

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOUTH-TEK SYSTEMS, LLC AND POTTER ELECTRIC CO.,
LLC,
Petitioner,

v.

ENGINEERED CORROSION SOLUTIONS, LLC,
Patent Owner.

Case IPR2016-01351
Patent 9,186,533 B2

Before WILLIAM V. SAINDON, BARRY L. GROSSMAN, and
JEREMY M. PLENZLER, *Administrative Patent Judges*.

GROSSMAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
35 U.S.C. § 318(a)

I. INTRODUCTION

South-Tek Systems, LLC and Potter Electric Co., LLC (collectively, “Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–10 of U.S. Patent No. 9,186,533 B2 (“the ’533 patent”). Paper 3 (“Pet.”). Patent Owner, Engineered Corrosion Solutions, LLC, (“Patent Owner”), filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Petitioner asserted six separate and distinct grounds against the challenged claims. Pet. 10–11. We instituted review on four of the six grounds. Paper 9, 31 (“Dec. Inst.”). We instituted a trial on the following grounds of unpatentability:

Ground	Claims	Prior Art
§ 103(a) ¹	1, 2, 5–10	Golinveaux, ² AAPA, ³ and Craig ⁴
§ 103(a)	3, 4	Golinveaux, AAPA, Craig, and Wagner ⁵

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 296–07 (2011), took effect on September 16, 2012. Because the application for the patent at issue in this proceeding has an effective filing date before that date, we refer to the pre-AIA versions of the statute.

² US Patent Application Pub. No. 2006/0021759 A1, publ. Feb. 2, 2006 (Ex. 1010).

³ Applicant Admitted Prior Art (“AAPA”) in the ’533 patent specification. See Pet. 31–32 (citing and referring to portions of the ’533 Specification as AAPA).

⁴ US Patent No. 6,102,066, issued Aug. 15, 2000 (Ex. 1011).

⁵ US Patent No. 7,717,776 B2, issued May 18, 2010 (Ex. 1012).

Ground	Claims	Prior Art
§ 103(a)	1–10	Viking ⁶ , NFPA ⁷ , Cahill-O’Brien ⁸ , and EPRI ⁹
§ 103(a)	1–10	Viking, NFPA, Cahill-O’Brien, and Wood ¹⁰

Patent Owner filed a Response to the Petition (Paper 14, “PO Resp.”), and Petitioner filed a Reply (Paper 18, “Pet. Reply”).

Petitioner submitted 47 exhibits (Exs. 1001–1047). Patent Owner submitted 90 exhibits (Exs. 2001–2088, 2092, 2093). We added one exhibit to the record, Exhibit 3001, which is a Terminal Disclaimer in the ’533 patent.

Petitioner filed a Motion to Exclude Certain Evidence. Paper 21. Patent Owner filed an Opposition to the Motion to Exclude. Paper 29. Petitioner filed a Reply. Paper 33.

Patent Owner also filed a Motion to Exclude Certain Evidence. Paper 26. Petitioner filed an Opposition to the Motion to Exclude. Paper 31. Patent Owner Filed a Reply. Paper 35.

A hearing was held October 11, 2017. Paper 39 (“Tr.”).

⁶ Viking Corp. TECHNICAL DATA: DRY PIPE SPRINKLER SYSTEM (Mar. 2, 2007) (Ex. 1014).

⁷ National Fire Protection Association (“NFPA”) *Standard for the Installation of Sprinkler Systems*, 2007 Ed. (Ex. 1015).

⁸ US Patent No. 5,438,841, issued Aug. 8, 1995 (Ex. 1016).

⁹ *Plant Layup and Equipment Preservation Sourcebook*, Interim Report, Mar. 1987, prepared by Multiple Dynamics Corp. for the Electric Power Research Institute, (“EPRI”) (Ex. 1017).

¹⁰ U.S. Patent No. 6,540,028 B2, issued Apr. 1, 2003 (Ex. 1018).

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner has the burden of proving unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e). Based on the findings and conclusions below, we determine that Petitioner has met its burden to establish that claims 1–10 are unpatentable based on Viking, NFPA, Cahill-O’Brien, and EPRI.

We deny Petitioner’s and Patent Owner’s Motion to Exclude.

A. Related Proceedings

The ’533 patent is the subject of a suit captioned *Engineered Corrosion Solutions, LLC. v. South-Tek Systems, LLC*, Civil Action No. 4:16-cv-00096-CEJ (E.D. Mo.). Pet. 8; Paper 4, 2.

The ’533 patent states it is a continuation of U.S. Patent No. 9,144,700 (the “700 patent”). Patent Owner voluntarily submitted a Terminal Disclaimer in the application leading to issuance of the ’533 patent disclaiming the terminal part of the statutory term that would extend beyond the expiration date of the full statutory term of the ’700 patent. *See* Ex. 3001. The ’700 patent is the subject of *inter partes* review No. IPR2016-00136 filed by Petitioner, asserting some of the same references asserted in the proceeding now before us. The Board entered a Final Written Decision in IPR2016-00136 holding that Petitioner did not establish that claims 1–9 of the ’700 patent are unpatentable. *South-Tek Systems, LLC v. Engineered Corrosion Solutions, LLC*, IPR2016-00136, Paper 52 (PTAB May 10, 2017).

Petitioner filed a Notice of Appeal. IPR2016-00136, Paper 55 (PTAB July 12, 2017).

B. The '533 Patent

The '533 patent relates to a fire protection system. As disclosed in the Specification, there are two basic types of fire protection systems: dry pipe systems and wet pipe systems. Ex. 1001, col. 5, ll. 7–10. A wet pipe system uses pipes filled with pressurized water. *Id.* at col. 6, ll. 1–2. A dry pipe system uses pipes filled with pressurized gas. *Id.* at col. 5, ll. 11–14. The dry pipe system includes a valve coupling a source of pressurized water to the pipes. The valve is in a closed position until the fire protection system actuates. Preaction systems are a subset of dry pipe systems. *Id.* at col. 5, ll. 8–9. The Specification does not further define a “preaction” system, although the claims recite “a preaction sprinkler system.” *Id.* at col. 18, l. 24.

Corrosion of the pipes, sprinklers and related components is a significant problem in fire protection systems. *Id.* at col. 1, ll. 23–29. Stagnant water or other moisture in the pipes, coupled with oxygen available in the pipes, increases corrosion of the pipes. *Id.* at col. 2, ll. 1–9.

According to the Specification, corrosion in the disclosed invention is reduced by filling the pipes of a dry pipe system with pressurized nitrogen. *Id.* at col. 2, ll. 46–52. The pressurized nitrogen displaces air, which contains oxygen, from the pipes. The disclosed system also includes a vent positioned within the piping network. The vent allows

air and oxygen, and the pressurized nitrogen itself, to exit the piping network. *Id.* at col. 3, ll. 7–11.

Figure 1 from the '533 patent is reproduced below.

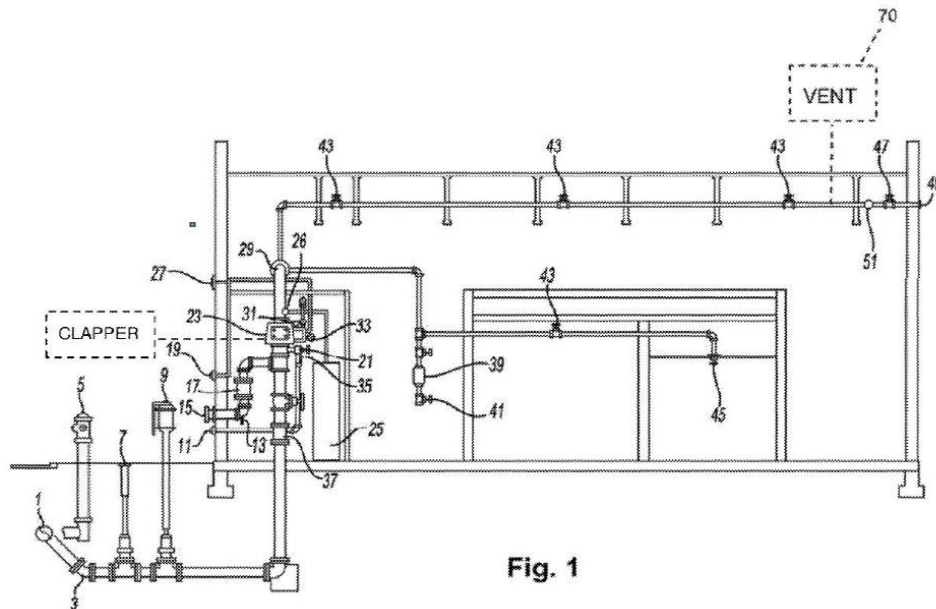


Figure 1 illustrates a “dry pipe” fire protection system. *Id.* at col. 3, ll. 25–27. As described in the Specification (*see id.* at col. 16, ll. 3–34 (Example 1)), and as shown generally in Figure 1, water supply line 1 provides pressurized water through a piping system. Dry pipe valve 23 controls the pressurized water flow from the water supply to the piping network. The pressurized nitrogen within the piping network maintains dry pipe valve 23 in a closed position. When the system activates in response to a fire, pressurized nitrogen escapes through the open sprinklers, pressure in the pipes drops, and valve 23 opens, thereby allowing water to enter the piping network and exit through the sprinklers.

Nitrogen generator 25 provides a source of pressurized nitrogen to the system. The nitrogen generator may recharge the pressurized piping network as needed and may do so automatically. Alternatively, the nitrogen generator may continuously supply pressurized nitrogen into the piping network. In this case, the nitrogen generator provides a steady stream of pressurized nitrogen into the system to keep the dry pipe valve closed. When activated in response to a fire, pressure within the piping network is lost faster than the nitrogen generator can replace it. When the pressure trip-point is reached, the dry-pipe valve opens allowing water to flow through the system piping. *Id.* at col. 15, ll. 24–27

The piping network includes drum drip 39 and drain valve and plug 41. Sprinklers 43 and 45 within the piping network provide fire protection coverage. *Id.* at col. 16, ll. 24–27. One or more oxygen sensors 51 measure oxygen and ensure all oxygen, or an acceptable level of oxygen, is purged from the system. *Id.* at col. 16, ll. 29–34.

The system includes vent 70, which may be a pressure relief valve to control or limit the nitrogen or other gas pressure in the system. *Id.* at col. 11, ll. 24–31. The relief valve allows pressurized nitrogen to escape at a preset or adjustable limit to prevent over-pressurization while maintaining enough pressure within the system to prevent the dry pipe valve from opening. *Id.*

C. Representative Claim

Claims 1–10, all the claims in the '533 patent, are challenged. Claim 1 is the sole independent claim. Claim 1, reproduced below, is representative of the claimed invention:

1. A water-based fire protection system comprising:

a preaction sprinkler system comprising at least one fusible sprinkler, a source of pressurized water, a piping network connected to the at least one fusible sprinkler, one or more drains, and a mechanically or electrically controlled valve coupling the source of pressurized water to the piping network, the piping network pitched toward the one or more drains, and the one or more drains including a drum drip;

a nitrogen generator coupled to the piping network, the nitrogen generator operable to pressurize the piping network with nitrogen until the water-based fire protection system is actuated; and

at least one vent positioned within the piping network, the at least one vent operable to allow gas including oxygen displaced by the nitrogen to exit the piping network at a preset or adjustable limit until the water-based fire protection system is actuated to thereby increase the concentration of nitrogen and decrease the concentration of oxygen in the piping network to reduce or eliminate the rate of corrosion in the piping network.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R.

§ 40.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46

(2016). Under that standard, and absent any special definitions, we generally give claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner proposes specific definitions for two claim terms: “preaction” and “drum drip.” Pet. 20–25.

We determine that specific construction of these terms is not necessary to resolve this proceeding.

B. Asserted Grounds of Unpatentability

We first consider the asserted ground based on Viking, NFPA, Cahill-O’Brien, and EPRI, which we find dispositive.

1. Obviousness of Claims 1–10 Based on Viking, NFPA, Cahill-O’Brien, and EPRI¹¹

Section 103(a) forbids issuance of a patent when “the differences between the subject matter sought to be patented and the prior art are

¹¹ As explained in our Decision to Institute (*see* Dec. Inst. 19, fn 16), the Petition states that Ground 5 is based on the Viking, NFPA, and Cahill-O’Brien references “and further in view of *either* EPRI . . . *or* Wood.” Pet. 11 (emphases added). The claim charts for this ground repeat the alternative use of EPRI *or* Wood for the disclosure of the “at least one

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.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”). The Court in *Graham* explained that these factual inquiries promote

vent” limitation in claim 1. *Id.* at 63. The heading of Section VI, however, refers to “EPRI, *and* Wood.” *Id.* at 50 (emphasis added). Petitioner also refers to one combination of references with EPRI but *without* Wood. *Id.* at 60 (“The combination of Viking, NFPA 13, Cahill-O’Brien, and EPRI teaches all limitations of claims 1-10.”). Petitioner, however, also refers to a combination of references with EPRI *and* Wood. *Id.* at 62 (“The combination of Viking, NFPA 13, Cahill-O’Brien, EPRI, and Wood teaches all limitations of claims 1-10.”). Patent Owner addressed this ground based on EPRI *or* Wood. Prelim. Resp. 24; PO Resp. 18, 28. As stated in the section of the Petition titled “Specific Statutory Grounds (37 C.F.R. § 42.104(b)(2)),” Petitioner asserted Ground 5 based on either EPRI *or* Wood, Pet. 10. Petitioner’s Reply confirms that our understanding of this asserted Ground was correct in that the Reply argues this asserted Ground based only EPRI *or* Wood. *See* Pet. Reply 17–24 (“Obviousness, Ground 5, Claims 1-10 (EPRI)”), 25–26 (“Obviousness, Ground 5, Claims 1-10 (Wood)”). Here we address only the ground based on EPRI.

“uniformity and definiteness,” for “[w]hat is obvious is not a question upon which there is likely to be uniformity of thought in every given factual context.” 383 U.S. at 18.

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. To reach this conclusion, however, it is not enough to show merely that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*

Moreover, in determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 164 (Fed. Cir. 1985) (“It is elementary that the claimed invention must be considered as a whole in deciding the question of obviousness.”) (citation omitted); *see also Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537 (Fed. Cir. 1983) (“[T]he question under 35 U.S.C. § 103 is not whether the

differences themselves would have been obvious. Consideration of differences, like each of the findings set forth in *Graham*, is but an aid in reaching the ultimate determination of whether the claimed invention as a whole would have been obvious.”) (citation omitted).

“A reference must be considered for everything it teaches by way of technology and is not limited to the particular invention it is describing and attempting to protect.” *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985).

As a factfinder, we also must be aware “of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *KSR*, 550 U.S. at 421. This does not deny us, however, “recourse to common sense” or to that which the prior art teaches. *Id.*

Against this general background, we consider the references, other evidence, and arguments on which the parties rely.

a. Level of Skill

The parties argue that the challenged claims would (Petitioner) or would not (Patent Owner) have been obvious to a person of ordinary skill in the pertinent technology. The parties refer to the level of skill, but neither party defines the applicable level of skill. We note that Patent Owner’s expert, Mr. O’Neill, testifies that a “sprinkler system designer of ordinary skill . . . is someone who has at least a few years of experience actually designing fire sprinkler systems.” Ex. 2001 ¶ 9. Patent Owner, however, makes no specific argument referring to, or citing, Mr. O’Neill’s testimony concerning the level of skill. Thus, we give Mr. O’Neill’s testimony on this issue no consideration or

evidentiary weight. 37 C.F.R. § 42.22(a)(2) (“Each *petition* or motion . . . must include: . . . (2) A full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence including material facts, and the governing law, rules, and precedent.” (emphasis added)); *see also id.* at § 42.104(b) (“The Board may exclude or give no weight to the evidence where a party has failed to state its relevance or to identify specific portions of the evidence that support the challenge.”).¹²

The level of skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (“the level of skill in the art is a prism or lens through which a judge, jury, or the Board views the prior art and the claimed invention”). Factors pertinent to a determination of the level of ordinary skill in the art include: (1) educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology, and (6) educational level of workers active in the field. *Environmental Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82

¹² *See Fidelity National Information Services, Inc., v. Datatransury Corp.* Case IPR2014-00489, slip. op. at 9, (PTAB Aug. 13, 2014) (Paper 9) (“We, therefore, decline to consider information presented in a supporting declaration, but not discussed sufficiently in a petition; among other reasons, doing so would permit the use of declarations to circumvent the page [or word] limits that apply to petitions.”).

(Fed.Cir.1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.* Moreover, these factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art. *Daichi Sankyo Co. Ltd, Inc. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

In determining a level of ordinary skill, we also may look to the prior art, which may reflect an appropriate skill level. *Okajima*, 261 F.3d at 1355. Additionally, the Supreme Court informs us that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

Neither party presents an evidence-based analysis of factors typically considered in determining the level of ordinary skill.

We have not been directed to any evidence in the record concerning the educational level of the inventors of the ’533 patent; the rapidity with which innovations in the relevant technology are made; or the educational level of workers active in the field.

The type of problems discussed in the ’533 patent suggest skill involving control of fluid and gas flows, corrosion, and dry pipe fire protection systems. The prior art also suggests these same areas of skill. The technology is somewhat sophisticated in that it relates to fire safety and requires knowledge of thermal and pressure-based control systems.

Based on the record before us, we determine that a person of ordinary skill has a bachelor’s degree in a relevant engineering

discipline and at least two years of experience designing dry pipe fire protection systems or similar systems, or at least five years of experience designing dry pipe fire protection systems or similar systems.

b. Scope and Content of the Prior Art,
Including Differences from the Claimed Invention

i. Viking (Ex. 1014)

Viking is a six page document titled “[T]echnical Data [–] ‘Dry Pipe Sprinkler System.’” It describes the components, applications, operation, and maintenance of a dry pipe sprinkler system. Ex. 1014, 1–6. As stated in Viking, “[w]hen a fire occurs, the heat produced will operate a sprinkler causing the air pressure in the piping system to escape. When the pressure trip-point is reached (directly or through the accelerator), the dry-pipe valve opens allowing water to flow through the system.” *Id.* at 3.

Viking discloses “[t]he system piping from the Dry Pipe Valve to the fusible sprinklers is filled with *pressurized air or nitrogen*.” *Id.* at 1 (emphasis added). Viking discloses a “[c]ompressed *air* supply (automatic or manual)” (*id.* (emphasis added)), but does not refer to a supply or source of pressurized nitrogen when nitrogen is used as an alternative to air. It is clear, however, Viking discloses that pressurized nitrogen can be used as an alternative to pressurized air. When pressurized nitrogen is used, there must, of course, be a source of the pressurized nitrogen. Viking does not address why, or under what

specific conditions, pressurized nitrogen would be used or preferred rather than pressurized air.

Viking refers to venting outlet pressure to the atmosphere, but only in the context of an optional “accelerator.” Ex. 1014, 3, Sec. 4(B), (“On a pneumatic release system, the outlet pressure is vented to atmosphere, speeding the release system operation.”). As explained in Viking, “[a] dry pipe valve equipped with an accelerator will trip more rapidly and at a higher air-pressure differential.” *Id.* at 3, Sec. 4.

The dry pipe system disclosed in Viking is substantially similar to the dry pipe system disclosed and claimed in the ’533 patent. *E.g.*, compare the figure in Viking (Ex. 1014, 2) with Figure 1 in the ’533 patent, reproduced below.

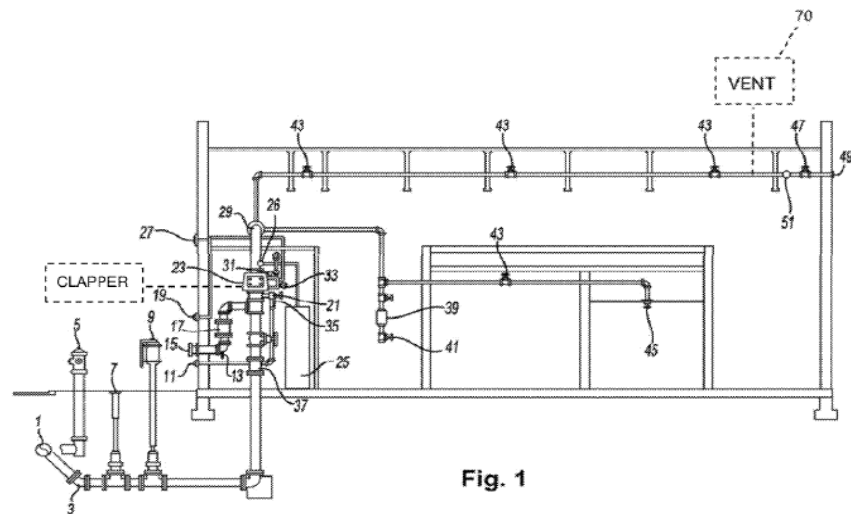
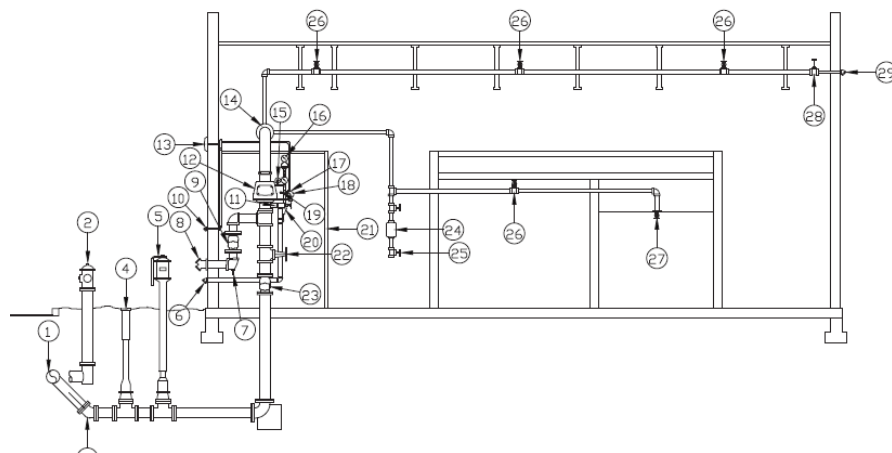


Figure 1 from the '533 patent (Ex. 1001).



As Petitioner acknowledges, Viking does not disclose a nitrogen generator, a vent, or an oxygen sensor. Pet. 51.

ii. NFPA (Ex. 1015)

NFPA is a document titled “Standard for the Installation of Sprinkler Systems,” issued by the Standards Council of the National Fire Protection Association. Ex. 1015, 1. The document is 408 pages. It is a comprehensive document discussing in detail the design and installation of automatic fire sprinkler systems. *Id.* at 12. Petitioner

relies on this reference for the disclosure of a “preaction” sprinkler.¹³ Pet. 51 (citing Ex. 1015 § 3.4.9, p. 19) (“Preaction Sprinkler System. A sprinkler system employing automatic sprinklers that are attached to a piping system that contains air that might or might not be under pressure, with a supplemental detection system installed in the same areas as the sprinklers.”); *id.* at 62.

iii. Cahill-O’Brien (Ex. 1016)

Cahill-O’Brien discloses a controlled atmosphere system for a refrigerated container. Ex. 1016, col. 1, ll. 8–9. The system regulates the amount of nitrogen, oxygen, and carbon dioxide inside a refrigerated container to provide an environment that extends the post-harvest shelf life or quality of fruits and vegetables. *Id.* at col. 1, ll. 10–13. The system controls the amount of oxygen and carbon dioxide by replacing them with nitrogen. *Id.* at col. 1, ll. 26–31. Nitrogen is generated using an air separator to divide a stream of ambient air, under pressure, into its principal constituents of oxygen and nitrogen. Ex. 1016, col. 1, ll. 49–53.

iv. EPRI (Ex. 1017)

Patent Owner asserts that Petitioner has not established that EPRI is a proper publication under § 102, arguing that “mere indexing under title ‘Plant Layup and Equipment Preservation Sourcebook’ or even the subject matter ‘corrosion’ does not make it available to a Typical Sprinkler Designer.” PO Resp. 19, n.2 (citing Ex. 2012, ¶ 48).

¹³ Neither claim 1 nor the ’533 Specification recites any structure that defines what makes a sprinkler system a “preaction” sprinkler system.

Mr. O'Neill testifies that “the title Plant Layup and Equipment Preservation Sourcebook and subject matter ‘corrosion’ would not have indicated to a Typical Sprinkler Designer that EPRI was relevant to corrosion induced water leaks in fire sprinkler systems.” Ex. 2012, ¶ 48. We disagree.

A given reference is “publicly accessible” upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it. *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006).

The EPRI reference is a “sourcebook” prepared for a trade association. Ex. 1017, 4. It indicates that it was classified in 1987 in the library system of Indiana University. *Id.* It contains the following marking: “BUSP; TK; 9203; .P7; P53; 1987; Indiana University Libraries; Bloomington.” *Id.* We determine that the evidence establishes it was publicly accessible. As discussed above, a person of ordinary skill is a person knowledgeable about control of fluid and gas flows, corrosion, and dry pipe fire protection systems, with a bachelor’s degree in a relevant engineering discipline and at least two years of experience designing dry pipe fire protection systems or similar systems. Based on the library classification of EPRI, we are persuaded it was accessible to a person of ordinary skill.

EPRI is an “Interim Report,” titled “Plant Layup and Equipment Preservation Sourcebook,” prepared by “Multiple Dynamics

Corporation” for the Electric Power Research Institute. Ex. 1017, 1. The Report is 196 pages. It is a reference document disclosing techniques for the care of nuclear power plant systems and equipment during construction and also during long periods when the plant is not operating. *Id.* at 6. The Report refers to maintaining the power plant during these idle, non-operational periods as “plant lay-up.” *Id.* A primary objective is to protect plant components from corrosion. *See generally, id.* at 17–35. As stated therein, “[d]ebilitating phenomena occurring during lay-up conditions can result in component deterioration and degraded performance. The debilitating phenomena discussed in this section include general corrosion, stress corrosion cracking, galvanic corrosion, [and] microbiologically influenced corrosion.” *Id.* at 17.

As discussed in EPRI, microbiologically influenced corrosion (MIC) has been a widespread problem in nuclear power plants. *Id.* at 27. EPRI notes that many, if not all, water-filled systems seem to be susceptible to some form of MIC. *Id.* EPRI notes specifically that “[a]ny system can be made susceptible to MIC if the system is not kept clear of materials which encourage the growth of microbes. Keeping the materials free of water or moisture in a stagnant condition, as well as clear of dirt and construction debris, will reduce the occurrence of MIC.” *Id.* at 30.

EPRI discloses various “Lay-Up Methods.” *Id.* at 62. These methods include, for example, forced air drying and dehumidified air drying; wet lay-up; nitrogen blanket or purge; and steam blanket. *Id.*

The “Nitrogen Lay-up” system described in EPRI uses a source of nitrogen to provide nitrogen at a “slightly positive pressure,” that is, slightly above atmospheric pressure. *Id.* at 65. EPRI discloses that where complete isolation of the system is not possible, “a low purge flow must be maintained during the lay-up.” *Id.* In order to implement the various lay-up treatments, the lay-up medium (air, water, or nitrogen) “must be introduced into and *vented/drained* from” the system. *Id.* at 68 (emphasis added). Preferably, existing hardware can be used without modification for these inlet/outlet connections. *Id.* In some cases, existing hardware, such as a condensate check valve, can be modified for use. *Id.* EPRI also discloses the use of a gate valve to control the inlet/outlet connections. *Id.* at 69.

As explained in EPRI, “[t]he nitrogen limits the amount of oxygen available for corrosion. . . . Without oxygen, corrosion will not take place.” *Id.* at 70.

We recognize that EPRI does not deal specifically with a “fire protection system,” as recited in the challenged claims. EPRI does, however, deal comprehensively with the issue of corrosion in piping systems that carry or contain water. As stated in *KSR*, “[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one.” 550 U.S. 417. Moreover, the status of a plant in “lay-up,” which is an idle, non-operational period, is the same as the status of a fire protection system in stand-by mode, which is an idle, non-operational period of the sprinkler system. The claimed pressurized nitrogen

system functions only until the system becomes operational, that is, the system detects a fire, sprinklers open, and water fills the piping system.

c. Discussion

As Petitioner points out (Pet. 50–51), there are substantial similarities between the Viking reference and the system disclosed in the '533 patent. For example, comparing Figure 1 from the '533 patent with a figure on page 2 of Viking, both figures reproduced below, there can be no reasonable dispute that they are, in fact, substantially similar. The most significant differences, in the context of the issues before us, are the additions in Figure 1 of the '533 patent of nitrogen generator 25, oxygen sensor 51 (recited in dependent claim 3), and vent 70.

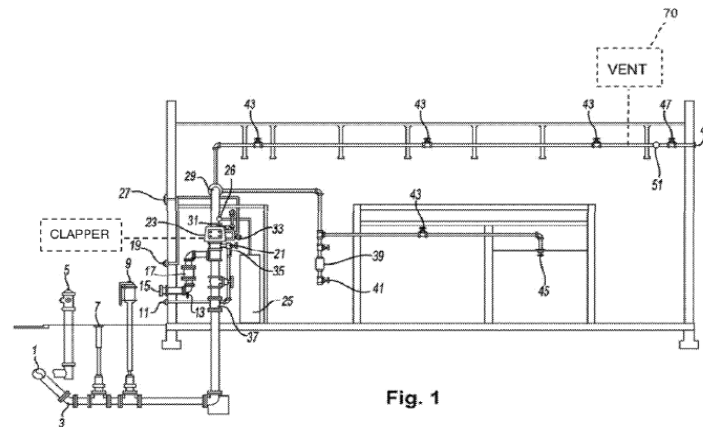


Figure 1 from the '533 patent (Ex. 1001).

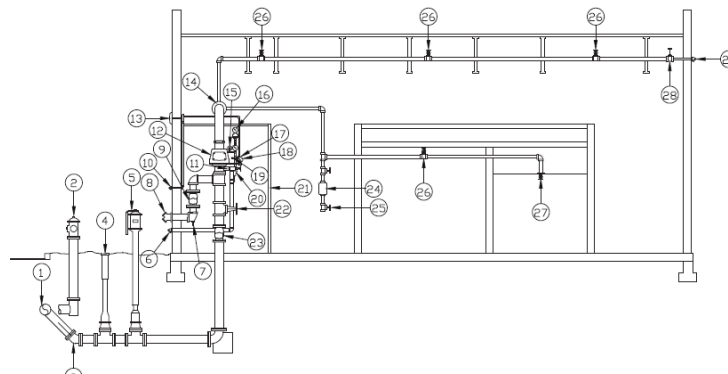


Figure from Viking (Ex. 1014, 2).

It is Petitioner's position that: "Viking teaches maintaining pressurized nitrogen in the system." Pet. 51. Petitioner recognizes, however, that "Viking does not explicitly teach a preaction system, use of a nitrogen generator, a vent, or an oxygen sensor." *Id.* Petitioner relies on Cahill-O'Brien for the disclosure of a nitrogen generator (*id.* at 52, 63) and oxygen sensor (dependent claim 3) (*id.* at 53, 64); and on EPRI (*id.* at 56–58, 63) for the vent. Petitioner concludes it would have been obvious to combine these elements with Viking to meet the limitations of independent claim 1.

It is beyond reasonable dispute that Viking discloses a typical dry pipe sprinkler system, which includes fusible sprinklers, a source of pressurized water, a piping network filled with pressurized air or nitrogen and pitched toward one or more drains including a drum drip, and a dry pipe valve coupling the source of pressurized water to the piping network. *See* Pet. 62–65.

i. Nitrogen Generator

It is beyond reasonable dispute that Viking discloses using pressurized nitrogen, but does not specify a specific source of the nitrogen. Petitioner relies in Cahill-O’Brian simply for the specific disclosure of a source of pressurized nitrogen. *See* Pet. 52–53. Cahill-O’Brien teaches the use of a nitrogen generator, “wherein extremely high purity nitrogen gas is generated using an air separator of a type which incorporates membranes to divide a stream of ambient air, under pressure, into its principal constituents of oxygen and nitrogen.” Ex. 1016, col. 1, ll. 49-53. Some of the nitrogen generators use an electronic controller to electrically operate a valve which will selectively increase or decrease the amount of nitrogen delivered from the membrane separator to the container. *Id.* at col. 1, ll. 53–57.

Moreover, the ’533 patent expressly acknowledges that such nitrogen generators were well-known and commonly used. According to the disclosure of the ’533 patent, various types of nitrogen generators, including “nitrogen membrane systems” and “pressure swing adsorption systems” (Ex. 1001, col. 9, ll. 56–57), were well-known and commercially available for use in dry pipe sprinkler systems. *Id.* at col. 13, ll. 11–17;

see also col. 10, l. 64–col. 11, l. 4 (disclosing commercially available “[s]uitable nitrogen generators”).

Additionally, at the hearing, Patent Owner’s counsel acknowledged that manufacture and sales of nitrogen generators was a “huge industry” with uses in technologies other than “fire protection systems.” Tr. 33, ll. 6–9. Patent Owner’s counsel also acknowledged that “[Petitioner] South-Tek has been selling nitrogen generators for *decades*.” *Id.* (emphasis added).

Patent Owner asserts that Viking does not suggest controlling oxygen levels in a sprinkler piping network. PO Resp. 20. According to Patent Owner, Viking is unrelated to displacing oxygen. *Id.* at 21. Patent Owner concludes that Viking “would not have motivated a PHOSITA to ‘control oxygen levels’ in Viking’s fire sprinkler system. *Id.* (citing Ex. 2012, ¶¶ 44–45). We disagree.

Petitioner asserts that increasing the concentration of nitrogen and decreasing the concentration of oxygen to control corrosion is the result of the vent in EPRI. Pet. 62 (claim chart). Indeed, this is the fundamental objective of EPRI, which discloses specifically that “[t]he nitrogen limits the amount of oxygen available for corrosion. . . . Without oxygen, corrosion will not take place.” Ex. 1017, 70. As explained above, the “Nitrogen Lay-up” system described in EPRI uses a source of nitrogen to provide nitrogen at a “slightly positive pressure,” that is, slightly above atmospheric pressure to provide “a low purge flow” during the lay-up. *Id.* at 65. In order to implement the various lay-up treatments, the lay-up medium (air, water, or nitrogen)

“must be introduced into and *vented/drained* from” the system.

Id. at 68 (emphasis added).

We are persuaded that adding a nitrogen generator, as suggested by Cahill-O’Brien, to provide the source of pressurized nitrogen to control oxygen levels in the Viking system would be well within the capabilities of a person of ordinary skill in the relevant technology. Petitioner asserts, and we agree, that the combination would have been obvious because one skilled in the art would have appreciated that having a nitrogen generator is better than swapping out individual gas cylinders. Pet. 53.

ii. Vent

The vent recited in claim 1 is operable to allow gas, including oxygen displaced by the nitrogen, to exit the piping network at a preset or adjustable limit until the water-based fire protection system is actuated. According to the claimed invention, this increases the concentration of nitrogen and decreases the concentration of oxygen in the piping network, to thereby reduce or eliminate the rate of corrosion in the piping network.

Petitioner relies on EPRI for the claimed vent. Petitioner makes clear that the proposed combination is to “*add an air ejector vent*, as taught by EPRI, to the sprinkler system of Viking, as modified by Cahill-O’Brien to include a nitrogen generator.” *Id.* at 60 (emphasis added). According to Petitioner, the reason why a person of ordinary skill would have made this change would have been “to establish a

purge flow while maintaining a positive nitrogen pressure in the pipe,” to thereby obtain the anti-corrosion benefits disclosed in EPRI. *Id.*

The EPRI vent can be “set” to maintain both a slightly positive pressure in the system and a low purge flow through the system and out the vent. Ex. 1017, 65. Thus, we determine that EPRI meets the alternative recitation of “preset *or* adjustable” (Ex. 1001, col. 18, l. 39) (emphasis added). Because claim 1 recites “preset *or* adjustable” as alternatives, a reference need only show one of the two alternatives. *See Brown v. 3M*, 265 F.3d 1349, 1352 (Fed. Cir. 2001) (interpreting the phrase “at least one of two-digit, three-digit, or four-digit year-date representations” as “only two-digit, only three-digit, only four-digit, or any combination of two-, three-, and four-digit date-data”).

Patent Owner asserts “EPRI also fails to teach venting while, at the same time, maintaining a pipe pressure above the minimum system pressure.” PO Resp. 19. Patent Owner does not cite persuasive evidence to support this interpretation.

We note that Mr. O’Neill testifies, “EPRI teaches applying a slightly positive pressure to a closed system only after the purging is completed, not during purging.” Ex. 2001 ¶ 26. We disagree. For nitrogen lay-up, EPRI isolates “each region” of the power plant. Ex. 1017, 65. EPRI discloses, “[a]fter filling, the region’s isolation valves are closed and the nitrogen supply regulators are set to maintain a slightly positive pressure.” *Id.* Where complete isolation of a region cannot be accomplished, however, “*a low purge flow must be maintained during the lay-up period.*” *Id.* (emphasis added). In the Region 1 and

Region 2 examples in EPRI, nitrogen is introduced into a region and is vented through the condenser. *Id.* at 66. We determine a person of ordinary skill would have understood this disclosure to mean that in some circumstances, such as when a region cannot be isolated, in order to maintain “a slight positive pressure” in the region, a continuous low purge flow is necessary during the entire lay-up period. In order to maintain a “purge flow” through the vent, a slight pressure above atmospheric pressure is required.

Mr. O’Neill also testifies that “EPRI also does not teach venting a system while the system is up and running.” Ex. 2001 ¶ 26. By “up and running,” we understand Mr. O’Neill to mean operational and producing power. Mr. O’Neill does not direct us to any claim limitation that requires the claimed fire protection system to be “up and running.” As recited in claim 1, the claimed vent operates only “until the water-based fire protection system is actuated.” Ex. 1001, col. 18, ll. 39–40. Thus, once the fire protection system is actuated, that is, “up and running,” with pressurized water flowing through the pipes and sprinklers, the claimed vent no longer is operational. The claimed vent, like the system in EPRI, operates only when the system is in its non-operational “standby” mode, that is, awaiting a signal that a fire is present.

Patent Owner asserts that “by teaching that ‘[t]o prevent MIC from occurring, the water must be treated,’ EPRI teaches away from using nitrogen to displace oxygen and inhibit corrosion, including MIC.” PO Resp. 1–2. Patent Owner also argues that “because EPRI teaches

chemical treatments for preventing MIC, EPRI would not have motivated a PHOSITA to use nitrogen to displace oxygen and inhibit corrosion. *Id.* at 19, 25. We disagree. Patent Owner misconstrues the comprehensive disclosure in EPRI.

EPI discloses that a person of ordinary skill and creativity has a broad range of choices for controlling corrosion in piping systems that contain water. Among the choices are several options for preventing MIC, such as “to use materials that are resistant to MIC under field conditions” (Ex. 1017, 30); “[k]eeping the materials free of water or moisture in a stagnant condition” (*id.*); keeping materials clear of dirt and construction debris (*id.*); and chemically treating the water (*id.*). As further explained in EPRI, one way of keeping the materials free of water or moisture is to use a “[n]itrogen lay-up.” *Id.* at 65. One advantage of the nitrogen lay-up method of minimizing corrosion is the “nitrogen limits the amount of oxygen available for corrosion.” *Id.* at 70. “Without oxygen, corrosion will not take place.” *Id.* All of these corrosion control techniques for MIC and other forms of corrosion were explained in EPRI and available for a person of ordinary skill and creativity to use, as appropriate, for the task at hand.

Based on the analysis above, we are persuaded that a preponderance of the evidence establishes all the elements recited in claim 1 are disclosed in Viking, NFPA, Cahill-O’Brien, and EPRI, and Petitioner has established a persuasive rationale why it would have been obvious to combine these elements.

iii. Dependent Claims 2–10

Claims 2–10 depend directly or indirectly from claim 1. Patent Owner does not address or rebut Petitioner’s allegations concerning the patentability of claims 2, and 5–10. Nonetheless, Petitioner has the burden of proof to establish that these claims are not patentable.

Patent Owner addresses only dependent claims 3 and 4. PO Resp. 28. We address the dependent claims below.

Claim 2 recites that at least one sprinkler is operable to depressurize the piping network, thus allowing the pressurized water to fill the piping network and the fused sprinkler.

Petitioner asserts that Viking discloses this element. Pet. 63–64. Viking discloses that when a fire occurs, the heat produced will operate a sprinkler causing the air pressure in the piping system to escape. Ex. 1014, 3. When the pressure trip-point is reached, the dry-pipe valve opens, thereby allowing water to flow through the system piping and sprinklers. *Id.* The water will continue to flow until the system is shut off manually. *Id.*

We agree with Petitioner’s arguments and evidence and adopt them.

Claim 3 recites that an oxygen sensor is coupled to the sprinkler system. Claim 4 recites that the nitrogen generator provides pressurized nitrogen to the system automatically in response to the oxygen level measured by the oxygen sensor.

Petitioner asserts the limitations recited in claims 3 and 4 are disclosed in Cahill-O’Brien. Pet. 64. Cahill-O’Brien clearly discloses

oxygen sensor 110 used to measure the concentration of oxygen inside the container. Ex. 1016, col. 7, ll. 45–47. The purpose of the oxygen sensor is to provide a “controlled atmosphere system is to control the amount of oxygen and carbon dioxide inside the container. *Id.* at col. 1, ll. 26–28. The oxygen sensor measures the amount of oxygen (O₂) and replaces it with nitrogen (N₂). *Id.* at col. 1, ll. 29–31. Cahill-O’Brien also discloses that, based on the output of oxygen sensor 110, controller 50 determines automatically whether additional nitrogen is required. *Id.* at col. 13, l. 63–col. 14, l. 15.

Patent Owner asserts “Cahill-O’Brien and Viking fail to support the asserted motivation for adding oxygen sensors to Viking’s system.” PO Resp. 28. We disagree.

Cahill-O’Brien suggests the benefits of measuring what matters, which is the relative amounts of oxygen and nitrogen in a system. Cahill-O’Brien also discloses the elements to measure the amount of oxygen and also to automatically regulate the desired balance between oxygen and nitrogen. A person of ordinary skill and creativity also knows from the prior art, such as EPRI, that, “[t]he nitrogen limits the amount of oxygen available for corrosion. . . . Without oxygen, corrosion will not take place.” *Id.* at 70. Thus, if the objective is to reduce corrosion, there is a clear motivation to measure what matters, which is the level of oxygen. An oxygen sensor measures the level of oxygen. When the oxygen/nitrogen level falls below a desired limit, Cahill-O’Brien discloses how to automatically adjust the oxygen/nitrogen mix

to the desired design objective. Thus, we agree with Petitioner's arguments and evidence and adopt them.

Claim 5 recites that the "nitrogen generator is a nitrogen pressure swing adsorption system." Petitioner asserts that the '533 specification admits that pressure swing adsorption type nitrogen generators were well known at the time of the invention. Pet. 64 (citing Ex. 1001, col. 9, ll. 47–48; col. 10, ll. 16–19. *See also*, Ex. 1001, col. 9, ll. 56–57 ("Nitrogen generators include nitrogen membrane systems and nitrogen pressure swing adsorption systems."); col. 10, l. 64–col. 11, l. 1 (disclosing manufactures of suitable "membrane and PSA [pressure swing adsorption] nitrogen generators"). Based on the admitted state of the art, pressure swing adsorption nitrogen generators were well-known and commercially available. It would have been obvious to a person of ordinary skill and creativity to choose the appropriate known generator for the task at hand.

Claim 6 recites that the nitrogen generator is a nitrogen membrane system. Petitioner asserts that Cahill-O'Brien discloses a nitrogen membrane generator. Pet. 64 (citing Ex. 1016, col. 1, ll. 49–57; col. 4, ll. 61–65. Cahill-O'Brien discloses systems wherein extremely high purity nitrogen gas is generated using an air separator of a type which incorporates membranes to divide a stream of ambient air, under pressure, into its principal constituents of oxygen and nitrogen. Ex. 1016, col. 1, ll. 49–53. As also disclosed in Cahill-O'Brien, some of such systems use an electronic controller to electrically operate a valve which will selectively increase or decrease the amount of nitrogen delivered

from the membrane separator. *Id.* at col. 1, ll. 53–57. We determine it would have been obvious to use such a system based on system needs.

Claim 7 recites that the nitrogen generator is capable of generating a continuous supply of at least 90% nitrogen.

Petitioner asserts Cahill-O’Brien discloses this limitation. Pet. 64 (citing Ex. 1016, col. 5, ll. 3–4). Cahill-O’Brien discloses nitrogen generators generating nitrogen purity levels “greater than 99 percent.” Ex. 1016, col. 5, ll. 3–4. We are persuaded that using a nitrogen generator with generating a continuous supply of at least 90% nitrogen would have obvious to a person of ordinary skill and creativity.

Claim 8, dependent from claim 7, is otherwise identical to claim 6. Claim 9, dependent from claim 8, is otherwise identical to claim 2. For the reasons stated above in our analysis of claims 2 and 6, we also determine that claims 8 and 9 would have been obvious.

Claim 10 recites that the “mechanically or electrically controlled valve” recited in claim 1 is an “electronically controlled valve.” Petitioner asserts such a valve is disclosed in Cahill-O’Brien. Pet. 65 (citing Ex. 1016, col. 4, ll. 1–6). Cahill-O’Brien discloses that a programmed microprocessor, controller 18, is adapted to receive inputs from various sensors in the refrigeration system, such as oxygen sensor 110, and thereby control the operation of the refrigeration system components. Ex. 1016, col. 4, ll. 1–6. We determine that use of such a controlled valve would have been obvious based on Cahill-O’Brien.

Before determining patentability of claims 1–10 under Section 103, however, we consider the objective evidence presented by Patent Owner.

d. Objective Evidence

Patent Owner asserts Petitioner’s arguments and evidence that claim 1 and its dependent claims would have been obvious over Viking, NFPA, Cahill-O’Brien, and EPRI does not overcome the objective evidence of patentability PO Resp. 28 (referring to Section VIII of the Response).

Objective indicia of non-obviousness play an important role as a guard against the statutorily proscribed hindsight reasoning in the obviousness analysis. *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016). “[E]vidence of secondary considerations may often be the most probative and cogent evidence in the record.” *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983). “[E]vidence rising out of the so-called ‘secondary considerations’ must always when present be considered en route to a determination of obviousness.” *Id.* at 1538. “For objective evidence . . . to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention.” *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (quoting *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010)) (emphasis omitted) (internal quotation marks omitted).

Patent Owner offers evidence it asserts shows objective evidence of non-obviousness in the form of long-felt, unmet need (PO Resp. 35–46), skepticism of others (*id.* at 46–52), commercial success (*id.* at 53–

59), and copying by competitors (*id.* at 59–63). Before addressing these issues, we consider the issue of nexus to the claimed invention.

i. Nexus

For objective evidence to be accorded substantial weight, “a nexus must exist between the evidence and the merits of the claimed invention.” *Novartis Ag V. Torrent Pharmaceuticals*, 853 F.3d 1316, 1330 (Fed. Cir. 2017) (citing *Wyers v. Master Lock*, 616 F.3d at 1246).

“For objective evidence of secondary considerations to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the *claimed invention*.” *Wyers v. Master Lock Co.*, 616 F.3d at 1246. Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention. *Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1369 (Fed.Cir.2011) (“If commercial success is due to an element in the prior art, no nexus exists.”); *Ormco Corp.*, 463 F.3d at 1312 (“[I]f the feature that creates the commercial success was known in the prior art, the success is not pertinent.”).

We recognize that it is the claimed combination as a whole that serves as a nexus for the objective evidence. *WBIP v. Kohler*, 829 F.3d at 1330; see also *id.* at 1332 (stating that this is especially true for a combination of elements that were known individually in the prior art, because commercial success may be linked to the inventive combination of known elements).

There is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product is the invention disclosed and claimed in the patent. *Id.* at 1329.

“Questions of nexus are highly fact-dependent ‘It is within the province of the fact-finder to resolve these factual disputes regarding whether a nexus exists between commercial success of the product and its patented features, and to determine the probative value of evidence of secondary considerations.’” *Id.* at 1331 (citing *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75 F.3d 1568, 1574 (Fed. Cir. 1996)).

The challenged claims are directed to a “fire protection system.” The claimed system includes sprinklers, a piping network, drains, a nitrogen generator, and a vent. Patent Owner asserts its objective evidence based in substantial part on the nitrogen generator and vent elements of the claimed combination. *See, e.g.*, PO Resp. 44 (“The ’533 Patent discloses an improved fire sprinkler system having a nitrogen generator combined with a specific type of vent¹⁴ for inhibiting sprinkler pipe corrosion (the ‘ECS Invention’)”). Patent Owner sells only nitrogen

¹⁴ As discussed above, the claimed vent performs a specific function, which is “to allow gas including oxygen displaced by the nitrogen to exit the piping network at a preset or adjustable limit until the water-based fire protection system is actuated.” The claimed vent does not have a specific structure, other than what is implicated, if anything, by the functional recitation just quoted.

generator and vent products that are “only sold for use in fire sprinkler systems.” PO Resp. 64 (citing Ex. 2013 ¶¶ 18–20).

Petitioner asserts a lack of nexus based, in part, on the fact that nitrogen generators were well-known for supplying pressurized nitrogen in numerous different contexts before the priority date of the ’533 Patent, and that nitrogen generators, with uses across a broad technology spectrum, generate significant sales compared to vent sales. Pet. Reply 29 (citing Ex. 1043 ¶ 9). We recognize that, as Counsel for Patent Owner acknowledged, manufacture and sales of nitrogen generators is a “huge industry” with uses in technologies other than “fire protection systems.” Tr. 33, ll. 6–9. We also recognize that Patent Owner’s counsel also acknowledged that “[Petitioner] South-Tek has been selling nitrogen generators for *decades*.” *Id.* (emphasis added). Nonetheless, our focus is on the claimed combination of known elements, not the individual elements.

We determine that sufficient evidence establishes a nexus for consideration of the objective evidence at issue in this case. Establishing nexus, however, does not establish commercial success or other objective indicia of patentability. *In re Kao*, 639 F.3d at 1067 (when secondary considerations are present, “they are not always dispositive”); *see also Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1372 (Fed.Cir. 2007) (“Although secondary considerations must be taken into account, they do not necessarily control the obviousness conclusion.”).

We consider below the objective evidence of nonobviousness asserted by Patent Owner. We then consider the totality of the evidence in our conclusion on patentability.

ii. Long-Felt, Unmet Need

Long-felt need can be shown by evidence that indicates that the prior art had a recognized need for a solution to the problem and that others had tried and failed to find a solution to that problem. *Al-Site Corp. v. VSI Int'l, Inc.*, 174 F.3d 1308, 1325 (Fed. Cir. 1999); *Stratoflex v. Aeroquip*, 713 F.2d at 1540. Notably, the case law characterizes the need in terms of a long-felt but *unresolved* need. *Al-Site*, 174 F.3d at 1325 (discussing “long felt but unresolved needs”). Accordingly, Patent Owner must show that the need was both known and not resolved.

According to Patent Owner, as of 2008, corrosion-induced water leaks were a major challenge for building owners, fire marshals, fire protection engineers, and fire sprinkler contractors. PO Resp. 43 (citing Ex. 2012 ¶ 100). Patent Owner asserts that the potential causes of the leaks “ranged from poor workmanship, poor pipe quality and thin-wall pipe to cutting oils, moisture from the air compressor, the pipe material, residual water and, ultimately, microbiologically influenced corrosion, or MIC.” *Id.* Patent Owner acknowledges, however, that prior to 2008 “[n]itrogen was widely regarded as an inert gas that will not react with other materials, so using nitrogen to ‘inert’ the piping network seemed like a plausible solution.” *Id.* at 42 (citing Ex. 2012 ¶ 96). Patent Owner states that at this time “*Mr. O’Neill* . . . did not consider using a vent to allow gas to exit the piping network while the sprinkler system

was in service.” *Id.* at 42–43 (citing Ex. 2012 ¶ 98 (emphasis added)). There is no evidence that Mr. O’Neill represented the entire industry or any representative quantity of it. Patent Owner also asserts that “*Mr. O’Neill* did not have a good solution for removing trapped air/oxygen from a sprinkler piping network.” *Id.* at 43 (emphasis added). Again, there is no evidence that Mr. O’Neill represented the entire industry or any representative quantity of it. Patent Owner asserts it was the addition of a vent combined with a nitrogen generator that created the solution to the industry’s unmet need and “surprised the industry.” PO Resp. 46. Patent Owner provides no persuasive evidence, however, that the “industry was surprised.”

Indeed, the prior art discussed above suggests that pressurized nitrogen, nitrogen generators, and pressurized purge flow through vents to reduce oxygen levels in pipes and thereby reduce corrosion were well-known and commonly used in fire protection and other similar water distribution piping systems subject to corrosion due to the presence of residual water and oxygen.

Accordingly, there is little-to-no evidence of a long-felt but unresolved need.

iii. Skepticism of Others

Patent Owner asserts that following its public disclosure of the claimed invention, the industry was skeptical of “nitrogen as a solution to MIC [microbial influenced corrosion].” Patent Owner states it “had to convince the entire sprinkler industry that the combination of a nitrogen generator and a vent would solve the problem of oxygen cell

corrosion and MIC in dry pipe and preaction fire sprinkler systems.”
PO Resp. 50 (citing Ex. 2012, ¶ 113).

Evidence of industry skepticism weighs in favor of non-obviousness. *WBIP v. Kohler*, 829 F.3d at 1335. If industry participants or skilled artisans are skeptical about whether or how a problem could be solved or the workability of the claimed solution, it favors non-obviousness. *Id.*

As discussed above, EPRI disclosed that using pressurized nitrogen to reduce oxygen levels in pipes was an effective method for controlling or reducing corrosion from all sources of corrosion, including MIC. Among the choices disclosed in EPRI for preventing MIC, are to use materials that are resistant to MIC under field conditions (Ex. 1017, 30); keeping the materials free of water or moisture in a stagnant condition (*id.*); keeping materials clear of dirt and construction debris (*id.*); and chemically treating the water (*id.*). As further explained in EPRI, one way of keeping the materials free of water or moisture is to use a “[n]itrogen lay-up.” *Id.* at 65. One advantage of the nitrogen lay-up method of minimizing corrosion, including MIC, is the “nitrogen limits the amount of oxygen available for corrosion.” *Id.* at 70. “Without oxygen, corrosion will not take place.” *Id.* All of these corrosion control techniques for MIC and other forms of corrosion were explained in EPRI and available for a person of ordinary skill and creativity to use, as appropriate, for the task at hand.

Accordingly, there is little-to-no persuasive evidence of industry skepticism.

iv. Commercial Success

Patent Owner asserts its “core business is sales of nitrogen generators and vents specifically designed to address corrosion in fire sprinkler systems. PO Resp. 53 (citing Ex. 2013, ¶ 18). Patent Owner presents evidence of substantial sales of its generators and vents. *Id.* at 53–54 (citing Ex. 2013 ¶ 24). Patent Owner also asserts that prior to its claimed invention “the use of the combination of nitrogen generator and vent to address corrosion-induced water leaks was not known in the art.” *Id.* at 55. This broad allegation is refuted by the prior art discussed above, such as EPRI. Patent Owner’s assertion of commercial success also is based on sales of nitrogen generators, which were a well-known source of pressurized nitrogen prior to 2008. The ’533 patent does not cover nitrogen generators; it covers a fire protection system. Patent Owner’s estimates of sales other industry participants (PO Resp. 55–57) is “estimated” and thus speculative.

Accordingly, there is little-to-no evidence of commercial success.

v. Copying

Patent Owner asserts Petitioners South-Tek and Potter, and a third company, United, copied Patent Owner’s patented invention. PO Resp. 60. Patent Owner also admits, however, that Petitioner South-Tek “has designed and manufactured nitrogen generators for a wide variety of industries since 1997.” *Id.* at 61. The claims of the ’533 patent do not recite any specific requirements for the claimed nitrogen generator.

For copying to be effective in showing non-obviousness, there must be more than simply a competing version of the product. *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (“Not every competing product that arguably falls within the scope of a patent is evidence of copying. Otherwise every infringement suit would automatically confirm the nonobviousness of the patent.”). Evidence of copying can be particularly persuasive when a competitor had tried and failed to introduce a competing product until the patented product became available. *Vandenberg v. Dairy Equipment Co., a Div. of DEC Int’l, Inc.*, 740 F.2d 1560, 1567 (Fed. Cir. 1984). We have no such persuasive evidence in this case.

Merely offering competing products or alleging infringement are not signs of non-obviousness. *Wyers v. Master Lock*, 616 F.3d at 1246 (Fed. Cir. 2010). The secondary consideration of copying is very specific—“evidence of efforts to replicate a specific product.” *Id.* This specifically is not *evidence of efforts to provide a competing product* or *evidence of a product having the same features*, or we would be reading out the crux of the basis for the court’s reasoning in *Wyers*, that “[n]ot every competing product that arguably falls within the scope of a patent is evidence of copying.” *Id.*

Here, we have no evidence of efforts to replicate a specific product. Thus, the evidence on which Patent Owner relies has no probative weight of copying.

vi. Conclusion Regarding Patentability

Weighing the totality of evidence before us, we are persuaded that a preponderance of the evidence establishes that claims 1–10 would have been obvious to one of ordinary skill in the art based on Viking, NFPA, Cahill-O’Brien, and EPRI.

Because this ground is dispositive of patentability of all the challenged claims, we need not address the other grounds on which we instituted a trial.

III. Motions to Exclude

Petitioner moves to exclude:

1. E-mails in Exhibits 2005 and 2035;
2. Exhibit 2011 discussing the content of Exhibit 2005;
3. Sales Data Chart in Exhibit 2065; and
4. Portions of Exhibit 2013 discussing the content of Exhibit 2065.

Pet. Mot. Excl. 1.

Patent Owner moves to exclude:

1. Exhibits 1022–1024 (PO Mot. Excl. 1);
2. Exhibits 1025 and 1026 (*id.* at 2);
3. Exhibit 1034 (*id.* at 4);
4. Exhibits 1038–1040 (*id.* at 6); and
5. Exhibit 1043, ¶¶ 4–13, 16–22, 26–35 and 51–61 (*id.* at 9).

We deny each Motion.

We note we have not relied on the evidence that the parties seek to exclude. Thus, we deny the motions with respect to these exhibits as moot.

Moreover, the Board acts as both the gatekeeper of evidence and as the weigher of evidence. Rather than excluding evidence that is allegedly confusing, misleading, and/or irrelevant, we will simply not rely on it or give it little weight, as appropriate, in our analysis. Similar to a district court in a bench trial, the Board, sitting as a non-jury tribunal with administrative expertise, is well positioned to determine and assign appropriate weight to evidence presented, including giving it no weight. *See, e.g., Donnelly Garment Co. v. NLRB*, 123 F.2d 215, 224 (8th Cir. 1941) (“One who is capable of ruling accurately upon the admissibility of evidence is equally capable of sifting it accurately after it has been received . . .”). Thus, in this *inter partes* review, the better course is to have a complete record of the evidence to facilitate public access as well as appellate review.

IV. CONCLUSION

Based on the evidence and analysis above, we determine that Petitioners have established by a preponderance of the evidence that claims 1–10 would have been obvious based on Viking, NFPA, Cahill-O’Brien, and EPRI.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has established by a preponderance of the evidence that claims 1–10 would have been obvious based on Viking, NFPA, Cahill-O’Brien, and EPRI;

FURTHER ORDERED THAT Petitioner's and Patent Owner's
Motions to Exclude Evidence are denied; and

FURTHER ORDERED that this is a Final Written Decision under
35 U.S.C. § 318(a), and that parties to the proceeding seeking judicial
review of the decision under 35 U.S.C. § 319 must comply with the
notice and service requirements of 37 C.F.R. § 90.2.

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