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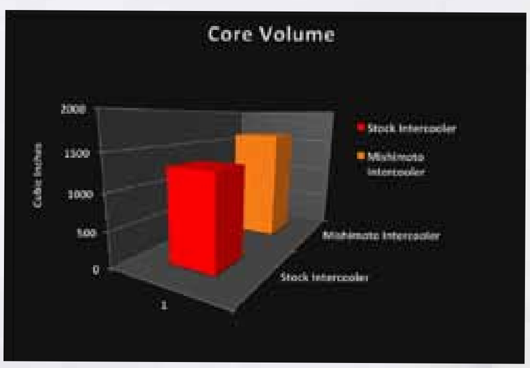
MISHIMOTO ENGINEERING REPORT

Subject: 2008–2010 Ford 6.4L Powerstroke Mishimoto Intercooler

Mishimoto Disclaimer

We at Mishimoto would like to thank you for taking the time to read our Engineering Report. We know that many readers have questions regarding the efficiency of diesel truck intercoolers. Many companies make broad claims but fail to substantiate them with proven testing data. Each Mishimoto product has been tested in-house on our Dynojet 424LX dynamometer. Testing results were obtained using PLX K-type thermocouples and analog pressure gauges (0-100 psi range). The sensors were kept in the same location, from factory intercooler testing to Mishimoto intercooler testing, to ensure consistency in data collection. This controlled experiment allowed us to isolate the intercooler, so that we could determine the performance of the product alone. No variables such as intakes, exhausts, or tunes were changed or modified during testing. Performance results will vary from vehicle to vehicle depending on modifications.



The engineering team went through multiple iterations while designing the end tanks. They used CFD software to make sure that the flow was optimized for the Ford 6.4L Powerstroke. The core of the Mishimoto unit is 18% thicker and 20% larger in volume than the stock unit. The Mishimoto intercooler has casted end tanks and a bar-and-plate core, versus the tube-and-fin core and plastic end tanks of the stock unit. (Note: The stock unit is casted on bottom and plastic on top.)

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Testing of the 2008–2010 Ford 6.4L Powerstroke Mishimoto Intercooler

Test Vehicle

2010 Ford F-250 Powerstroke Super Duty

- S466 twin-scroll single turbo with custom intake
- 30% over nozzles
- Upgraded turbo back exhaust
- Tuned by Eric at Innovative Diesel Performance (650hp at 42 psi)

Apparatus

For hardware Mishimoto chose PLX sensor modules driven by the Kiwi WiFi plus IMFD. This is a wireless system from the sensor modules to an iPad or laptop computer. The software used was the Palmer Performance Scan XL pro, which has full data logging capabilities.

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Air intake temperatures (AIT) were taken from the inlet and outlet of both intercoolers using PLX K-type thermocouples. Boost pressure was also tested to ensure that no dramatic pressure drop occurs when installing the larger Mishimoto intercooler. Mechanical gauges were used because of the high boost levels.

Sensor locations

1. Pre-intercooler air intake temperature (data logger)
2. Pre-intercooler boost pressure (mechanical gauge)
3. Post-intercooler boost pressure (mechanical gauge)
4. Post-intercooler air intake temperature (data logger)

Testing conditions

Ambient temperature range: 91°F to 93°F

Experiment

The test compares the stock intercooler with the Mishimoto intercooler under exactly the same conditions. To conduct the test we made three runs with each setup, taking 3-minute intervals between runs to ensure 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

The results shown below are for the post-intercooled AIT temperatures. The graph shows that the Mishimoto intercooler had an average of 9%-10% lower outlet temperatures and a maximum difference of about 21% (approximately 25°F) as compared with the stock intercooler. The color sections show the different stages of the dyno run. In the green shaded area the truck is increasing in speed and rpm. The red shaded area shows the actual dyno pull (this section is expanded below). In the yellow section the truck is off the throttle and cooling down after the pull.

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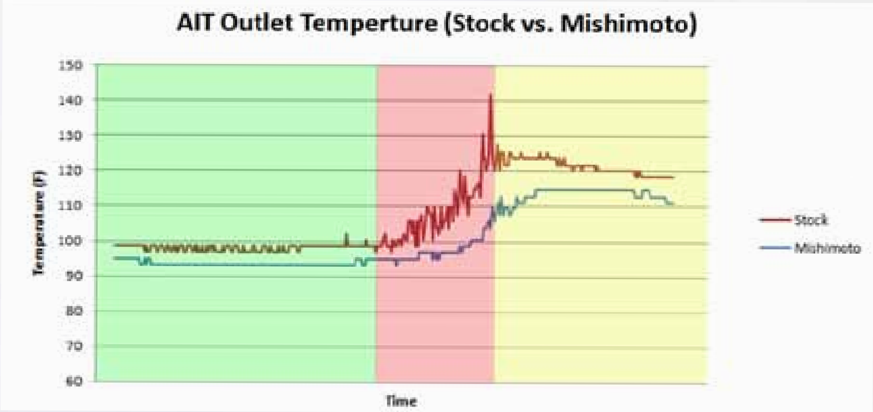
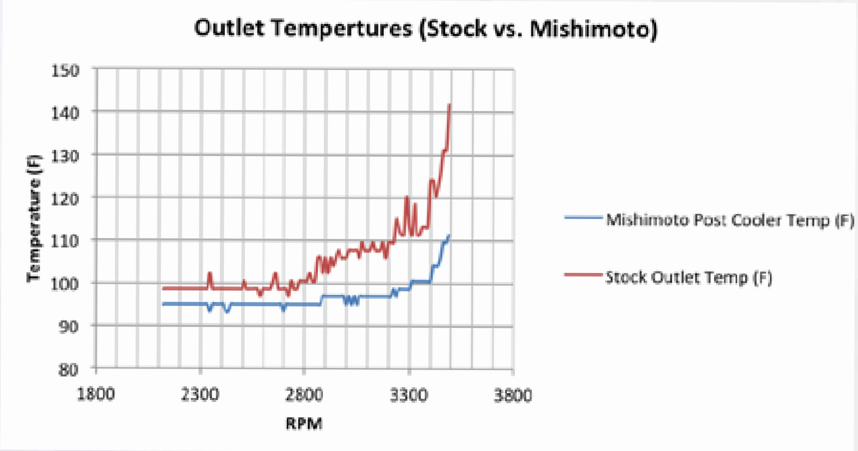


Shown below is a closer look at the top gear pull of the dyno run. As the truck reaches approximately 2800 rpm, the temperatures begin to rise for both intercoolers. At this point the test truck built full boost and was pushing around 42 psi. The graph shows the temperature of the stock cooler rising exponentially, compared with the Mishimoto unit that rises in a linear fashion.



The mechanical boost gauges are shown below. The stock intercooler unit shows a 2 psi drop in pressure, while the Mishimoto unit shows only about a 1 psi drop. Both units had the same 42 psi outlet pressure, but the turbo had to work harder on the stock intercooler to reach the desired boost level.

Mishimoto

Stock

Conclusion

The dyno indicated that the stock intercooler is a suitable unit for normal everyday driving. However, the stock unit becomes inefficient under full boost and higher rpm. The Mishimoto unit is able to handle higher temperatures and pressures much better than the stock unit. Also, for highly modified or upgraded turbo trucks, the Mishimoto unit features casted end tanks and a bar-and-plate core, which will handle much higher boost levels than the factory plastic end tank and tube-and-fin core of the stock unit.

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