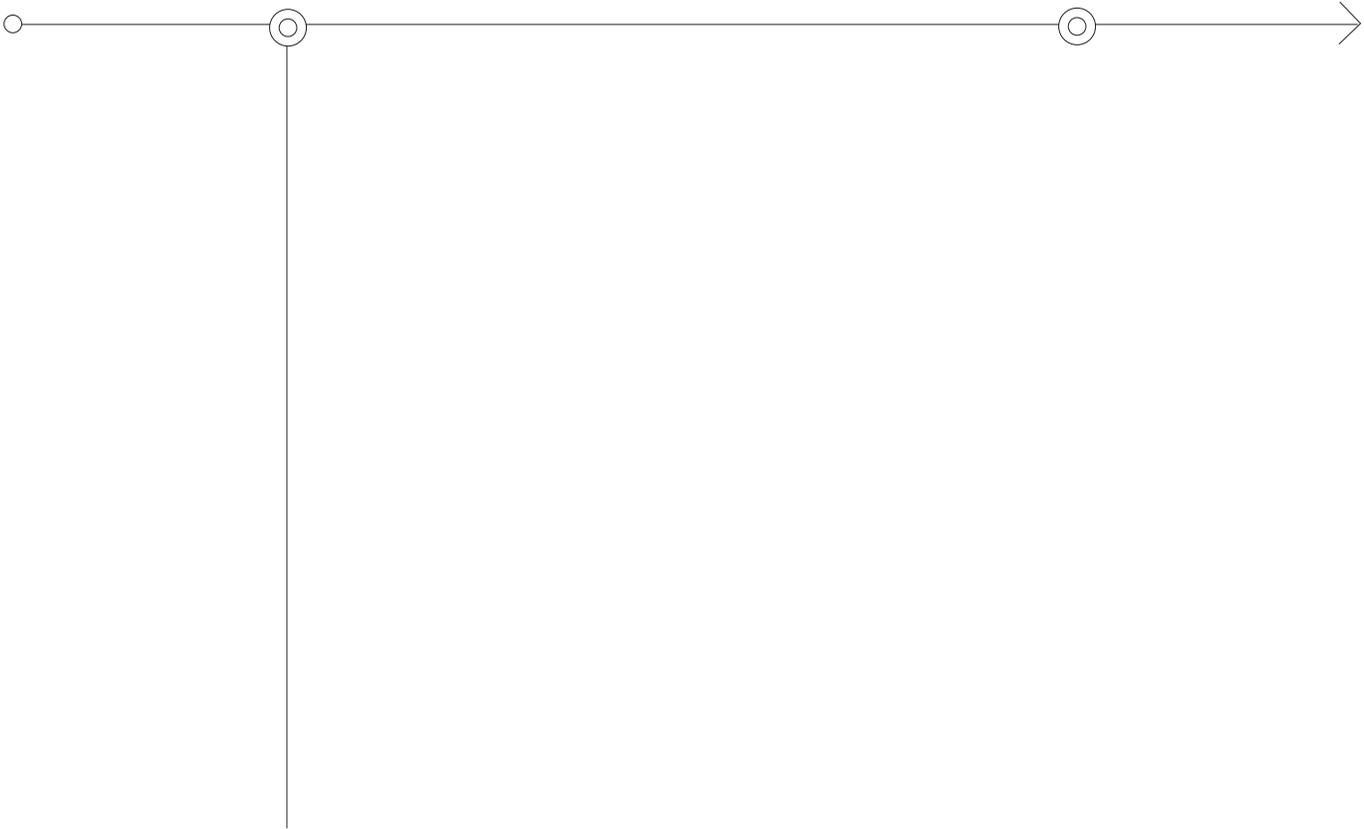




ENGINEERING REPORT

DODGE 5.9 CUMMINS INTERCOOLER

By Daniel Tafe, *Mishimoto Product Engineer*





Test Vehicle:

2001 Dodge RAM 2500 with 6-speed manual transmission

Test Vehicle Modifications:

Compound turbo setup, upgraded fuel system, turbo back exhaust, and tune

Testing conditions:

Outside temperatures range: 72°F–76°F (22.2°C–24.4°C)

The engineering team went through multiple iterations while designing the end tanks using computational fluid dynamics (CFD) software to make sure that the flow was just right for the Dodge 5.9L Cummins. This intercooler is designed with a 50% thicker core than the factory intercooler and has a 47% increase in core volume.

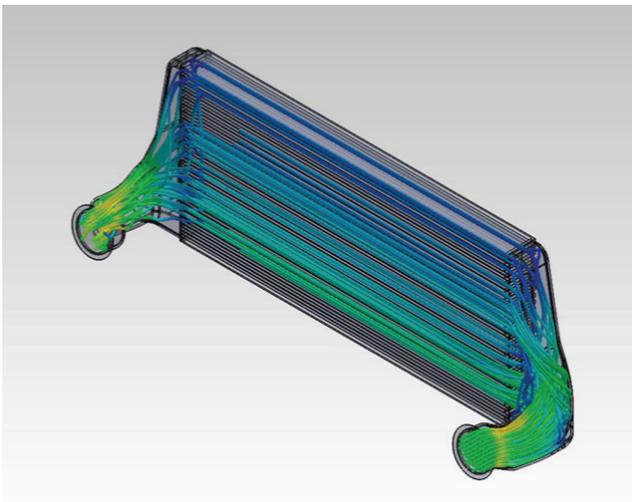


FIGURE 1: CFD testing of the Mishimoto intercooler

Core Thickness

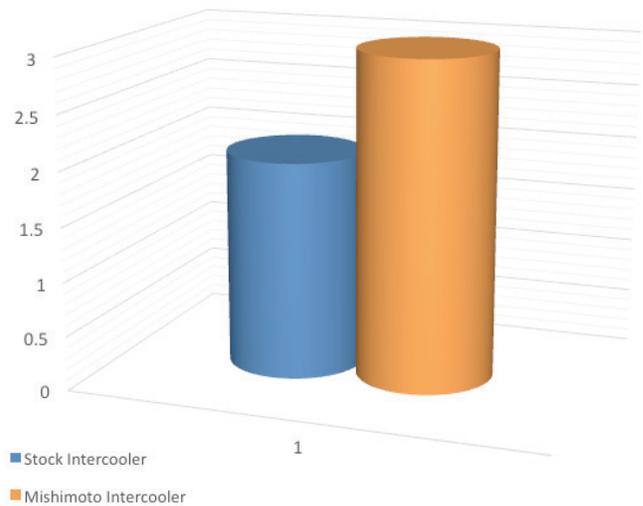


FIGURE 2: The Mishimoto intercooler thickness is 50% greater than the factory intercooler.

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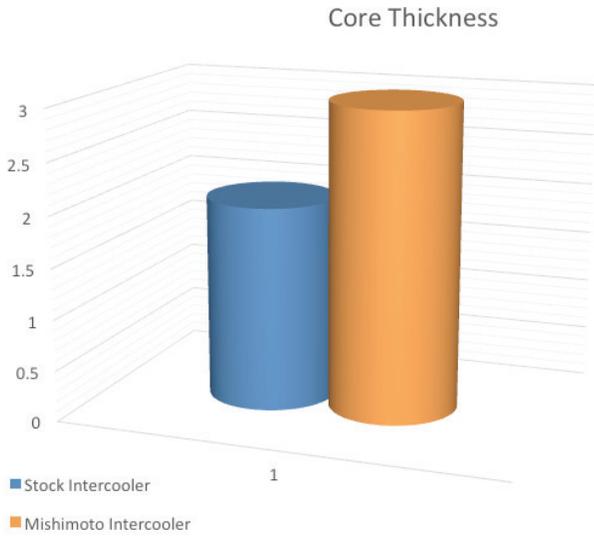


FIGURE 3: *The Mishimoto core volume is increased by 47% over the factory core volume.*



APPARATUS: *For hardware Mishimoto chose to use the AEM AQ-1 driven by the AQ-1 Data Acquisition System.*

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FIGURE 4: *AEM AQ-1 Data Logging System*

Air intake temperatures (AITs) were taken from the inlets and outlets of both intercoolers using K-type thermocouples.

Sensor locations

1. Pre-intercooler air intake temperature
2. Post-intercooler air intake temperature

Experiment:

The test compares the factory intercooler with the Mishimoto intercooler under exactly the same conditions. To conduct the test we made three runs with each setup in 6th gear and ran the truck from 1,400 rpm to 3,400 rpm. Between each run, a 3-minute break ensured that each run started with similar temperature conditions. Every test was conducted with the hood up, and a large fan was placed directly in front of the core. The truck was strapped down once, and the intercoolers were swapped out on the dynamometer so that both tests had exactly the same conditions.



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FIGURE 5: *Sensor locations for the inlet of the intercoolers*



FIGURE 6: Dynamometer testing of the Mishimoto Intercooler

2001 Dodge 2500 5.9L Cummins Stock Intercooler Temperatures

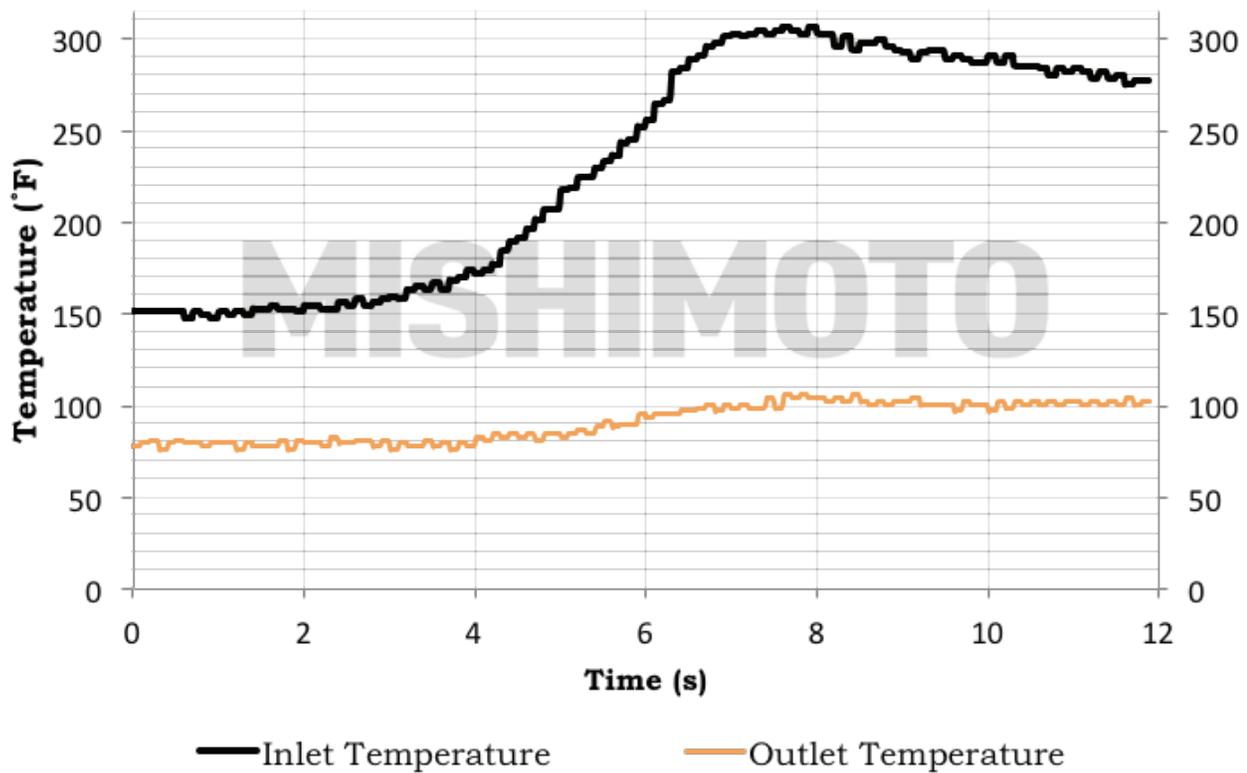


FIGURE 7: Graph of inlet and outlet air temperatures recorded for the factory intercooler

2001 Dodge 2500 5.9L cummins Mishimoto Intercooler Temperatures

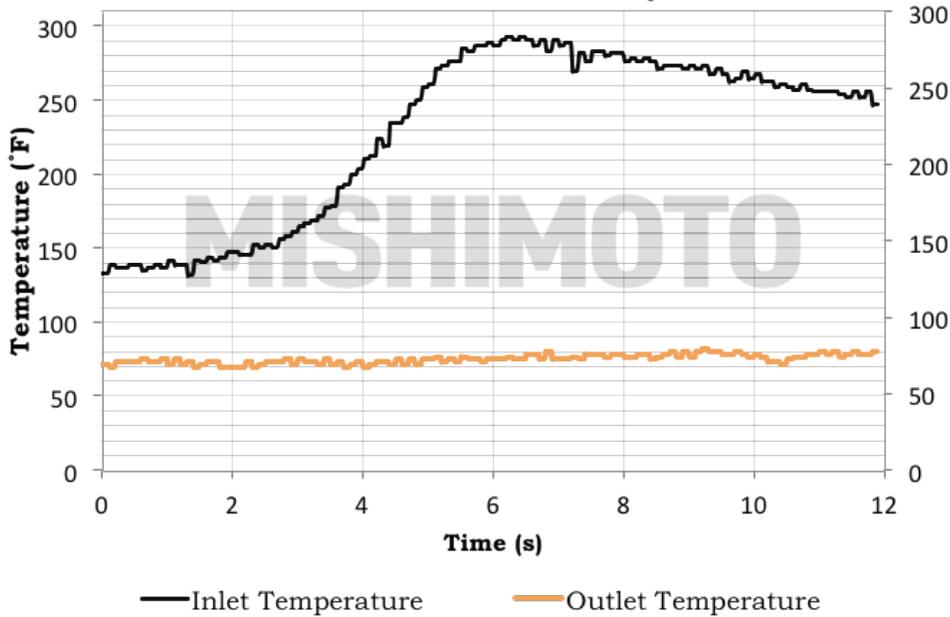


FIGURE 8: Graph of inlet and outlet air temperatures recorded for the Mishimoto intercooler

2001 Dodge 2500 5.9L Cummins Intercooler Outlet Temperature Comparison

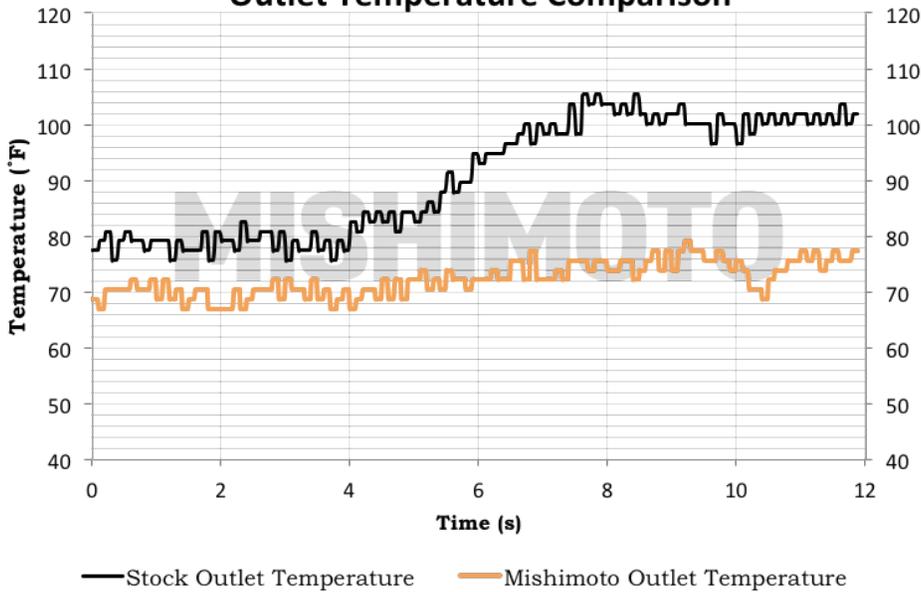


FIGURE 9: Graph comparing outlet temperatures of the Mishimoto intercooler and the factory intercooler

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The Mishimoto intercooler was able to reduce the air temperature coming out of the intercooler to a nearly ambient temperature. Figure 9 shows a 25% reduction in outlet temperatures of the Mishimoto intercooler compared to the factory intercooler.

Conclusion

The dyno testing indicated that the factory intercooler is a good unit for normal everyday driving. When we switched to the Mishimoto intercooler, we saw a 25% decrease in outlet temperatures with only a slight increase in pressure drop. The Mishimoto unit features casted end tanks and a bar-and-plate core, which handles much higher boost levels than the tube-and-fin core of the factory unit. This makes the Mishimoto intercooler a great choice for highly modified or upgraded turbo trucks.

Testing Done By:

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