IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ETHANOL BOOSTING SYSTEMS, LLC, and MASSACHUSETTS INSTITUTE OF TECHNOLOGY Plaintiffs, v. FORD MOTOR COMPANY Defendant.	Civil Action No. _____ **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

This is an action for willful patent infringement in which Ethanol Boosting Systems, LLC ("EBS") and the Massachusetts Institute of Technology ("MIT") (collectively, "Plaintiffs") make the following allegations against Ford Motor Company ("Defendant" or "Ford"):

THE PARTIES

1. Plaintiff EBS is a limited liability company duly existing and organized under the laws of the State of Delaware with its principal place of business in Cambridge, Massachusetts.

2. EBS was co-founded by three MIT researchers who work in the field of internal combustion engines: Dr. Leslie Bromberg, Dr. Daniel R. Cohn, and Professor John B. Heywood.

3. During the more than four decades that Dr. Bromberg, Dr. Cohn, and Professor Heywood have been at MIT, they have been widely recognized as leaders in their field, and have published hundreds of articles in academic journals and conference proceedings.

4. For example, Dr. Bromberg is internationally known for his work, including his work in the fields of vehicle engine and pollution reduction technologies, alternative fuels, and plasma-based energy technologies. Dr. Bromberg also has received a number of awards for the

innovative technologies he has invented, and his inventions have resulted in more than 90 granted United States patents.

5. Dr. Cohn also is internationally known for his work on improved engine technologies, alternative transportation fuels, and plasma-based energy and environmental technologies and has received awards for innovation in transportation and environmental technologies. He also is a fellow of the American Physical Society, and his inventions have resulted in more than 80 granted United States patents.

6. Professor Heywood was the Director of the Sloan Automotive Laboratory at MIT and has done research and taught classes at MIT on internal combustion engines for decades. He also literally wrote the book on internal combustion engines. Since first being published in 1988, his textbook—Internal Combustion Engine Fundamentals—has sold more than 130,000 copies and is widely considered a field-defining publication. A revised and updated second edition was published in 2018.

7. Building on its founders' expertise and inventions, EBS has sought to develop innovative internal combustion engines and fuel-management systems that result in cleaner and more efficiently operating internal combustion engines. One of EBS's approaches for accomplishing this improvement is through the use of gasoline internal combustion engines and fuel-management systems that incorporate the MIT/EBS dual port and direct injection technology at issue in this case.

8. Plaintiff MIT is a non-profit private research and educational institution duly incorporated and existing under the laws of the Commonwealth of Massachusetts with its principal place of business in Cambridge, Massachusetts. MIT's mission is to advance knowledge and educate students in science, technology, and other areas of scholarship that will

best serve the nation and the world in the 21st century. MIT commits itself to generating, disseminating, and preserving knowledge, and to working with others to bring this knowledge to bear on the world's great challenges.

9. Defendant Ford is a corporation duly existing and organized under the laws of the State of Delaware that makes, sells, and offers for sale in the United States, or imports into the United States, motor vehicles and related motor vehicles components and accessories, including those products accused of infringement in this matter.

JURISDICTION AND VENUE

10. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a) as this action arises under Title 35 of the United States Code.

11. This Court has personal jurisdiction over Ford because Ford is incorporated in the State of Delaware. This Court also has personal jurisdiction over Ford because Ford regularly transacts business with entities and individuals in the State of Delaware, including one or more of at least four Ford dealerships located in the State of Delaware, and because Ford manufactures and distributes infringing motor vehicles and other infringing products that it purposefully directs into the State of Delaware, including this District, or at least places into the stream of commerce via established distribution channels with the knowledge and expectation that they will be sold in the State of Delaware, including in this District.

12. Venue is proper in this District under 28 U.S.C. § 1400(b) because Ford is incorporated in the State of Delaware.

THE ASSERTED PATENTS

13. This lawsuit concerns Ford's infringement of United States Patent No. 8,069,839 (the "'839 Patent"); United States Patent No. 9,255,519 (the "'519 Patent"); United States Patent

No. 9,810,166 (the "'166 Patent"); and United States Patent No. 10,138,826 (the "'826 Patent") (collectively, the "Asserted Patents").

14. Each of the above patents continues from and claims priority to the application that resulted in United States Patent No. 7,314,033, which was filed on November 18, 2004.

15. Each of the Asserted Patents was invented by Dr. Bromberg, Dr. Cohn, and Professor Heywood, who assigned their inventions to MIT before each patent was issued by the Patent and Trademark Office. Since such assignment, MIT has owned and continues to own each of the Asserted Patents. Further, EBS currently is the exclusive licensee of each Asserted Patent with the right to sue for any infringement of the Asserted Patents and the exclusive right to sublicense any alleged infringer of such patents.

16. Generally speaking, each of the Asserted Patents is directed to engines and/or fuel management systems that improve over prior art engines and fuel management systems through their incorporation of MIT/EBS's dual injection technology, which involves the use of both port and direct fuel injection. For example, each of the Asserted Patents recites ways in which an engine or fuel management system employs both port and direct injection such that, at certain torque values, the engines are fueled by both simultaneously. Further, in some embodiments, the fraction of fueling provided by direct injection decreases with decreasing torque. Further, in other embodiments, port fueling alone is utilized when torque is below a certain value.

17. Such inventions improve over the prior art by, for example, permitting an increase in engine efficiency and reducing emissions as described in their common specification—providing the advantages of port fuel injection, which allows for better fuel/air mixing and combustion stability than direct injection, while also providing the engine knock suppression advantage associated with direct injection.

18. The inventions disclosed in the Asserted Patents have been revolutionary throughout the industry. In fact, the patent family to which each of the Asserted Patents belongs has been cited by over 115 other patents, including dozens of patents filed by Ford and its related entities such as Ford Global Technologies, LLC.

THE PARTIES' PAST RELATIONSHIP AND FORD'S USE OF PLAINTIFFS' TECHNOLOGY

19. Ford incorporated MIT/EBS's patented dual injection technology into its highly profitable vehicles even though (a) EBS told Ford that such technology was patented and (b) Ford indicated to EBS that Ford would not be incorporating the MIT/EBS dual injection technology into its vehicles and thus did not need a license.

20. As described below, Ford's representations were false when made, and Ford has willfully infringed and continues to willfully infringe the Asserted Patents.

21. Ford has had notice since at least October 2014 of a number of MIT and EBS patents and pending applications covering the use of dual port and direct injection.

22. For example, on October 30, 2014, Professor Heywood emailed Dr. Ken Washington (Ford's Vice President of Research and Advanced Engineering) and Mr. Bill Coughlin (Ford's Global Technologies CEO and chief intellectual-property officer) on behalf of EBS—attaching a document titled "Optimized Port + Direct Injection for Cleaner and More Efficient Gasoline Engines."

23. In his email, Professor Heywood explained to Ford that EBS "would like to discuss possible licensing of another important technology to Ford" and that "[t]his technology involves optimized combinations of port and direct injection for gasoline engines," which he explained "could provide a relatively simple and low cost way to reduce particulate emissions in

direct-injection gasoline engines without the need for a particulate filter" and "could also be employed to increase engine efficiency."

24. Professor Heywood also wrote that "[t]his technology along with the intellectual property is further described in the attachment" and that, given their past dealing, EBS "would like to give Ford the first opportunity to discuss a possible license for this intellectual property portfolio." In the referenced attachment, EBS further explained that "EBS has developed a patent portfolio that includes a variety of options related to minimization of direct injection and reduction of particulate emissions in gasoline engines," including "US patents 8,857,410; 8,733,321; 8,302,580; 8,146,568; and 8,069,839."

25. Professor Heywood concluded his email by asking Ford to "[p]lease let us know by December 8, 2014, whether Ford would like to pursue this licensing discussion." He also explained that, "while we are excited about the prospect of entering into a licensing agreement with Ford for the technology, we may approach other potential licensees including the possibility of entering into an exclusive license with such licensees," but that "Ford is the first, and only, company we have approached at this time."

26. The next day, Dr. Washington responded on behalf of Ford—stating: "Thank you for your note with the offer for Ford to be the first to discuss a possible license for this intellectual property portfolio. I suspect that these technologies have a complex business case. I will consult with our technical, legal and business teams and get back with you."

27. After more than a month passed without EBS hearing back from Ford, Professor Heywood emailed Dr. Washington again on December 16, 2014—stating: "We have not yet heard from you and would appreciate knowing where you are in your deliberations and when you could let let [sic] us know if you would like to discuss the possibility of licensing. We

believe the technology [i]s important to address the pressing environmental issue of particulate emissions in an affordable way and want to move forward in establishing the path for its utilization. Please let us know if you need any additional information."

28. Dr. Washington replied the following day—telling EBS: "We have not forgotten," and "[s]omeone will get back with you later in the month of January or early February with our thoughts."

29. After another month passed without EBS hearing back from Ford, Professor Heywood emailed Dr. Washington on January 23, 2015. In that email, Professor Heywood told Dr. Washington that EBS had "significantly enhanced our technology and intellectual property portfolio since I contacted you in October and thought it would be useful to pass on an updated description (attached)." In the attachment Professor Heywood provided, EBS again identified several of the patents it was offering to license to Ford, including the '839 Patent. Professor Heywood then concluded his email by stating: "We look forward to hearing Ford's thoughts about exploration of licensing possibilities of mutual benefit to Ford, MIT and EBS."

30. EBS again was met with silence. On February 13, 2015, Professor Heywood thus wrote Dr. Washington again—telling him "[w]e have not received a response as to whether Ford will meet with us about possible licensing of the MIT spinoff technology on optimized port +direct injection," which Professor Heywood described as "an important part of the solution for the best available technology for direct injection particulate reduction and can also provide other benefits."

31. Professor Heywood concluded his email by telling Ford: "It has been three and half months since I first contacted you and we had expected a response from Ford by now based on your last e-mail. Our only request has been an answer as to whether Ford would meet with us.

We have held off in contacting other organizations while awaiting Ford's response. At this point we need to know if Ford will meet with us. If not, we will pursue other pathways for moving forward." He also added: "We believe there are potential arrangements that are fair and mutually beneficial to Ford, MIT and EBS. Please let us know whether or not Ford will meet with us to explore them."

32. Two days later on February 15, 2015, Ford's chief intellectual property officer, Bill Coughlin, responded. Mr. Coughlin told EBS that he was "cause of the delay" and that "[u]nless advised otherwise by Ken, Ford will meet with you." Mr. Coughlin also added that Ford "should be in a position to advise when we can meet soon." EBS responded—telling Ford: "Thanks for your reply. We would like to set up a meeting date as soon as possible. Would a time in the March 17 to 27th period be feasible?"

33. After further back and forth, Mr. Coughlin agreed to meet with EBS in person at MIT on April 17, 2015. Dr. Cohn and Dr. Bromberg attended that meeting in person; Professor Heywood was traveling but participated via phone.

34. During that meeting, EBS again underscored the existence and importance of the patent family at issue in this case. In response, Mr. Coughlin proposed that—in exchange for EBS agreeing not to assert the patents against Ford—Ford would work with EBS to market other MIT/EBS technology. Mr. Coughlin also told EBS that Ford did not like to work on technology that it was infringing and that, as a result, Ford typically would license such technology, invalidate the patents at issue, or not pursue the technology. Mr. Coughlin also asked Dr. Bromberg, Dr. Cohn, and Professor Heywood whether they were "greedy inventors" and was told that the inventors were not greedy but that they did want to be treated fairly.

35. In response, EBS suggested that a better way to proceed was for Ford to analyze the patents EBS had disclosed and identify any that Ford believed had weaknesses or were otherwise inapplicable to Ford's products. EBS explained that, once Ford did so, EBS would be happy to discuss with Ford the results of such analysis. In response, Mr. Coughlin asked for more information about Plaintiffs' pending patent applications and told EBS that Ford expected to get back to EBS within around two months.

36. The April 17, 2015 meeting concluded with Dr. Cohn stating that it would be good if Ford and MIT/EBS could find a resolution that was a win-win for all parties involved.

37. After not hearing further from Ford, Professor Heywood and Dr. Cohn reached out to Mr. Coughlin again via email on June 5, 2015. In that email, Professor Heywood reiterated that EBS wanted to license to Ford but also told Ford "that the value of the MIT/EBS patent portfolio is much higher than the value represented by Ford's proposal"—i.e., Ford's offer to work with EBS to market other MIT/EBS technology in exchange for EBS agreeing not to assert the patents for the MIT/EBS dual injection technology at issue in this matter. Professor Heywood suggested that "a good next step to make further progress is to have an in-person meeting to discuss the structure of a possible transaction and appropriate valuation / fees" and also suggested "setting-up a meeting around the end of June, consistent with the timeframe you suggested for reconnecting during our meeting on April 17t[h]." Professor Heywood also proposed that—during that meeting—the parties could have "a more detailed discussion of the patent portfolio and related inventions, and how they may be helpful to Ford."

38. Ford did not respond to Professor Heywood's June 5, 2015 email. On July 6, 2015, Professor Heywood thus reached out to Mr. Coughlin again—stating: "We have not received a response to our June 5 e-mail and would like to keep moving forward in discussions

with Ford." He also expressed that EBS "would appreciate a reply as to whether you would like to have a meeting in Dearborn and, if so, a sense of the time frame in which you think it could occur." EBS also attempted to reach Mr. Coughlin by phone on July 20, 2015.

39. Having heard nothing back from Mr. Coughlin, Professor Heywood emailed Dr. Washington on July 29, 2015—noting that Mr. Coughlin had not replied to EBS's June 5 email, July 6 email, or attempted July 20 phone call. Professor Heywood requested a "meeting in Dearborn to discuss the MIT/EBS technology and how we might thoroughly explore possible solutions that would be fair and beneficial to all parties"—explaining, "[t]his meeting could include anyone at Ford that you would like to include, including technical staff and others at Ford as well as the IP professionals." Professor Heywood concluded his email by asking Ford to "[k]indly acknowledge receipt of this e-mail promptly and let us know by August 31 if Ford wishes to meet with us; and if so, please propose dates that work for Ford. If we have not heard from you by then, we will assume that Ford is no longer interested in continuing discussions regarding use of our optimized port + direct injection gasoline engine technology."

40. Mr. Greg Brown, who at the time was Global Engine Intellectual Property Counsel at Ford Global Technologies, LLC, replied the following week—writing in an August 3, 2015 email that "Bill Coughlin has asked [him] to step in for him on this matter" and that he stood "ready to discuss" Ford's pitch to help EBS license other MIT/EBS technology to third parties in exchange for a "covenant not to sue" on the MIT/EBS dual injection technology at issue in this matter.

41. EBS subsequently had a number of phone calls with Mr. Brown. As part of these discussions, Dr. Cohn emailed Mr. Brown a "list of MIT/EBS patents and patent applications"

on October 12, 2015. That list disclosed several patents that EBS already had discussed with Ford, including the '839 Patent (inadvertently described in that list as the "8,069,939" patent).

42. Mr. Brown responded the same day—stating: "I think it is likely critical that we (Ford) are in a position to review all of the applications in the portfolio" and that "[i]t might be difficult to progress our discussion until that time."

43. EBS's final licensing conversation with Ford occurred in November 2015. Mr. Brown told EBS that Ford was not interested in licensing the offered technology and patents. In response to a question about whether Ford might be interested in the MIT/EBS dual injection technology for future vehicles, Mr. Brown indicated that Ford had no plans that he knew of to use that technology in its vehicles. Mr. Brown also declined EBS's request to involve Ford engineers in their discussions.

44. Contrary to what Mr. Brown had indicated to EBS, however, Ford did have imminent plans to use EBS's patented technology, incorporating infringing dual port and direct injection systems in a number of Ford's EcoBoost engines, as well as some of its V8 engines. Indeed, not only did Ford have plans to incorporate EBS's patented technology into its engines and fuel management systems, but Ford already was incorporating that technology into its engines and fuel management systems at the same time Ford was telling EBS that Ford had no plans to use the technology.

45. For example, just six months after Ford's last discussion with EBS, Forbes Magazine published a May 3, 2016, article detailing how several of Ford's new engines featured "dual fuel systems with both direct and port injectors for each cylinder." Such engines included Ford's 3.5L EcoBoost engine, which Ford rolled out in its most popular product: the Ford F-150.

46. The article states that Ford "completely redesigned [this engine] from the sump up"—with the "single most significant change to the engine" being its "new dual fuel system that now includes both port and direct injection." The article further explained that the 3.5L EcoBoost engine previously had used only direct injection and quoted Al Cockerill (a Ford engine systems supervisor for the 3.5L EcoBoost engine) as explaining how Ford's switch to a dual port and direct injection system was what enabled the "engine to meet Tier III emissions standards without resorting to a particulate filter of the type that is required on modern diesel engines."

47. Similar reports soon followed. On July 11, 2016, for example, Motor Trend Magazine published an article describing Ford's "all-new, ground-up redesign" of the Ford "EcoBoost V-6 we've become accustomed to since 2010." In particular, the article described how Ford had "reveal[ed]" that the 3.5L EcoBoost engine would incorporate Ford's "first use of direct and port fuel injection" and that the use of this (infringing) technology had allowed Ford to increase the engine's horsepower and "all-important torque."

48. Less than a year later, on June 16, 2017, Ford issued a press release explaining that it was incorporating this new (infringing) dual port and direct injection technology not just in its 3.5L EcoBoost engines, but a number of other engine options utilized in the Ford F-150, Ford Expedition, and other Ford models—stating:

> For 2018, F-150 introduces an even smaller, more efficient 3.3-liter V6 that adds dual port and direct-injection technology to deliver more power and torque than the previous 3.5-liter V6, plus improved projected EPA-estimated gas mileage – a win-win for customers.
>
> Aiding in light-weighting, the standard 3.3-liter V6 in the 2018 F-150 is projected to offer a 5 percent power-to-weight ratio improvement versus the steel-bodied 2014 F-150 equipped with 3.7-liter V6 – with better anticipated fuel efficiency and performance.
>
> With advanced dual port and direct-injection technology, the all-new second-generation 2.7-liter EcoBoost® engine delivers a 25 lb.-ft. increase in torque, and at lower engine speeds compared to a traditional V8. Like the second-generation 3.5-liter EcoBoost that debuted last model year, the

> 2.7-liter will be paired to a segment-exclusive 10-speed automatic transmission for 2018.
>
> The 5.0-liter V8 also is enhanced for 2018. This naturally aspirated engine brings significant upgrades including advanced dual port and direct-injection technology for 10 more horsepower and 13 ft.-lb. of torque.

49. It also has been reported that Ford has incorporated its (infringing) second-generation 3.5L EcoBoost engine in Ford's luxury SUV: the Lincoln Navigator. For example, a July 2018 article in Car and Driver Magazine reported that the 2018 Lincoln Navigator packs the same "port and direct fuel injection" equipped "450-hp, twin-turbocharged 3.5-liter EcoBoost V-6" as the Ford F-150 Raptor.

FORD HAS TOUTED THE BENEFITS OF THE INFRINGING TECHNOLOGY

50. Ford itself has touted the improvements realized by the incorporation of such innovative dual port and direct fuel injection technology. For example, in a June 16, 2017 press release, Ford stated that its new (infringing) EcoBoost engines "add[] dual port and direct-injection technology to deliver more power and torque than [Ford's] previous 3.5-liter V6, plus improved projected EPA-estimated gas mileage—a win-win for customers."

51. Further, according to Hua Thai-Tang, Ford's Executive Vice President of Product Development and Purchasing, incorporation of this (infringing) dual port and direct injection technology is what allows Ford to meet its customers' "unique needs" by "deliver[ing] even more of the capability and efficiency they are looking for." Ford also has touted how its "innovative V6 engines" allow Ford's customers to "take care of their growing families and businesses, all with fewer stops for fuel along the way."

52. Ford similarly has touted its other dual port and direct injection engines, including its 5.0L V8 engine, which Ford said it recently "enhanced" with "significant upgrades including advanced dual port and direct-injection technology."

53. Ford's marketing brochures for its vehicles similarly emphasize that its vehicles and engines use (infringing) dual port and direct-injection technology.

54. For example, Ford's 2017 brochure for its F-150 trucks emphasized that its "all-new, 2nd-generation 3.5L EcoBoost engine" included a "new dual injection system" that "features both direct injection and port fuel injection. Two injectors per cylinder—one mounted in the intake port where air enters and another positioned inside the cylinder—work together to improve power output and efficiency."

55. Moreover, Ford's 2018 brochure for the Ford F-150 listed at least three additional engines incorporating and using this same "dual-injection system." According to Ford's marketing materials, these engines included Ford's "All-New 3.3L Ti-VCT V6," Ford's "Enhanced 2.7 EcoBoost," and Ford's "Enhanced 5.0L Ti-VCT V8."

56. Similarly, Ford marketed a "port- and direct-fuel-injected 3.5L EcoBoost engine" in Ford's 2018 brochure for the Ford Expedition.

57. Further, Ford's 2018 brochures for its Mustang sports car touted a "more powerful, higher-revving 5.0L V8" engine in the Mustang GT "[t]hanks to a new dual-injection system featuring low-pressure port fuel injection and high-pressure direct injection." That brochure also promoted that this "New Dual-Injection System" would "improve power output and efficiency over a wide variety of engine loads."

58. Ford has realized substantial revenues and profits from its sale of such infringing products. For example, in June 2018 it was reported that "the F-Series pickup truck franchise [was expected] to produce $42 billion in revenues this year, to generate earnings before interest, taxes and other items of more than $10 billion, and to produce net income of about $6.5 billion."

The vast majority of those F-150s included engines and fuel management systems that incorporate EBS's patented technology.

59. It also has been reported that, "[i]n terms of profitability," sales of the F-Series alone would place Ford "well inside the top 50 companies in the U.S."—generating "more profit than giants such as McDonald's Corp. (MCD), 3M Co. (MMM), and United Technologies Corp. (UTX)." For example, it has been reported that industry estimates "of Ford F-Series net profit would place the business at a rank of around #38 on the 2018 Fortune 500 list."

60. Further, in its January 3, 2019 Form 8-K report to the Securities and Exchange Commission, Ford disclosed that its F-Series "finished 2018 with a record 10 straight months above 70,000 pickups sold" and "had record transaction prices in 2018."

COUNT 1
INFRINGEMENT OF U.S. PATENT NO. 8,069,839

61. Plaintiffs repeat and incorporate by reference each preceding paragraph as if fully set forth herein and further state:

62. The '839 Patent was duly and legally issued on December 6, 2011. A true and correct copy is attached as **Exhibit A**. Collectively, Plaintiffs hold all rights and title to such patent, including the sole and exclusive right to bring a claim for its infringement.

63. As described below, Ford has directly infringed the '839 Patent in violation of 35 U.S.C. § 271(a) by making, using, selling, and/or offering for sale in the United States, and/or importing into the United States, without authorization, products that practice claims of the '839 Patent.

64. At a minimum, such infringing products include what Ford calls its "second generation" "EcoBoost" engines and fuel management systems, including Ford's 2.7L EcoBoost engine and fuel management system, 3.5L EcoBoost engine and fuel management system, and

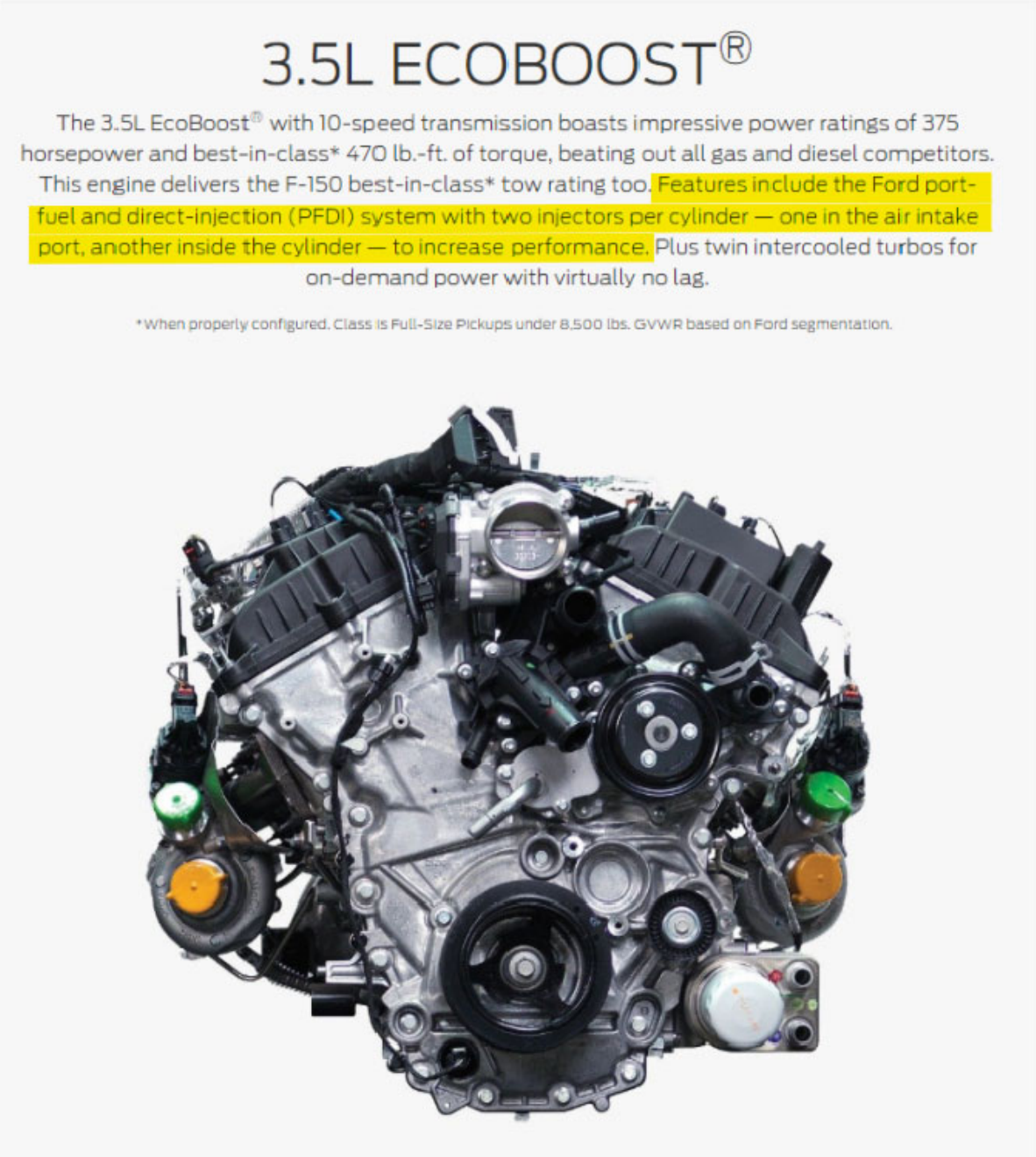
High Output 3.5L EcoBoost engine and fuel management system. Such infringing products also include Ford's 3.3L Ti-VCT and 5.0L Ti-VCT V8 engines and fuel management systems, and other Ford engines that utilize dual port and direct fuel injection. Such infringing products also include those vehicles that include such dual port and direct injection engines and/or fuel management systems.

65. For example, Claims 1 and 2 are illustrative of the claims of the '839 Patent. Claim 1 recites "[a] spark ignition engine that is fueled both by direct injection and by port injection wherein above a selected torque value the ratio of fuel that is directly injected to fuel that is port injected increases; and wherein the engine is operated at a substantially stoichiometric fuel/air ratio." Claim 2 recites "[t]he spark ignition engine of claim 1 where the ratio of directly injected fuel to port injected fuel increases with increasing torque."

66. Ford's 3.5L EcoBoost engine, including its fuel management system, meets every element of these claims.[1]

[1] This description of infringement is illustrative and not intended to be an exhaustive or limiting explanation of every manner in which Ford's products infringe.

67. As the below Ford image reflects, the engine is fueled by both port and direct fuel injection:



https://www.ford.com/trucks/f150/features/power/.

68. Further, as demonstrated by the below figure from a July 2018 report issued by the National Highway Traffic Safety Administration, Ford's 3.5L EcoBoost engine, including its

fuel management system, utilizes such port and direct fuel injection such that, above a selected value of torque (e.g., above approximately 40% absolute engine load), the proportion of fuel that is introduced via direct injection (as compared to port injection) increases:

5.4.3.2.DI vs PFI

The fuel can be fed to the engine through the PFI system or the DI system. Figure 29 shows the map of the PFI and DI strategy. The PFI system provides the fuel to the engine when the absolute engine load is below 40 percent. The DI system is quickly blended in above 40 percent absolute engine load. Between 60 percent to 140 percent absolute load, 80 percent to 70 percent of the fuel is delivered through the DI system. At absolute engine loads above 140 percent the PFI system provides an increase proportion of the fuel up to 40 percent. At the maximum absolute load above 2,000 rpm 60 percent of the fuel is provided by the DI system and 40 percent by the PFI system that corresponds to the values shown in the maximum acceleration test in Figure 24.

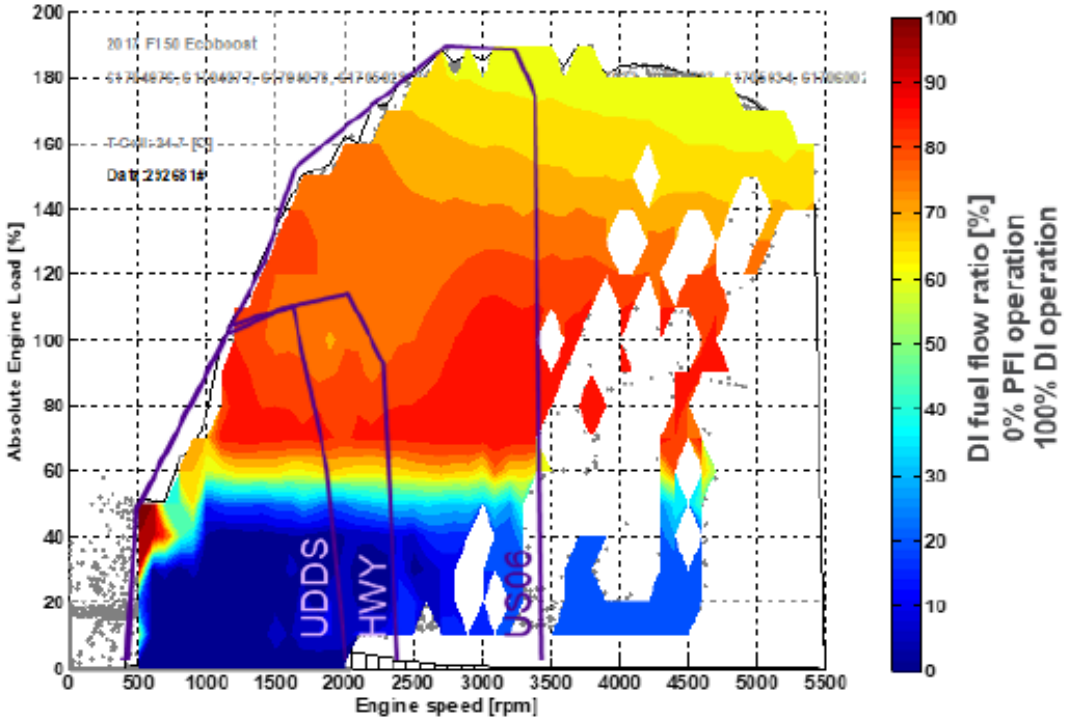


Figure 29: DI and PFI usage map as a function of the engine speed and load

The island of 100 percent DI operation at 575 rpm and 40 percent absolute load corresponds to the engine starting on the DI system before switching to the PFI system as described in the previous section.

69. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel

management system, utilizes such port and direct fuel injection such that the ratio of direct injected fuel to port injected fuel continues to increase with increasing torque such that up to 80% of the fuel is injected via direct injection at certain torque values (e.g., approximately 60% absolute engine load).

70. Further, as evidenced in part by the fact that the Ford F-150 is equipped with what are known in the industry as "three way" catalytic converters, the 3.5L EcoBoost engine, including its fuel management system, operates at a stoichiometric fuel/air ratio.

71. Ford's acts of infringement have damaged Plaintiffs, and Plaintiffs are entitled to recover from Ford for those damages in an amount to be proven at trial.

COUNT 2
INFRINGEMENT OF U.S. PATENT NO. 9,255,519

72. Plaintiffs repeat and incorporate by reference each preceding paragraph as if fully set forth herein and further state:

73. The '519 Patent was duly and legally issued on February 9, 2016. A true and correct copy is attached as **Exhibit B**. Collectively, Plaintiffs hold all rights and title to such patent, including the sole and exclusive right to bring a claim for its infringement.

74. As described below, Ford has directly infringed the '519 Patent in violation of 35 U.S.C. § 271(a) by making, using, selling, and/or offering for sale in the United States, and/or importing into the United States, without authorization, products that practice claims of the '519 Patent.

75. At a minimum, such infringing products include what Ford calls its "second generation" "EcoBoost" engines and fuel management systems, including Ford's 2.7L EcoBoost engine and fuel management system, 3.5L EcoBoost engine and fuel management system, High Output 3.5L EcoBoost engine and fuel management system, and other Ford engines that utilize

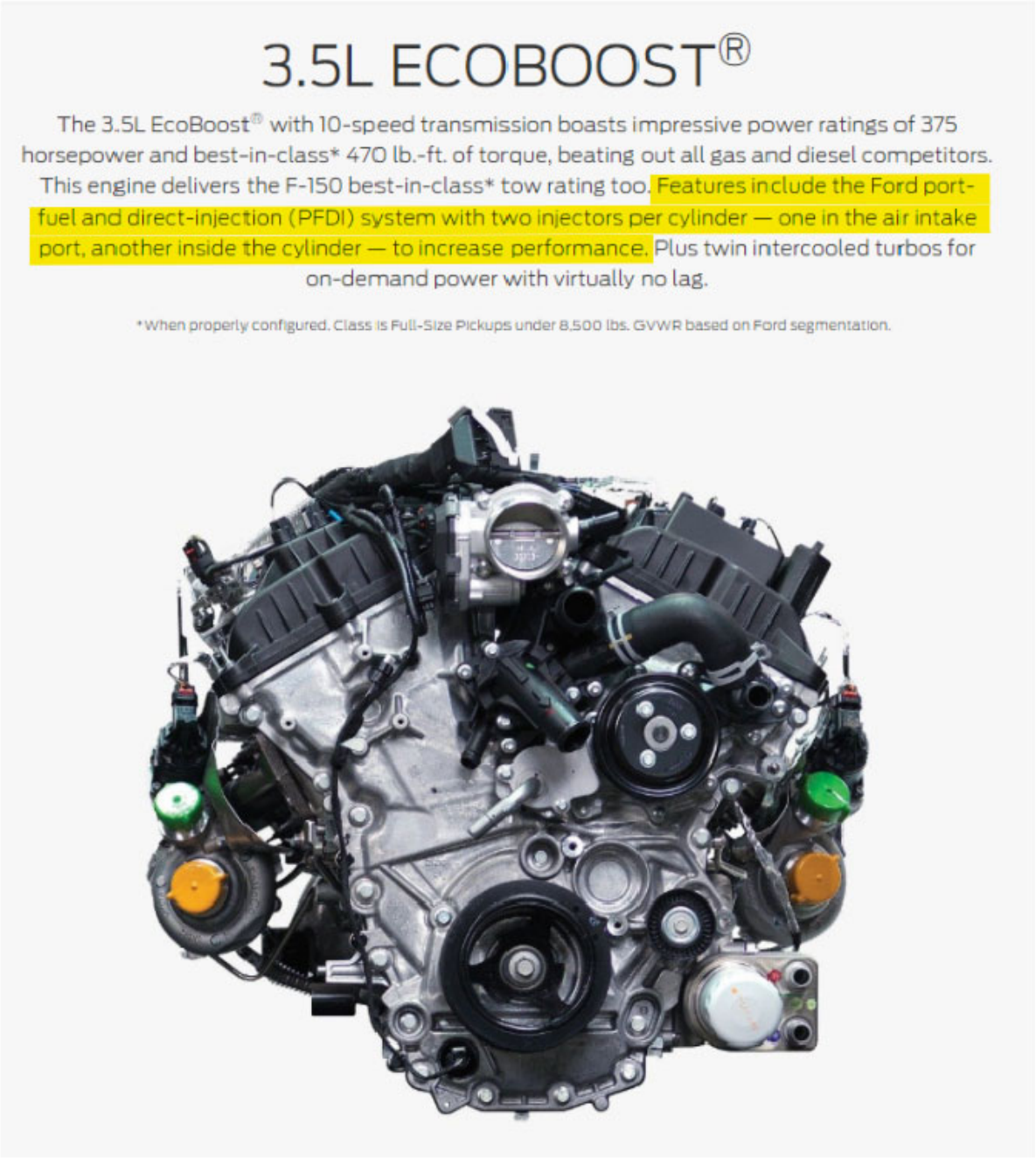
dual port and direct fuel injection. Such infringing products also include those vehicles that include such dual port and direct injection engines and/or fuel management systems.

76. For example, Claim 1 is illustrative of the claims of the '519 Patent. It recites "[a] fuel management system for a turbocharged or supercharged spark ignition engine where the fuel management system controls fueling from a first fueling system that directly injects fuel into at least one cylinder as a liquid and increases knock suppression by vaporization cooling and from a second fueling system that injects fuel into a region outside of the cylinder; and where there is a range of torque where both fueling systems are used at the same value of torque; and where the fraction of fuel in the cylinder that is introduced by the first fueling system decreases with decreasing torque and the fuel management system controls the change in the fraction of fuel introduced by the first fueling system using closed loop control that utilizes a sensor that detects knock; and where the fuel management system also employs spark retard so as to reduce the amount of fuel that is introduced into the cylinder by the first fueling system."

77. Ford's 3.5L EcoBoost engine, including its fuel management system, meets every element of these claims.[2]

[2] This description of infringement is illustrative and not intended to be an exhaustive or limiting explanation of every manner in which Ford's products infringe.

78. As the below Ford image reflects, Ford's 3.5L EcoBoost engine comprises a turbocharged spark ignition engine fueled by both port and direct fuel injection:



https://www.ford.com/trucks/f150/features/power/.

79. Further, Ford's 3.5L EcoBoost engine, including its fuel management system, controls fueling via a first fueling system that directly injects fuel into at least one cylinder as a

liquid, which has the effect of increasing knock suppression through what is known as vaporization cooling. In addition, in such engines, the fuel management system also controls fueling via a second fueling system that injects fuel into a region outside of the cylinder via port injection.

80. Further, as demonstrated by the below figure from a July 2018 report issued by the National Highway Traffic Safety Administration, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that there is a range of torque where both fueling systems are used at the same value of torque (e.g., each torque value above approximately 40% absolute engine load):

5.4.3.2.DI vs PFI

The fuel can be fed to the engine through the PFI system or the DI system. Figure 29 shows the map of the PFI and DI strategy. The PFI system provides the fuel to the engine when the absolute engine load is below 40 percent. The DI system is quickly blended in above 40 percent absolute engine load. Between 60 percent to 140 percent absolute load, 80 percent to 70 percent of the fuel is delivered through the DI system. At absolute engine loads above 140 percent the PFI system provides an increase proportion of the fuel up to 40 percent. At the maximum absolute load above 2,000 rpm 60 percent of the fuel is provided by the DI system and 40 percent by the PFI system that corresponds to the values shown in the maximum acceleration test in Figure 24.

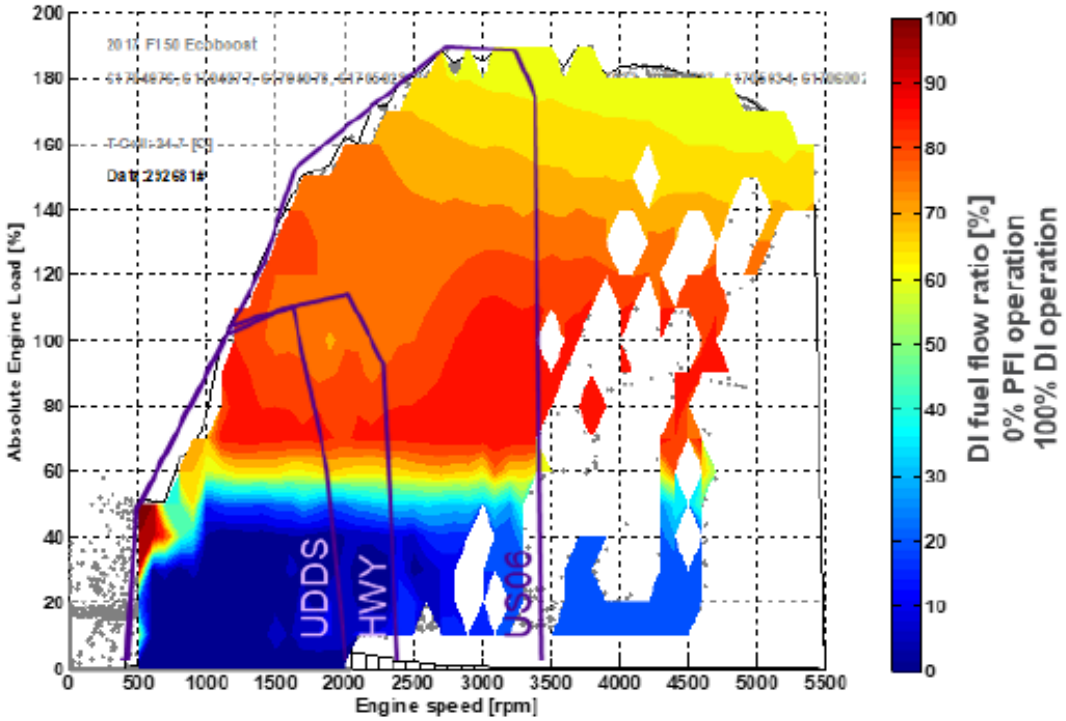


Figure 29: DI and PFI usage map as a function of the engine speed and load

The island of 100 percent DI operation at 575 rpm and 40 percent absolute load corresponds to the engine starting on the DI system before switching to the PFI system as described in the previous section.

81. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that the fraction of fuel in the cylinder that is introduced via direct injection decreases with decreasing torque. For example,

as the above figure reflects, the fraction of fuel introduced via direct injection decreases as torque decreases below approximately 80% absolute engine load.

82. Further, on information and belief, Ford's 3.5L EcoBoost engine, including its fuel management system, controls the change in the fraction of fuel introduced by the first fueling system using closed loop control that utilizes a sensor that detects knock and also employs spark retard so as to reduce the amount of fuel that is introduced into the cylinder by the first fueling system. Such functionality also is demonstrated by the below figure from the July 2018 National Highway Traffic Safety Administration report, which reflects that spark advance decreases with increasing load and—when comparing with the previous figure—shows the fraction of the fuel provided by the first system decreasing with decreasing spark advance (increasing spark retard):

5.4.3.3.Ignition timing

Figure 30 shows the spark ignition timing map for the engine. The most advance is observed at 20-40 percent load (low load cruise) and from 1,000-2,750 rpm.

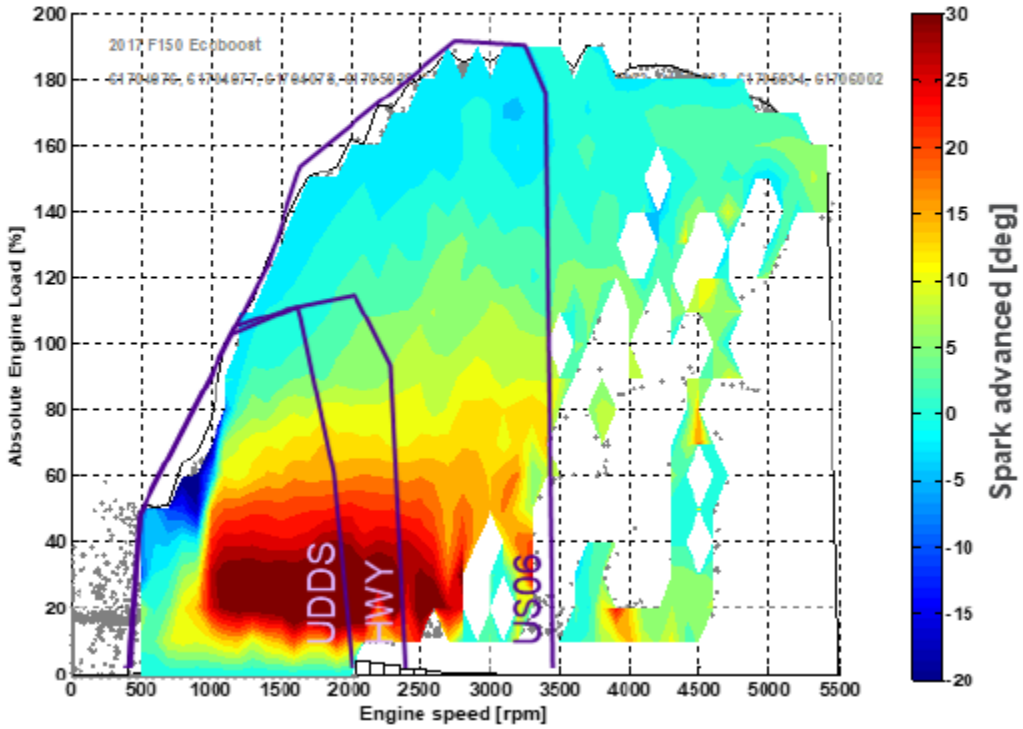


Figure 30: Spark advance map as a function of the engine speed and load

83. Ford's acts of infringement have damaged Plaintiffs, and Plaintiffs are entitled to recover from Ford for those damages in an amount to be proven at trial.

COUNT 3
INFRINGEMENT OF U.S. PATENT NO. 9,810,166

84. Plaintiffs repeat and incorporate by reference each preceding paragraph as if fully set forth herein and further state:

85. The '166 Patent was duly and legally issued on November 7, 2017. A true and correct copy is attached as **Exhibit C**. Collectively, Plaintiffs hold all rights and title to such patent, including the sole and exclusive right to bring a claim for its infringement.

86. As described below, Ford has directly infringed the '166 Patent in violation of 35 U.S.C. § 271(a) by making, using, selling, and/or offering for sale in the United States, and/or importing into the United States, without authorization, products that practice claims of the '166 Patent.

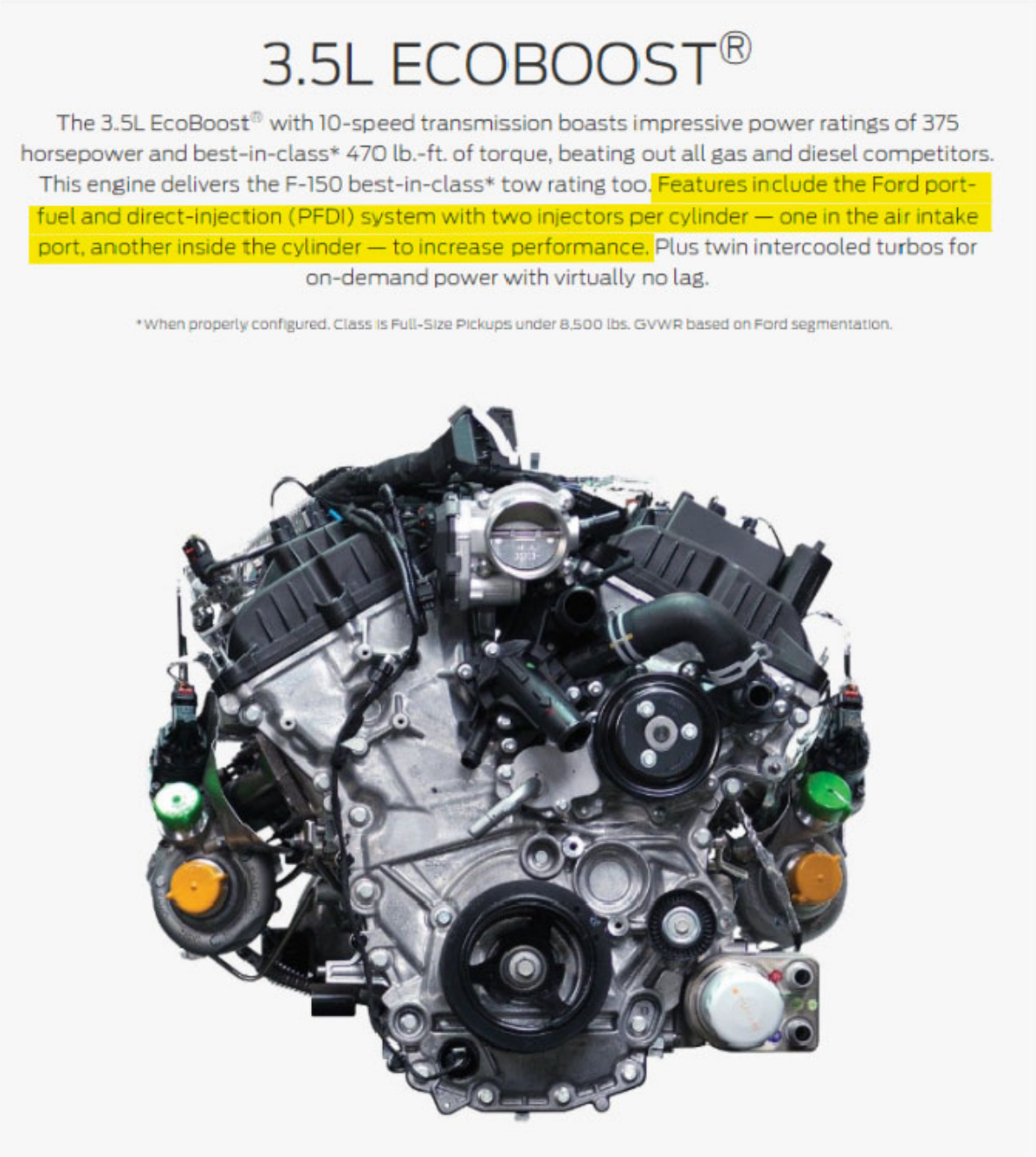
87. At a minimum, such infringing products include what Ford calls its "second generation" "EcoBoost" engine and fuel management systems, including Ford's 2.7L EcoBoost engine and fuel management system, 3.5L EcoBoost engine and fuel management system, High Output 3.5L EcoBoost engine and fuel management system, and other Ford engines that utilize dual port and direct fuel injection. Such infringing products also include those vehicles that incorporate such dual port and direct injection engines and/or fuel management systems.

88. For example, Claim 19 is illustrative of the claims of the '166 Patent. It recites "[a] fuel management system for a turbocharged spark ignition engine which utilizes port fuel injection and also utilizes direct fuel injection; and where there is a first range of torque throughout which direct injection and port injection are used at the same value of torque; and wherein as torque is increased the fraction of fuel that is directly injected is increased to a value that prevents knock; and where there is a second range of torque where only port fuel injection is used; and where when torque exceeds the highest torque in the second range of torque the engine operates in the first range of torque."

89. Ford's 3.5L EcoBoost engine, including its fuel management system, meets every element of these claims.[3]

[3] This description of infringement is illustrative and not intended to be an exhaustive or limiting explanation of every manner in which Ford's products infringe.

90. As the below reflects, such engine comprises a turbocharged spark ignition engine fueled by both port and direct fuel injection:



https://www.ford.com/trucks/f150/features/power/.

91. Further, as demonstrated by the below figure from a July 2018 report issued by the National Highway Traffic Safety Administration, Ford's 3.5L EcoBoost engine, including its

fuel management system, utilizes such port and direct fuel injection such that there is a first range of torque (e.g., each torque value above approximately 40% absolute engine load) throughout which both direct injection and port injection are used at the same value of torque:

5.4.3.2.DI vs PFI

The fuel can be fed to the engine through the PFI system or the DI system. Figure 29 shows the map of the PFI and DI strategy. The PFI system provides the fuel to the engine when the absolute engine load is below 40 percent. The DI system is quickly blended in above 40 percent absolute engine load. Between 60 percent to 140 percent absolute load, 80 percent to 70 percent of the fuel is delivered through the DI system. At absolute engine loads above 140 percent the PFI system provides an increase proportion of the fuel up to 40 percent. At the maximum absolute load above 2,000 rpm 60 percent of the fuel is provided by the DI system and 40 percent by the PFI system that corresponds to the values shown in the maximum acceleration test in Figure 24.

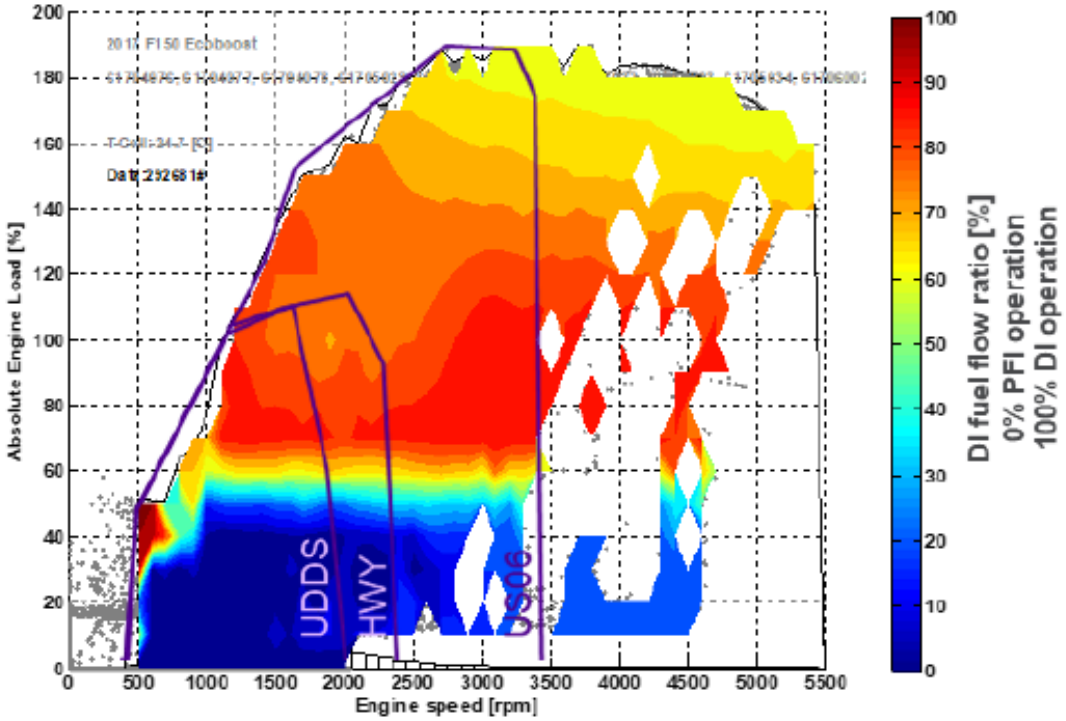


Figure 29: DI and PFI usage map as a function of the engine speed and load

The island of 100 percent DI operation at 575 rpm and 40 percent absolute load corresponds to the engine starting on the DI system before switching to the PFI system as described in the previous section.

92. Further, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that, as torque is increased, the fraction of fuel

that is directly injected is increased to a value that prevents knock. For example, as demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, the fraction of fuel that is directly injected by the Ford's 3.5L EcoBoost engine fuel management system increases from a low of 0% at or around 40% absolute engine load to 70% or 80% direct injection between approximately 60% to 140% absolute engine load.

93. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that there is a second range of torque (e.g., each torque value below approximately 40% absolute engine load) where only port fuel injection is used and where, when torque exceeds the highest torque in the second range of torque, the engine operates in the first range of torque wherein both port and direct fuel injection are used.

94. Ford's acts of infringement have damaged Plaintiffs, and Plaintiffs are entitled to recover from Ford for those damages in an amount to be proven at trial.

COUNT 4
INFRINGEMENT OF U.S. PATENT NO. 10,138,826

95. Plaintiffs repeat and incorporate by reference each preceding paragraph as if fully set forth herein and further state:

96. The '826 Patent was duly and legally issued on November 27, 2018. A true and correct copy is attached as **Exhibit D**. Collectively, Plaintiffs hold all rights and title to such patent, including the sole and exclusive right to bring a claim for its infringement.

97. As described below, Ford has directly infringed the '826 Patent in violation of 35 U.S.C. § 271(a) by making, using, selling, and/or offering for sale in the United States, and/or

importing into the United States, without authorization, products that practice claims of the '826 Patent.

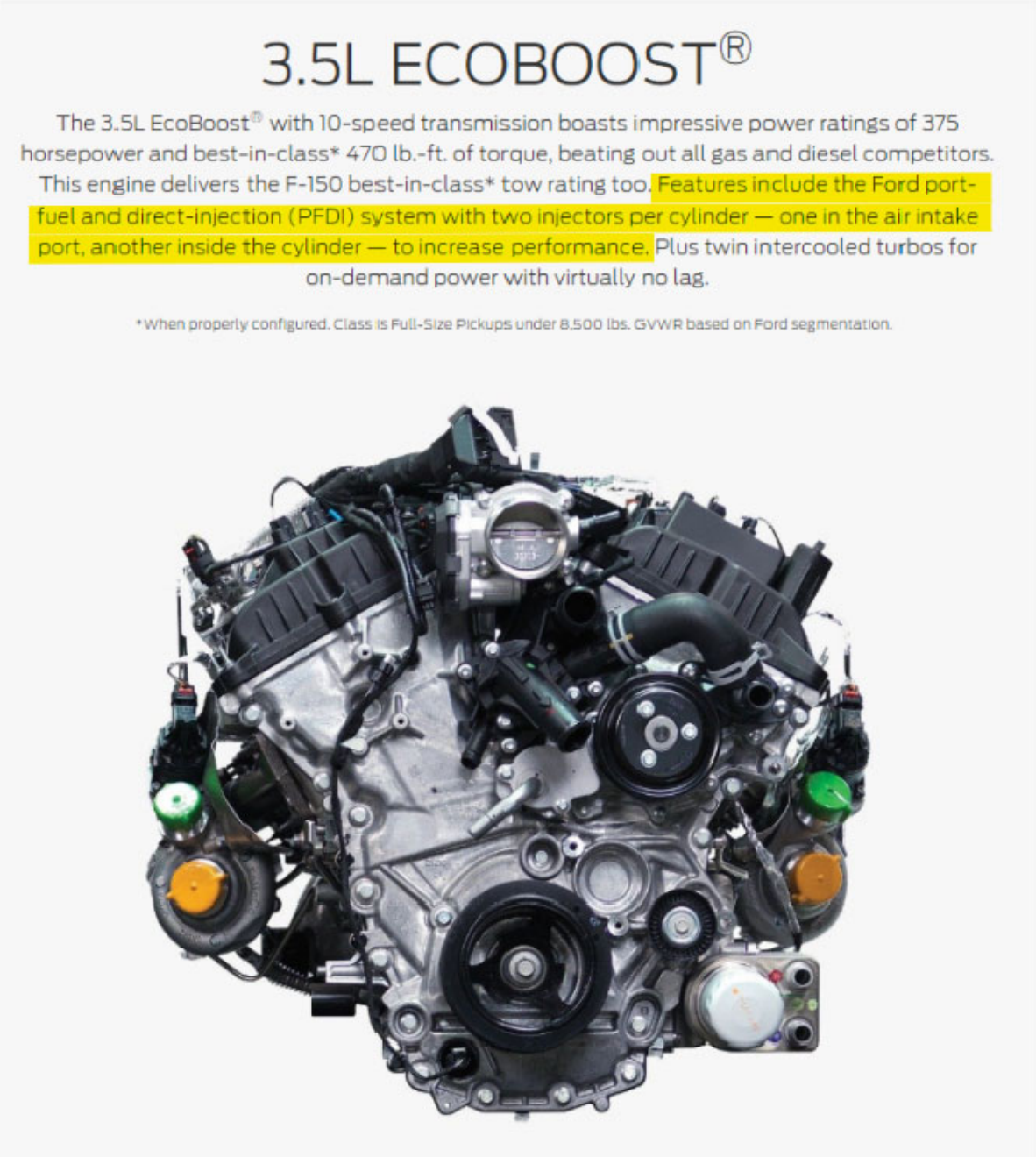
98. At a minimum, such infringing products include what Ford calls its "second generation" "EcoBoost" engine and fuel management systems, including Ford's 2.7L EcoBoost engine and fuel management system, 3.5L EcoBoost engine and fuel management system, and High Output 3.5L EcoBoost engine and fuel management system. Such infringing products also includes Ford's 3.3L Ti-VCT and 5.0L Ti-VCT V8 engines and fuel management systems, and other Ford engines that utilize dual port and direct fuel injection. Such infringing products also include those vehicles that incorporate such dual port and direct injection engines and/or fuel management systems.

99. For example, Claim 12 is illustrative of the claims of the '826 Patent. It recites "[a] fuel management system for a spark ignition engine that has a first fueling system that uses direct injection and also has a second fueling system that uses port fuel injection; and where the fueling is such that there is a first torque range where both the first and second fueling system are used throughout the range; and where there is a second torque range where only the second fueling system is used; where when the torque is higher than the highest value of torque in the second torque range the engine is operated in the first torque range; and where the second torque range extends from zero torque to the highest torque in the second torque range."

100. Ford's 3.5L EcoBoost engine, including its fuel management system, meets every element of these claims.[4]

[4] This description of infringement is illustrative and not intended to be an exhaustive or limiting explanation of every manner in which Ford's products infringe.

101. As the below reflects, such engine comprises a spark ignition engine fueled by both port and direct fuel injection:



https://www.ford.com/trucks/f150/features/power/.

102. Further, as demonstrated by the below figure from a July 2018 report issued by the National Highway Traffic Safety Administration, Ford's 3.5L EcoBoost engine, including its

fuel management system, utilizes such port and direct fuel injection such that there is a first torque range (e.g., above approximately 40% absolute engine load) where both fueling systems are used throughout the range:

5.4.3.2.DI vs PFI

The fuel can be fed to the engine through the PFI system or the DI system. Figure 29 shows the map of the PFI and DI strategy. The PFI system provides the fuel to the engine when the absolute engine load is below 40 percent. The DI system is quickly blended in above 40 percent absolute engine load. Between 60 percent to 140 percent absolute load, 80 percent to 70 percent of the fuel is delivered through the DI system. At absolute engine loads above 140 percent the PFI system provides an increase proportion of the fuel up to 40 percent. At the maximum absolute load above 2,000 rpm 60 percent of the fuel is provided by the DI system and 40 percent by the PFI system that corresponds to the values shown in the maximum acceleration test in Figure 24.

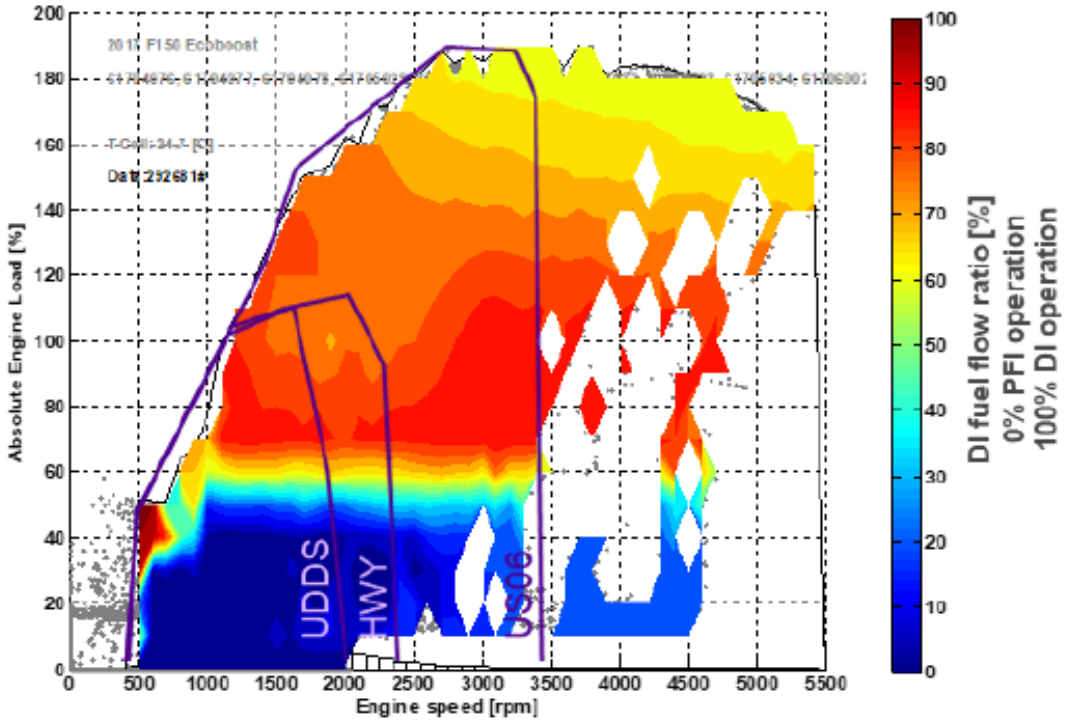


Figure 29: DI and PFI usage map as a function of the engine speed and load

The island of 100 percent DI operation at 575 rpm and 40 percent absolute load corresponds to the engine starting on the DI system before switching to the PFI system as described in the previous section.

103. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel

management system, utilizes such port and direct fuel injection such that there is a second torque range (e.g., below approximately 40% absolute engine load) where only the second (port) fueling system is used.

104. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that, when the torque is higher than the highest value of torque in the second torque range (e.g., approximately 40% absolute engine load) the engine is operated in the first torque range.

105. Further, as also demonstrated by the above figure from the July 2018 National Highway Traffic Safety Administration report, Ford's 3.5L EcoBoost engine, including its fuel management system, utilizes such port and direct fuel injection such that the second torque range extends from zero torque to the highest torque in the second torque range (e.g., approximately 40% absolute engine load).

106. Ford's acts of infringement have damaged Plaintiffs, and Plaintiffs are entitled to recover from Ford for those damages in an amount to be proven at trial.

WILLFUL INFRINGEMENT

107. Plaintiffs repeat and incorporate by reference each preceding paragraph as if fully set forth herein and further state:

108. Ford's infringement of the '839 Patent and '519 Patent was and continues to be willful.

109. For one non-exhaustive example, and as stated above, Ford received notice of the '839 Patent at least by October 30, 2014.

110. Further, on April 17, 2015 Ford's chief intellectual property officer, Mr. Coughlin, indicated that Ford had studied Plaintiffs' intellectual property related to their dual injection technology and identified perceived weaknesses in Plaintiffs' patents—which included the '839 Patent. Dr. Cohn responded that a "rational way to proceed" on negotiations over a licensing agreement was for Ford to analyze the patents issued to Plaintiffs and "specifically identify where [Ford] thought the patents had weaknesses." In addition, at the same meeting, Mr. Coughlin asked for information about Plaintiffs' pending patent applications.

111. Further, when asked when Ford could get back to EBS on this issue, Mr. Coughlin responded "around two months." At the end of that two-month period, Ford identified no perceived weakness in any of Plaintiffs' patents.

112. Ford also received yet another "list of MIT/EBS patents and patent applications" on October 12, 2015, and told EBS that it was "likely critical that we (Ford) are in a position to review all of the applications in the portfolio." On information and belief, Ford did review Plaintiffs' patents and pending patent applications, and yet Ford never identified to EBS any perceived weakness in the '839 Patent or the application that ultimately resulted in the '519 Patent. Instead, Ford told EBS in November 2015 that Ford had no plans to utilize the MIT/EBS dual port and direct fuel injection technology in Ford's products.

113. As demonstrated by the above, including by the announcement in Forbes Magazine's May 3, 2016 article that several of Ford's new engines featured "dual fuel systems with both direct and port injectors for each cylinder" and Ford's June 16, 2017 announcement that several of its new engines added "dual port and direct-injection technology to deliver more power and torque" than its previous engines, such representation was false when made.

114. Further, since making that statement, Ford has continued to willfully infringe the '839 and '519 Patents without identifying any perceived weakness in either patent or offering any explanation as to why Ford's identified products do not infringe such patents.

115. In addition, the filing of this lawsuit provides Ford with further notice of each of the Asserted Patents such that any continued infringement by Ford after the filing date of this lawsuit constitutes willful infringement.

DEMAND FOR JURY TRIAL

116. Plaintiffs hereby demand a jury trial on all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, PLAINTIFFS ETHANOL BOOSTING SYSTEMS, LLC and the MASSACHUSETTS INSTITUTE OF TECHNOLOGY request entry of judgment in their favor and against DEFENDANT FORD MOTOR COMPANY as follows:

A. Declaring that Ford has infringed each of the Asserted Patents;

B. Declaring that Ford's infringement has been willful;

C. Awarding damages equal to those damages Plaintiffs have suffered as a result of Ford's infringement, including no less than a reasonable royalty pursuant to 35 U.S.C. § 154(d) and 35 U.S.C. § 284, enhanced damages pursuant to 35 U.S.C. § 284, costs, and prejudgment and post-judgment interest;

D. Awarding of attorneys' fees pursuant to 35 U.S.C. § 285 or as otherwise permitted by law; and

E. Awarding such other costs and further relief as the Court may deem just and proper.

Dated: January 30, 2019

Respectfully submitted,

FARNAN LLP

/s/ Michael J. Farnan

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