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Mishimoto Engineering Report

Subject: 2015-2017 Ford Mustang EcoBoost Performance Air Intake

Testing of the 2015+ Mustang EcoBoost Performance Intake

Test Vehicle: 2015 Mustang EcoBoost | Fully Stock

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Objective

To make a direct-fit, performance intake that produces more power than the stock setup, without harming the engine

Testing Conditions

All testing was performed in a climate-controlled garage that maintained an average temperature of 68°F (20°C) and 10% humidity.

Testing Equipment

To test the effects of different intake setups, a DynoJet dynamometer was used to measure the power output. A handheld SCT X4 Power Flash Programmer was used to datalog certain parameters such as rpm and intake air temperature (IAT).

Goals and Metrics

The test compares the Mishimoto intercooler and piping kit with the stock intercooler and piping kit under constant conditions. Between runs, a 3-minute break ensured that each run started with similar temperature conditions. Every test was conducted with the hood up and a blower fan placed directly in front of the core. Wind speed out of the blower was 20 mph. The truck was strapped down once, and the intercoolers were swapped out on the dynamometer so that both tests were conducted under exactly the same conditions.

Results

Before development began on the 2015 Mustang EcoBoost performance intake, goals and metrics were defined for the project.

- First and foremost, create an intake that would make more power without potentially harming the engine and without the need for a tune. To accomplish this, air-fuel ratios (AFRs) were closely monitored to ensure that enough fuel was being supplied to the engine.
- Create an intake that would be isolated from the radiating heat of the engine bay. Cold air is denser than hot air and therefore creates a larger combustion, so the ideal intake would draw in as much cool air as possible. This can be achieved by placing the intake away from the engine and close to the cool air coming in through the front bumper.
- Ensure that no permanent modification would be necessary when installing the intake. It should be a direct bolt-in part without any cutting or grinding required.

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Experiment and Results

Instead of choosing to use the more common mass airflow (MAF) based system, Ford utilized a speed-density setup for the Mustang EcoBoost. This type of air metering system relies on an IAT sensor and a manifold absolute pressure (MAP) sensor to deliver information to the ECU. Previous testing has shown that this type of metering system is less likely to significantly change AFRs or power output when a performance intake is installed without a tune. Internal pipe diameter is critical on an MAF-based system, whereas it can be as large as allowable on a speed-density system. Since a larger intake pipe will create less overall system restriction, we chose to use a 3.5" pipe constructed from mandrel-bent aluminum.

The stock paper filter creates an obvious restriction in the Mustang intake system. The Mishimoto intake kit replaces this filter with a high-flow oiled filter that provides decreased media restriction while increasing overall surface area by 155%. A comparison between the surface areas of the stock paper filter and Mishimoto filter can be seen in Figure 2 below.

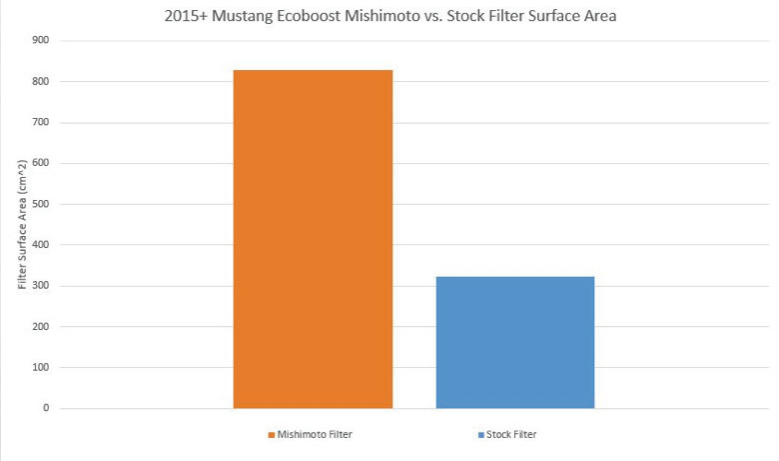

Figure 2: The Mishimoto filter increases surface area by 155% and will allow up to 2,000 CFM of airflow

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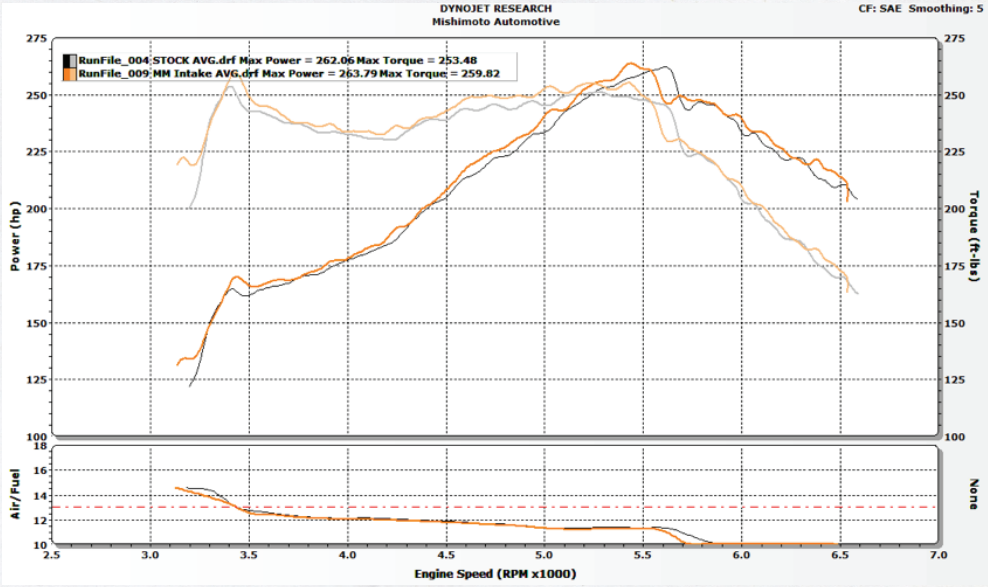
Once a design was chosen, the next step was to perform real-world testing to be sure that the intake functioned correctly without causing an unsafe AFR condition. To test this, the Mustang was strapped to the dyno and numerous pulls were made on both the stock and Mishimoto performance intakes. All stock and Mishimoto intake pulls were plotted together, and the average run was chosen for each setup. Results showed that the Mishimoto intake made consistently more power compared to the stock setup. Throughout the powerband the performance intake showed a 4-8 whp increase and up to a 9 wtq increase over stock while maintaining a near-stock AFR curve. These results can be seen in Figure 3 below.



It was clear that the Mustang was tuned to hold AFRs at approximately 11.4:1 until 5,500-5,800 rpm, at which point AFRs dropped to a very rich condition. This transition occurred at slightly different rpms on each pull, which is shown in Figure 3.

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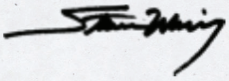
Conclusion

The 2015+ Mustang EcoBoost intake is a well-designed system but could be improved by increasing the pipe diameter and replacing the restrictive paper filter with a high-flow oiled filter. The Mishimoto intake showed gains of up to 8 whp and 9 wtq on the stock tune. Larger gains can be expected once the car is tuned with the higher-flow performance intake installed. The Mishimoto intake will install easily without any permanent modification or the need to remove the front bumper. The intake box serves to channel cold ram air from the stock duct directly to the high-flow air filter, which will allow for a more aggressive tune. Along with an increase in power and flow, the Mishimoto intake provides a deep intake tone under full throttle. This intake system is a must for anyone looking to improve performance, aesthetics, and intake tone on their 2015+ Mustang EcoBoost.



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