IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

AMERICAN AXLE & MANUFACTURING, INC.,	:	
Plaintiff,	:	
v.	:	C.A. No. 15-1168-LPS
NEAPCO HOLDINGS LLC and NEAPCO DRIVELINES LLC,	:	
Defendants.	:	

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MEMORANDUM OPINION

April 7, 2017
Wilmington, Delaware

STARK, U.S. District Judge:

Plaintiff American Axle & Manufacturing, Inc. ("AAM") brought this patent infringement suit against Defendants Neapco Holdings LLC and Neapco Drivelines LLC (collectively, "Neapco"), alleging that Neapco's propeller shaft assemblies with liners for certain GM trucks infringe AAM's U.S. Patent Nos. 7,774,911; 8,176,613; and 8,528,180. The asserted patents describe and claim methods for reducing noise and vibration by inserting tuned liners into a shaft assembly of a driveline system.[1] Presently before the Court is the issue of claim construction. The parties submitted technology tutorials (*see* D.I. 67, 68) and claim construction briefs (*see* D.I. 69, 70, 75, 76). Both parties also submitted expert declarations (*see* D.I. 69 Ex. D, 71, 75 Ex. H, 77), which the Court has considered. The Court held a claim construction hearing on February 7, 2017. (*See* D.I. 96 ("Tr."))

I. LEGAL STANDARDS

The ultimate question of the proper construction of a patent is a question of law. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 837 (2015) (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388-91 (1996)). "It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (internal quotation marks omitted). "[T]here is no magic formula or catechism for conducting claim construction." *Id.* at 1324. Instead, the court is free to attach the appropriate weight to appropriate sources "in light of the statutes and policies that inform patent law." *Id.*

[1]Because the specifications are nearly identical, the Court's citations are generally to the '911 patent.

"[T]he words of a claim are generally given their ordinary and customary meaning . . . [which is] the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Id.* at 1312-13 (internal citations and quotation marks omitted). "[T]he ordinary meaning of a claim term is its meaning to the ordinary artisan after reading the entire patent." *Id.* at 1321 (internal quotation marks omitted). The patent specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

While "the claims themselves provide substantial guidance as to the meaning of particular claim terms," the context of the surrounding words of the claim also must be considered. *Phillips*, 415 F.3d at 1314. Furthermore, "[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment . . . [b]ecause claim terms are normally used consistently throughout the patent . . . ." *Id.* (internal citation omitted).

It is likewise true that "[d]ifferences among claims can also be a useful guide . . . . For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim." *Id.* at 1314-15 (internal citation omitted). This "presumption is especially strong when the limitation in dispute is the only meaningful difference between an independent and dependent claim, and one party is urging that the limitation in the dependent claim should be read into the independent claim." *SunRace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1303 (Fed. Cir. 2003).

It is also possible that "the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the

inventor's lexicography governs." *Phillips*, 415 F.3d at 1316. It bears emphasis that "[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1372 (Fed. Cir. 2014) (quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004)) (internal quotation marks omitted).

In addition to the specification, a court "should also consider the patent's prosecution history, if it is in evidence." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996). The prosecution history, which is "intrinsic evidence," "consists of the complete record of the proceedings before the PTO [Patent and Trademark Office] and includes the prior art cited during the examination of the patent." *Phillips*, 415 F.3d at 1317. "[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Id.*

In some cases, "the district court will need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Teva*, 135 S. Ct. at 841. Extrinsic evidence "consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Markman*, 52 F.3d at 980. For instance, technical dictionaries can assist the court in determining the meaning of a term to those of skill in the relevant art because such dictionaries "endeavor to collect the

accepted meanings of terms used in various fields of science and technology." *Phillips*, 415 F.3d at 1318. In addition, expert testimony can be useful "to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field." *Id.* Nonetheless, courts must not lose sight of the fact that "expert reports and testimony [are] generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence." *Id.* Overall, while extrinsic evidence "may be useful" to the court, it is "less reliable" than intrinsic evidence, and its consideration "is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence." *Id.* at 1318-19. Where the intrinsic record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. *See Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1308 (Fed. Cir. 1999) (citing *Vitronics*, 90 F.3d at 1583).

Finally, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that "a claim interpretation that would exclude the inventor's device is rarely the correct interpretation." *Osram GmbH v. Int'l Trade Comm'n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007) (quoting *Modine Mfg. Co. v. U.S. Int'l Trade Comm'n*, 75 F.3d 1545, 1550 (Fed. Cir. 1996)).

II. CONSTRUCTION OF DISPUTED TERMS

A. Tuning Terms

"tuning at least one liner to attenuate at least two types of vibration transmitted through the shaft member"[2]

AAM "controlling characteristics of at least one liner, such that the at least one liner is effective in reducing vibration of a shaft member at a relevant frequency, to reduce at least two types of vibration transmitted through the shaft member"
Neapco "adjusting at least one liner to target frequencies to dampen at least two types of vibration transmitted through the shaft member"
Court "controlling characteristics of at least one liner to configure the liner to match a relevant frequency or frequencies to reduce at least two types of vibration transmitted through the shaft member"

"providing a liner tuned to attenuate a plurality of types of vibration transmitted through the shaft member"[3]

AAM "providing a liner having characteristics controlled, such that the liner is effective in reducing vibration of a shaft member at a relevant frequency, to reduce a plurality of types of vibration transmitted through the shaft member"
Neapco "providing a liner that is adjusted to target frequencies to dampen a plurality of types of vibration transmitted through the shaft member"
Court "providing a liner having characteristics configured to match a relevant frequency or frequencies to reduce a plurality of types of vibration transmitted through the shaft member"

[2]This term appears in claim 1 of the '911 patent.

[3]This term appears in claim 17 of the '613 patent.

"tuning a mass and stiffness of at least one liner"[4]

AAM "controlling a mass and stiffness of at least one liner such that the at least one liner is effective in reducing vibration of a shaft member at a relevant frequency"
Neapco "adjusting a mass and stiffness of at least one liner to target a frequency"
Court "controlling a mass and stiffness of at least one liner to configure the liner to match a relevant frequency or frequencies"

"liner having a mass and a stiffness that are tuned to the driveline system"[5]

AAM "liner having a mass and stiffness controlled such that the liner is effective in reducing vibration of a shaft member at a relevant frequency of the driveline system"
Neapco "liner having a mass and a stiffness that are adjusted to target a frequency of the driveline system"
Court "liner having a mass and a stiffness configured to match a relevant frequency or frequencies of the driveline system"

"tuned resistive absorber for attenuating shell mode vibrations"[6]

AAM "a liner whose characteristics are controlled such that the liner is effective in reducing shell mode vibration of a shaft member at a relevant frequency by deforming as vibration energy from the shaft member is transmitted through the liner so that the liner absorbs the vibration energy"

[4]This term appears in claims 22 and 36 of the '911 patent.

[5]This term appears in claim 13 of the '180 patent.

[6]This term appears in claims 22 and 36 of the '911 patent and claim 13 of the '180 patent.

Neapco "absorber that is adjusted to target a frequency and that deforms as vibration energy is transmitted through it to absorb the vibration energy to dampen shell mode vibrations"
Court "a liner having characteristics configured to match a relevant frequency or frequencies to deform as vibration energy is transmitted through the liner to absorb the vibration energy to dampen shell mode vibrations"

"tuned reactive absorber for attenuating bending mode vibrations"[7]

AAM "a liner whose characteristics are controlled such that the liner is effective in reducing bending mode vibration of a shaft member at a relevant frequency by oscillating in opposition to vibration energy of the shaft member to cancel out a portion of the vibration energy"
Neapco "absorber that is adjusted to target a frequency and that oscillates in opposition to vibration energy to cancel out a portion of the vibration energy to dampen bending mode vibrations"
Court "a liner having characteristics configured to match a relevant frequency or frequencies to oscillate in opposition to vibration energy to cancel out a portion of the vibration energy to dampen bending mode vibrations"

"tuned reactive absorber for attenuating at least one of bending mode vibrations and torsion mode vibrations"[8]

AAM "a liner whose characteristics are controlled such that the liner is effective in reducing at least one of a bending mode vibration and torsion mode vibration of a shaft member at a relevant frequency by oscillating in opposition to vibration energy of the shaft member to cancel out a portion of the vibration energy"
Neapco "absorber that is adjusted to target a frequency and that oscillates in opposition to vibration energy to cancel out a portion of the vibration energy to dampen at least one of bending mode vibrations or torsion mode vibrations"

[7]This term appears in claim 22 of the '911 patent.

[8]This term appears in claim 36 of the '911 patent and claim 13 of the '180 patent.

Court
"a liner having characteristics configured to match a relevant frequency or frequencies to oscillate in opposition to vibration energy to cancel out a portion of the vibration energy to dampen at least one of bending mode vibrations or torsion mode vibrations"

The parties' disputes relating to these various claim terms center on the meaning of "tuning" and "tuned." Neapco contends that tuning refers to adjusting a liner to a target frequency, while AAM argues that tuning requires controlling characteristics such that the liner is effective in reducing vibration. (*See* D.I. 76 at 3) The Court agrees, in part, with both parties.

The specification makes clear that tuning a liner involves matching a natural frequency of the liner to a relevant frequency or frequencies of the propshaft assembly. The specification indicates that liners "are preferably tuned to a natural frequency corresponding to" shell modes, bending modes, or torsion modes of vibration of the propshaft. '911 patent col. 7 ll. 44-55. The specification also notes that "it may not be possible to exactly tune the liner [] to the two or more relevant frequencies associated with a given propshaft assembly," and so a liner "will be considered to be tuned to a relevant frequency if it is effective in attenuating vibration at the relevant frequency." Col. 8 ll. 24-31. For example, the specification suggests that a liner "can be considered to be tuned to a relevant frequency if a frequency at which it achieves maximum attenuation is within ±20% of that relevant frequency." Col. 8 ll. 31-34.

The patent makes equally clear that tuning is achieved by controlling certain physical properties of the liner. *See* col. 7 ll. 56-59 ("[V]arious characteristics of the liner [] can be controlled to tune its damping properties in the shell mode and in one or both of the bending mode and the torsion mode."). The specification details some of the characteristics that may be controlled to result in a tuned liner:

> mass, length and outer diameter of the liner 204, diameter and wall thickness of the structural portion 300, material of which the structural portion 300 was fabricated, the quantity of the resilient members 302, the material of which the resilient members 302 was fabricated, the helix angle 330 and pitch 332 with which the resilient members 302 are fixed to the structural portion 300, the configuration of the lip member(s) 322 of the resilient member 302, and the location of the liners 204 within the shaft member 200.

Col. 7 l. 60 - col. 8 l. 2. The specification, therefore, teaches tuning a liner by controlling certain characteristics of that liner, such that the liner attenuates certain vibrations of the propshaft. *See* col. 8 ll. 29-31.

The Court is persuaded that "tuning" must incorporate both of these concepts. Accordingly, the Court will construe, for instance, "tuning at least one liner to attenuate as least two types of vibration transmitted through the shaft member" to mean "controlling characteristics of at least one liner to configure the liner to match a relevant frequency or frequencies to reduce at least two types of vibration transmitted through the shaft member."

B. Indefiniteness

> **"positioning the at least one liner within the shaft member such that the at least one liner is configured to damp shell mode vibrations in the shaft member by an amount that is greater than or equal to about 2%"**[9] / **"positioning the liner within the shaft member to damp shell mode vibration by an amount that is greater than or equal to about 2%"**[10]

AAM plain and ordinary meaning, no construction necessary
Neapco Indefinite

[9]This term appears in claim 1 of the '911 patent.

[10]This term appears in claim 17 of the '613 patent.

Court Indefinite

"tuned to within about ± 20% [15%, 10%, 5%] of a bending mode natural frequency of the shaft assembly as installed in the driveline system"[11] / **"tuned to within about ± 20% [15%, 10%, 5%] of the natural frequency of the driveline system in at least one of the bending mode and the torsion mode"**[12]

AAM plain and ordinary meaning, no construction necessary
Neapco Indefinite
Court Indefinite

Neapco contends that these terms are indefinite because the claims and the specification fail to provide any guidance about the testing and calculation methods that should be performed to determine whether a system practices these claim elements. (*See* D.I. 70 at 17-18) In particular, Neapco – supported by expert testimony – argues that an ordinarily skilled artisan would not know (1) the baseline state from which damping is measured; (2) whether to use static or dynamic testing; (3) what test conditions to use, such as boundary conditions or temperature; and (4) how to calculate the damping amount. (*See id.* at 18-20; D.I. 76 at 12-14)

A patent claim is indefinite if, "viewed in light of the specification and prosecution history, [it fails to] inform those skilled in the art about the scope of the invention with

[11]This term appears in claims 1-4 of the '911 patent.

[12]This term appears in claims 17-20 of the '613 patent.

reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014).[13] A claim may be indefinite if the patent does not convey with reasonable certainty how to measure a claimed feature. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1341 (Fed. Cir. 2015). But "[i]f such an understanding of how to measure the claimed [feature] was within the scope of knowledge possessed by one of ordinary skill in the art, there is no requirement for the specification to identify a particular measurement technique." *Ethicon Endo-Surgery, Inc. v. Covidien, Inc.*, 796 F.3d 1312, 1319 (Fed. Cir. 2015).

AAM acknowledges that the patent is devoid of information and instruction as to how to assess the amount of damping in a system and how to determine the natural frequencies of a bending or torsion mode of a shaft assembly. AAM contends, however, that a person of skill in the art would know how to measure these properties. Further, AAM argues that a person of skill in the art would understand that "[b]ending and torsion mode frequencies and the amount of shell mode damping in the system are natural properties that can be measured and do not change based on what test is used." (D.I. 75 at 12) Thus, it is AAM's view that a person of skill in the art independently possesses the knowledge needed to measure the claimed features, making explication in the patent unnecessary.

AAM's position is premised on the assertion that a person of ordinary skill knows that the relevant properties do not change based on test conditions or the test used. (*See* D.I. 75 at ¶ 11) The Court is not persuaded that this assumption is correct.

The patent itself states that "those of ordinary skill in the art will appreciate that the

[13]The parties disagree as to the identity of a person of ordinary skill in the art, but they agree that it is not necessary for the Court to resolve that dispute in order to construe the claims. (*See* D.I. 69 at 4; D.I. 70 at 11)

bending mode natural ***frequency is a function*** of not only the propshaft assembly [], but also ***of the 'boundary conditions'*** (i.e., the manner in which the propshaft assembly [] is coupled to the driveline [])." '911 patent col. 6 ll. 21-25 (emphasis added). The patent similarly states that "those of ordinary skill in the art will appreciate that the natural torsion ***frequency is a function*** of not only the propshaft assembly [], but also ***of the first and second driveline components*** (e.g., the transmission [] and the rear axle []) to which the propshaft assembly is coupled)." Col. 6 ll. 36-40 (emphasis added). Thus, the patent makes explicit that these frequencies will change depending on the boundary conditions used in a given test.

Further, the patent describes a number of real-world excitation sources of drivelines installed in vehicles, including "driveline imbalance and/or run-out, fluctuations in engine torque, engine idle shake, and motion variation in the meshing gear teeth of the hypoid gear set." Col. 1 ll. 24-26. The patent goes on to explain that "[m]otion variation is typically not constant," and "will typically vary as a function of load, temperature, gearset build position, and break-in wear." Col. 1 ll. 33-35. The patent then states that "[t]he various excitation sources can typically cause the propshaft to vibrate." Col. 1 ll. 42-43. That the patent describes various excitation sources – and how those excitation sources vary under different conditions – suggests that those excitation sources may also be expected to play some role in the extent to which the propshaft vibrates. Yet the patent provides no teaching as to how those excitation sources should be set. This results in the very real possibility that persons of ordinary skill in the art – lacking guidance as to, for example, the "load, temperature, gearset build position, and break-in wear" to be used when assessing a potential embodiment of the claims – would not have reasonable certainty as to whether a particular device is within or without the scope of the patent's claims.

Accordingly, the Court rejects AAM's assertion that the relevant properties do not change based on test conditions used to measure them. Instead, the Court is persuaded that these properties – while natural properties that may not change once test conditions are fixed – may vary based on how a test is designed.[14] The parties' experts agree that there are a number of variables and considerations that go into designing a test, including boundary conditions, excitation source, static versus dynamic testing, and temperature. (*See* D.I. 71 at ¶¶ 18-24; D.I. 69 Ex. D at ¶ 22) But the patent does not describe any set of testing conditions that can be used to measure the claimed features.

AAM contends that the patent discloses some of the test conditions that should be employed when measuring damping or natural frequencies. For instance, AAM argues that the claims and specification make clear to one of ordinary skill in the art that the proper boundary condition is the propshaft installed in the driveline system. (*See* D.I. 75 at 13) But, even if some test conditions are revealed, others plainly are not – for example, the temperature at which the relevant measurements are taken. AAM simply declares those undisclosed conditions to be irrelevant without explaining how a person of skill in the art would select appropriate conditions and without establishing (or even asserting) that there is a standard set of conditions employed in this industry. (*See, e.g.*, D.I. 75 Ex. H at ¶ 15) As the record supports a finding that conditions such as temperature will impact properties such as damping or vibrational frequencies – for

[14] *See, e.g.*, D.I. 71 at ¶ 18 ("[A] system designer could prepare a set of test conditions and measurement protocols and determine that a system meets the claimed damping amounts. Another designer could prepare a different set of test conditions and measurement protocols and determine that the exact same system does not meet the damping amounts. Neither the claims nor specification in the patents-in-suit provides any guidance to determine whether a system practices these claim elements. Whether a system meets these claim elements is left to the subjective choice of the engineer in preparing test conditions and methodologies.").

example, these properties are expected to change depending on whether the vehicle is being tested at 100° F or 10° F – and whether the claims are satisfied depends (in part) on such properties, yet the patent is silent as to such testing conditions (e.g., at which temperature to test), it follows that a POSA would lack reasonable certainty as to the scope of the invention.[15] (*See* Tr. at 54-55, 69-70; D.I. 71 at ¶ 24)

Accordingly, the Court finds by clear and convincing evidence that these terms are indefinite.

III. CONCLUSION

The Court construes the disputed terms as explained above. An appropriate Order follows.

[15]Although sometimes a "patent is not rendered invalid on the ground that the inventors failed to specify the method to be used in measuring the [claimed feature] set forth in the claims," *PPG Indus., Inc. v. Guardian Indus. Corp.*, 75 F.3d 1558, 1563 (Fed. Cir. 1996), the Court is not persuaded that that is the case here. The pre-*Nautilus* cases cited by AAM are not persuasive. (*See* D.I. 75 at 10-11) After *Nautilus*, "the existence of multiple methods leading to different results without guidance in the patent or the prosecution history as to which method should be used renders the claims indefinite," where a person of skill in the art would not have knowledge regarding which test to select. *Dow Chem. Co. v. Nova Chems. Corp. (Canada)*, 803 F.3d 620, 634 (Fed. Cir. 2015). Here, the Court finds that there are a number of test methods and conditions that can be employed, and the evidence does not show that most or all persons of skill in the art would know to implement the same conditions. As discussed above, different test conditions are expected to give different results.