120 μ m . . . whereby the liquid is finely-divided to a degree at which the particles of liquid will follow the same routes through the turbine compressor as those previously taken by the air-borne contaminants, when spraying said liquid onto and through said turbine compressor.

'860 patent col. 3 l. 17–col. 4 l. 16. As such, although the claim does not state a percentage of the liquid that must be in the claimed particle size, the claim makes clear that “small quantities” of liquid must follow the gas path. Whether a single particle would meet this claim limitation is not at issue: CAS presented undisputed evidence showing that 10–35% of its spray did meet the claim limitation.

EcoServices’ testing evidence, combined with CAS’s documentation indicating that, e.g., Cycleclean® utilizes “an evenly distributed water mist [that] follows the gas path,” *see* J.A. 1268–69; J.A. 2575, is substantial evidence that supports the jury’s verdict. That the remaining spray was not in the claimed particle size range does not mean the claim element was not met; nothing in the claim requires the “small quantities of finely-divided liquid” sprayed into the turbine compressor be the *only* liquid particles used. In other words, the fact that the accused Cycleclean® Engine Wash system uses particles of different sizes in addition to those within the claimed range does not mean the claim was not infringed by the 10–35% of the spray that does satisfy the claim element. *See Broadcom Corp. v. Emulex Corp.*, 732 F.3d 1325, 1333 (Fed. Cir. 2013) (“It is well settled that an accused device that sometimes, but not always, embodies a claim[] nonetheless infringes.”) (internal quotation marks and citation omitted).

The claim term “at a liquid particle size in the range of 250–120µm” is not indefinite and substantial evidence supports the jury’s verdict. Accordingly, we affirm the district court’s denial of judgment as a matter of law or a new trial as to infringement of the '860 patent. We turn now to the issue of supplemental damages and an ongoing royalty.

VI.

A.

Supplemental damages compensate the patentee for periods of infringement not considered by the jury. *Dow*

Chem. Co. v. Nova Chemicals Corp., (Canada), 803 F.3d 620, 626 (Fed. Cir. 2015) (citation omitted). In the absence of a permanent injunction, a patentee may be entitled to receive ongoing royalties. *Paice LLC v. Toyota Motor Corp.*, 504 F.3d 1293, 1314 (Fed. Cir. 2007).

B.

CAS's final argument on appeal is that the district court abused its discretion when it awarded EcoServices supplemental damages in the amount of \$175,000 and an ongoing royalty at a rate of \$400 per wash. Appellant's Br. 56–61. CAS contends that the \$400 per wash rate for supplemental damages and for the ongoing royalty was based almost exclusively on the value of the '860 patent, and because it has expired, it cannot be a basis for a royalty under *Kimble v. Marvel Entertainment, LLC*, 576 U.S. 446 (2015). According to CAS, EcoServices' expert calculated the reasonable royalty based on a hypothetical negotiation in 2010, when the '262 patent had not yet issued. *Id.* at 57.

In response, EcoServices contends that CAS misreads *Kimble*. Appellee's Br. 55–56. EcoServices points out that, in *Kimble*, the Supreme Court stated that “royalties may run until the *latest-running* patent covered in the parties' agreement expired.” *Id.* (quoting 576 U.S. at 454) (emphasis added). EcoServices then posits that since the '262 patent has not expired, the royalty rate set by the district court is proper. EcoServices also contends that (a) despite the time frame of its expert's hypothetical negotiation, the hypothetical negotiation was based on both patents, and (b) the jury was aware of the expiration of the '860 patent, and yet still awarded the equivalent of \$400 per wash in its \$1,949,600 damages award. *Id.* at 56–57, 59–60. In addition, EcoServices points to its expert's reliance on two agreements: (1) the LHT-CAS Lease Agreement under which CAS agreed to pay Luthansa a \$550 royalty per Cyclean® wash it performed; and (2) a license agreement that granted EcoServices rights to a portfolio that included the

'860 and '262 patents, and which corresponded to an average royalty of \$450 per wash that EcoServices was expected to pay. *Id.* at 57–59.

C.

We agree with CAS. EcoServices' expert's generalized statement that his "royalty considers the economic life of both of [the] patents," J.A. 1415, does not mean that he afforded the '262 patent any value. Instead, EcoServices' expert specifically stated that he did not perform a royalty valuation for the '262 patent alone because the '860 patent would have been the "driver of the negotiation in 2010." J.A. 1402–03. Indeed, EcoServices' expert repeatedly stated the significance of the '860 patent. *See* J.A. 1338–39 (emphasizing that in patent portfolios, often "a few patents . . . carry the majority of the value[, a]nd in this case insofar as these engine washing systems are concerned, the '860 is very, very important"); J.A. 1398 ("[T]he '860 is obviously a very important patent . . ."), J.A. 1405 ("The '860 is a really important patent . . ."). EcoServices' expert valued the '860 patent alone at \$500 per wash, but also noted that the patent expired approximately 77% of the way through the damages period. J.A. 1401. Accordingly, he "accounted for the loss in the value of the '860 patent by reducing [his] royalty." *Id.* In the view of EcoServices' expert, looking purely at the infringement period before the '860 patent expired and multiplying washes during that period by the estimated value of \$500 per wash, "you end up with a damages number that's very similar" to the damages calculated by multiplying \$400 per wash times the total number of washes performed in the infringement period.⁸

⁸ The jury's award of \$1,949,600 is equivalent to a \$400 per wash rate for the number of washes that occurred in the total infringement period. J.A. 675, 1402, 1408. Multiplying \$500 per wash times the number of washes

This testimony shows that EcoServices' expert awarded little, if any, value to the '262 patent.

In *Kimble*, the Supreme Court held that the expiration of a licensed patent does not mean that negotiated provisions in a settlement agreement licensing that patent necessarily cease to be effective. 576 U.S. 453–54, 464. Rather, such an arrangement can accomplish payment deferral and risk-spreading. *Id.* This does not mean, however, that a patent holder therefore has a right to exact royalties for sales occurring after a patent's expiration date outside the context of such an agreement. Indeed, the *Kimble* Court itself acknowledged the opposite. *Id.* at 451 (“[W]hen the patent expires, the patentee's prerogatives expire too, and the right to make or use the article, free from all restriction, passes to the public.”). In *Kimble*, the court addressed a settlement agreement the parties independently entered into, not a post-infringement, court-imposed, forward-looking royalty. *Id.* at 450. We do not see how *Kimble* applies to this case.

One purpose of an ongoing royalty is to “effectively serve[] as a replacement for whatever reasonable royalty a later jury would have calculated in a suit to compensate the patentee for future infringement.” *XY*, 890 F.3d at 1297 (citation omitted). Here, the record does not support that a later jury would have calculated a royalty of \$400 per wash as a royalty award for infringement of the '262 patent alone. The district court abused its discretion by awarding supplemental damages and an ongoing royalty based upon the jury's per-wash damages rate that included compensation for infringement of the now-expired '860 patent.

that occurred in the infringement period before the '860 patent expired (3,845 washes) would have resulted in damages of \$1,922,500. *See* J.A. 1402.

Accordingly, we vacate and remand for further proceedings regarding supplemental damages and the ongoing royalty rate.

CONCLUSION

For the foregoing reasons, we hold that claims 1, 9, and 14 of the '262 patent are eligible for patenting, are not invalid, and were infringed, and that claims 1 and 2 of the now-expired '860 patent are not indefinite and were infringed. We therefore *affirm* the judgment of infringement of these claims of the '262 patent and the '860 patent. We also hold, however, that the district court abused its discretion in awarding supplemental damages and an ongoing royalty based upon a rate of \$400 per wash. Accordingly, we *vacate* the district court's supplemental damages award and ongoing royalty. The case is *remanded* to the district court for a redetermination of the proper supplemental damages and ongoing royalty.⁹

AFFIRMED-IN-PART, VACATED-IN PART, AND REMANDED

COSTS

No costs.

⁹ We have considered the parties' other arguments, but have found them to be not relevant to our disposition of the appeal.

NOTE: This disposition is nonprecedential.

**United States Court of Appeals
for the Federal Circuit**

ECOSERVICES, LLC,
Plaintiff-Appellee

v.

CERTIFIED AVIATION SERVICES, LLC,
Defendant-Appellant

2019-1602

Appeal from the United States District Court for the Central District of California in No. 5:16-cv-01824-RSWL-SP, Senior Judge Ronald S.W. Lew.

DYK, *Circuit Judge*, concurring in part and dissenting in part.

I join Parts II-A, II-B, V, and VI of the majority opinion, but respectfully dissent from Part II-C of the majority's decision holding that claims 1, 9, and 14 of U.S. Patent No. 9,162,262 ("the '262 patent") are patent eligible under 35 U.S.C. § 101. Because those claims are not patent eligible, I would not reach the questions in Parts III and IV regarding infringement and invalidity (based on obviousness) of claims 1, 9, and 14.

I

Turbine engines consume large quantities of air that cause a coating of foreign particles and contaminants to build up in the engine compressor. This build-up, known as compressor fouling, negatively affects engine performance. For decades, turbine engines have been washed to remove compressor fouling, and this process was largely automated. Different engine types required different washing parameters. The operator entered variables, such as flow rates and wash times, depending on the type of engine being washed.

The '262 patent notes that it would be beneficial for the turbine engine washing process "if the influence of the human factor is minimized as much as possible." '262 patent, col. 3 ll. 65–67. To that end, the patent describes a computer-directed washing system that further automates the washing process, thereby reducing human error. *Id.* col. 4 ll. 1–10, 42–46. Under the patented automated process, the operator uses an information detector (such a keypad or a radio-frequency identification reader) to transmit the engine type to the computer, and the computer selects the preferred washing parameters, which do not have to be entered manually. *Id.* col. 6 ll. 34–41, col. 7 ll. 4–11. Independent claim 1, which is representative, recites:

A system for washing turbine engines comprising:

a washing unit for providing a washing liquid to the turbine engines;

an information detector configured to gather information related to engine type; and

a control unit configured to accept the information related to engine type from the information detector and to determine a washing program to be used as a function of the information relating to engine type

from a set of preprogrammed washing programs, and further configured to regulate the washing unit according to washing parameters associated with the washing program used.

Id. col. 8 ll. 36–47.¹

What is claimed is the further automation of the washing process using generic computers to select the correct parameters depending on engine type. The majority disagrees, finding that this claim is patent eligible at step one of the *Alice* analysis because it is not directed to an abstract idea. The majority states that the claims are “directed to a specific system that improves jet engine washing” and “do not recite the mere desired result of automated jet engine washing.” Maj. Op. 15. But the claims simply describe the generic computer apparatus used to further automate the previous manual process that utilized automated washing systems, as the patentee’s own evidence demonstrates. See ’262 patent, col. 3 ll. 38–43 (describing preexisting “systems for cleaning engines” that “are all dependent to some extent upon an operator manually making certain adjustments and/or system settings”); J.A. 1271 (EcoServices’s expert testifying that a “washing unit” is a unit that provides washing liquid); *id.* at 1274 (EcoServices’s expert testifying that an “information detector” is a keypad pressed

¹ Claims 9 and 14 are also at issue in this appeal. Claim 9, which depends from claim 1, recites that the “information provided by the information detector is used by the control unit to regulate a washing time.” ’262 patent, col. 9 ll. 11–13. Independent claim 14 covers a system with similar features recited in claim 1. EcoServices, LLP, the patent owner of the ’262 patent, does not argue that the features in claims 9 and 14 are meaningfully different from claim 1 for § 101 purposes.

by an operator); *id.* at 411–12 (EcoServices asserting that a “control unit” is a computer).

III

We look to the claims and specification to determine the focus of the claims and the claimed improvement. *See, e.g., ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759, 766–70 (Fed. Cir. 2019), *cert. denied*, 140 S. Ct. 983 (2020). The claims and the ’262 patent specification make clear that the claimed invention is the further automation of prior art engine manual washing systems. There is no dispute that humans entered the established wash parameters into automated washing systems, whereas the claimed system computerizes the parameter selection.

As the majority recognizes, the specification is “helpful in illuminating what a claim is ‘directed to.’” Maj. Op. 14 (quoting *CardioNet, LLC v. InfoBionic, Inc.*, 955 F.3d 1358, 1368 (Fed. Cir. 2020)); *ChargePoint*, 920 F.3d at 767 (“The ‘directed to’ inquiry may also involve looking to the specification to understand ‘the problem facing the inventor’ and, ultimately, what the patent describes as the invention.” (quoting *In re TLI Commc’ns LLC Patent Litig.*, 823 F.3d 607, 612 (Fed. Cir. 2016))).

Here, the specification states that prior art washing systems had a problem in that they depended on a human “operator manually making certain adjustments” based on “information regarding the engine type . . . [and] the requirements for washing that particular engine type.” ’262 patent, col. 3 ll. 41–55. Manual adjustments were a problem “in particular since many engine washing operations [were] performed during night-time when the operators may not be fully alert.” *Id.* col.3 ll. 56–64. Upon recognizing the benefits for minimizing “the influence of the human factor” and “the risk of wrongly operating the equipment” by a human, *id.* col. 3 ll. 65–67, col. 4 ll. 13–14, the specification states that the “present invention provides for a higher degree of safety and quality regarding

wash results obtained in that the washing system is *automated*,” and “[a]s a result, any human error introduced into the system is greatly reduced,” *id.* col. 4 ll. 42–46 (emphasis added). Hence, the claimed invention, as evident from the specification, is simply providing an aggregate of instructions determined by engine type when previously, an operator would individually enter the established parameters into the washing system.

In addition to the specification, EcoServices’s own evidence confirms this. At trial, the inventor of the ’262 patent testified that the claimed invention’s improvement was simply to “completely eliminat[e] subjectivity” of human operators. J.A. 55–56. And during oral argument, EcoServices conceded that the claimed invention “is an automation of something that was previously done by people,” Oral Arg. at 18:40–46, <http://oralarguments.cafc.uscourts.gov/default.aspx?fl=19-1602.mp3>, and that “manual [human] operators” did the washing operations using “appropriate parameters” based on the engine type as recited in the claims, *id.* at 29:30–30:05. As counsel for Ecoservices confirmed, before the ’262 patent, a human operator would consult a card for the type of engine to be washed, and enter the established flow parameters for the engine type.²

² The Court: Manual operators did that, too, right [i.e., loading “the correct parameters . . . for the correct engine type”]?

Mr. Jay: Manual operators selected the engine type. In other words, a manual operator might know the information about what the appropriate parameters for a particular type of engine are, that’s correct, if they had it on a wallet card or something, . . . but they have to take the right card out, and they have to follow the directions. . . .

The patent simply avoids error by computerizing this manually initiated process. *See also id.* at 17:32–40 (EcoServices admitting the fact that the claimed invention “is an automated process” is what makes it different from prior art); *id.* at 18:45–19:30 (EcoServices arguing it “is the automation [that] solve[d] [the particular problem]” and that its expert testified that the “problem[] relate[d] to human error in th[e washing] field,” i.e., “the fact that aircraft engines [we]re being washed by individuals, often late at night, often in the dark, and that automation . . . dealt with that problem by avoiding human error”).

IV

In my view, our case law compels the conclusion that claims 1, 9, and 14 of the ’262 patent are patent ineligible. Our cases have held that the mere automation of manual processes using generic computer components is directed to an abstract idea in *Alice* step one. Contrary to the majority, such cases are not limited to addressing *Alice* step two and explicitly hold that claims that simply add generic computer components to a preexisting manual process are directed toward an abstract concept at *Alice* step one. *See, e.g., BSG Tech LLC v. BuySeasons, Inc.*, 899 F.3d 1281, 1286 (Fed. Cir. 2018) (claims were directed to an abstract idea because they amounted to a “[computerized] fundamental, long-prevalent practice or a well-established method of organizing activity”); *FairWarning IP, LLC v. Iatric Sys., Inc.*, 839 F.3d 1089, 1093–94 (Fed. Cir. 2016) (claims “implement[ing] an old practice in a new [computer] environment” were “directed to an abstract idea”); *In re TLI Commc’ns*, 823 F.3d at 612 (explaining that claims “simply adding conventional computer components

Humans are not going to do so with the same degree of precision.

Oral Arg. at 29:05–30:10.

to well-known business practices” and “generalized steps to be performed on a computer using conventional computer activity” are directed to an abstract idea (quoting *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1338 (Fed. Cir. 2016) (internal quotation marks omitted)).³

V

The majority’s finding that the claims here are not directed to an abstract idea appears to rest primarily on the advantages of further automation, the majority admitting that the “described advantages are important to [its] determination.” Maj. Op. 16. The existence of the advantages resulting from further automation (i.e., “a higher degree of quality of an engine washing procedure,” a “minimize[d] risk of wrongly operat[ed] equipment,” “a higher degree of safety,” and “cost efficien[cy] and reliab[ility],” ’262 patent, col. 4 ll. 12–14, 42–49) do not make the claims patent eligible. Such improvements are exactly the types of improvement resulting from computerization of well-known activities that courts have repeatedly held to be insufficient to render claims non-abstract. *See, e.g., Customedia*

³ *See also Bozeman Fin. LLC v. Fed. Reserve Bank of Atlanta*, 955 F.3d 971, 979 (Fed. Cir. 2020) (“[T]he use of well-known computer components to . . . verify financial transactions [that were a long-standing commercial practice] d[id] not render the[] claims any less abstract.”); *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat’l Ass’n*, 776 F.3d 1343, 1347 (Fed. Cir. 2014) (computer-implemented claims were directed to an abstract idea of “data collection, recognition, and storage” that were well-known); *Intellectual Ventures I LLC v. Erie Indem. Co.*, 711 F. App’x 1012, 1015–16 (Fed. Cir. 2017) (“[C]laims [we]re directed to the [abstract idea of] identification of unwanted files in a particular field (i.e., a computer network)” where they “merely implement an old practice in a new [computerized] environment”).

Techs., LLC v. Dish Network Corp., 951 F.3d 1359, 1365 (Fed. Cir. 2020) (“generic speed and efficiency improvements inherent in applying the use of a computer to any task” were not directed to a patent-eligible improvement to computer functionality); *BSG Tech*, 899 F.3d at 1288 (“benefits that flow from performing an abstract idea in conjunction with a well-known database structure” were not patent-eligible); *Credit Acceptance Corp. v. Westlake Servs.*, 859 F.3d 1044, 1055 (Fed. Cir. 2017) (“[M]ere automation of manual processes using generic computers does not constitute a patentable improvement in computer technology.”).

The majority attempts to distinguish these cases as “addressing the eligibility of claims directed to various ways to manipulate data using a computer.” Maj. Op. 17–19 n.5. These cases are not so limited. *See Bozeman*, 955 F.3d at 979 (rejecting the argument that if a “process involves tangible steps, it cannot be an abstract idea, even if the claims additionally involve or include otherwise abstract concepts”).

But even under the majority’s interpretation, these cases control here. EcoServices itself concedes that these claims are directed to manipulating data using a computer, stating in its response brief,

[T]he claims-in-suit are directed to implementation of the information detector configured to gather information related to the type of engine being washed in combination with the control unit that is configured to utilize that information to regulate the claimed washing unit

Resp. Br. 28 (internal quotation marks omitted).

In *FairWarning*, we held similar claims to be directed toward an abstract idea:

The patented method . . . collects information regarding accesses of a patient’s personal health

information, analyzes the information according to one of several rules . . . to determine if the activity indicates improper access, and provides notification if it determines that improper access has occurred.

839 F.3d at 1093.

To be sure, there are patent claims that are eligible because they involve claims that accomplish improvements in a manual process. But here, the claimed invention does not involve “a specific improvement to computer functionality” that would make the claims directed to a non-abstract idea. *In re TLI Commc’ns*, 823 F.3d at 612. EcoServices itself makes no serious contention that the claims recite improved computer capabilities. The majority opinion reaches no such conclusion. There is no basis to conclude that this case involves an improvement in computer functionality in contrast to cases such as *Koninklijke Kpn N.V. v. Gemalto M2M GMBH*, 942 F.3d 1143 (Fed. Cir. 2019), and *Ancora Technologies, Inc. v. HTC America, Inc.*, 908 F.3d 1343 (Fed. Cir. 2018), *as amended* (Nov. 20, 2018).⁴

⁴ The majority cites *CardioNet*, which involved claims for “a device for detecting and reporting the presence of atrial fibrillation or atrial flutter in a patient.” 955 F.3d at 1364. The parties’ focus was almost entirely on whether the existing record showed the claimed process was a longstanding practice. The panel found that the defendant did not establish that “doctors long used the claimed diagnostic processes” and that “[n]othing in the record . . . suggest[ed] that the claims merely computerize[d] pre-existing techniques.” *Id.* at 1370. The panel also found that the claimed invention “achieve[d] multiple technological improvements,” such as “more accurately

For example, in *McRO, Inc. v. Bandai Namco Games Am. Inc.*, 837 F.3d 1299 (Fed. Cir. 2016), we held that a claim for automating part of a preexisting 3-D animation method was “directed to a patentable, technological improvement over the existing, manual 3-D animation techniques” because the claim used “specific, limited mathematical rules” whereas the previous manual process relied on “subjective determinations.” *Id.* at 1314, 1316. In contrast, the claims here do not “focus on a specific means or method that improves the relevant technology.” *Id.* at 1314.

There is no claim here to an improvement to the selection of washing parameters or to the parameters themselves, to the elimination of human subjectivity, or to an improvement of the washing process other than having a computer enter the established washing parameters instead of a human. *See, e.g.*, ’262 patent, col. 8, ll. 36–47; Oral Arg. at 29:38–30:10. EcoServices itself concedes that the improvement here is only “automation” of parameter selection. Oral Arg. at 18:45–19:30, 29:38–30:10. Here, claim 1 is directed to “an ‘abstract idea’ for which computers are invoked merely as a tool.” *RecogniCorp, LLC v. Nintendo Co.*, 855 F.3d 1322, 1327 (Fed. Cir. 2017) (quoting *Enfish*, 822 F.3d at 1335–36).

detect[ing] the occurrence of atrial fibrillation and atrial flutter—as distinct from V-TACH and other arrhythmias” by analyzing the “variability in the beat-to-beat timing” for “atrial fibrillation and atrial flutter in light of the variability in the beat-to-beat timing caused by ventricular beats identified by the ventricular beat detector” *Id.* at 1368–70 (internal quotation marks omitted). Here, the claimed invention “is an automation of something that was previously done by people.” Oral Arg. at 18:40–18:46.

VI

The district court (and the majority) did not reach *Alice* step two because they determined that claims are not directed to an abstract idea in step one. At step two, we search for an “inventive concept.” *Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 217, (2014) (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 72–73, (2012)). As noted earlier, EcoServices’s own evidence shows that the claimed elements are generic and conventional. We have repeatedly held that “generic computer elements . . . do not alone transform an otherwise abstract idea into patent eligible subject matter.” *FairWarning*, 839 F.3d at 1096.

EcoServices argues that the combination of the claimed “washing unit,” “information detector,” and “control unit” is an “inventive combination.” Appellee Br. 35. That “inventive combination” is simply the abstract idea of further automating the washing process. We have held that “[i]f a claim’s only ‘inventive concept’ is the application of an abstract idea using conventional and well-understood techniques, the claim has not been transformed into a patent-eligible application of an abstract idea.” *BSG Tech*, 899 F.3d at 1290–91. “It is well-settled that placing an abstract idea in the context of a computer does not ‘improve’ the computer or convert the idea into a patent-eligible application of that idea.” *Interval Licensing LLC v. AOL, Inc.*, 896 F.3d 1335, 1346 (citing *Alice*, 573 U.S. at 223.) That is the case here.