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MISHIMOTO ENGINEERING REPORT

Testing of the Ford Mustang GT 5.0L Direct-Fit Oil Cooler



Test Vehicle

2012 Ford Mustang GT 5.0L

Objective

To make an oil cooler that bolts directly onto the 2011-2014 Ford Mustang GT 5.0L. The cooler must be robust enough for the track but still safe for street conditions.

Testing conditions

Ambient temperature: 85-87°F, with high humidity.

Apparatus

For hardware Mishimoto chose the 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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Figure 1: PLX devices and sensors were used to obtain all testing data.



Figure 2: PLX Kiwi WiFi device



Figure 3: Palmer Performance Scan XL Pro software was used to record testing data.

Fluid temperatures were taken with PLX fluid temperature sensors from both the inlet and outlet of the standard Mishimoto Oil Sandwich Plate. Oil pressure was also measured to ensure that no dramatic pressure drop occurs when installing the oil cooler. A baseline temperature and pressure were recorded before the oil cooler was installed. This allowed us to see how well the cooler performed over the stock setup (which has no oil cooler).

Research and Development

For our first iteration the oil cooler was mounted near the top of the A/C condenser using a bracket system. The PLX temperature sensors were attached, and the vehicle was tested

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for decreases in oil temperature and pressure with the cooler attached. Although this setup showed a 20°F temperature decrease over stock, we weren't fully satisfied with the results. After placing an anemometer behind the front bumper, we found that air velocity was inadequate in the spot where the oil cooler was mounted.



Figure 4: The first mounting location showed a 20°F temperature drop over stock. This was considered adequate but not quite good enough.

Using the anemometer, we found a location with greater airflow behind the front bumper. A bracket was made to mount the oil cooler in the desired location, and the vehicle was once again tested using the PLX devices. The data showed that oil temperatures dropped an additional 15°F (35°F total) over stock once the oil cooler was mounted in the new location.



Figure 5: The lower placement of the oil cooler showed a 35°F temperature drop over stock at cruising speeds.

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Experiment

The test compares the uncooled factory oil temperatures and the resulting oil temperatures with the Mishimoto 25-Row Direct-Fit Oil Cooler installed. Both setups were tested until they reached steady-state conditions. To conduct the test we first let the car idle until it became heat soaked. Next, we drove the Mustang on a highway at approximately 65 mph and cruised for approximately five miles. Special attention was given to the space between the Mustang and the car in front of it to ensure that fresh air was flowing into the oil cooler. This experiment is 100% repeatable when the test is conducted under similar weather conditions.

At steady-state conditions, the stock operating temperature of the oil was approximately 220°F. The Mishimoto 25-Row Oil Cooler was then installed and the same test was run.

Under the same steady-state conditions, the oil temperature was stable at approximately 185°F. The chart below shows the testing data.

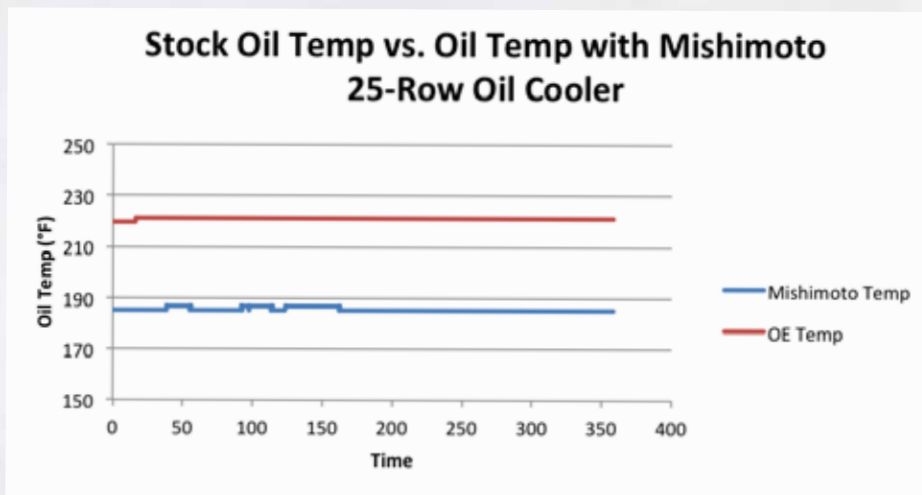


Figure 7: The Mishimoto oil cooler showed a temperature decrease of approximately 35°F over stock temperatures.

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Along with oil temperature, oil pressure was recorded to ensure that the pressure loss with the cooler installed would not be damaging to the engine. The average pressure loss was 7 psi, which is an acceptable value and will not cause damage to the motor. The outlet pressure (about 60 psi) is well above the Ford-recommended minimum oil pressure (40 psi) at 2,000 rpm. Oil pressure data along with a linear fit for the data is shown below.

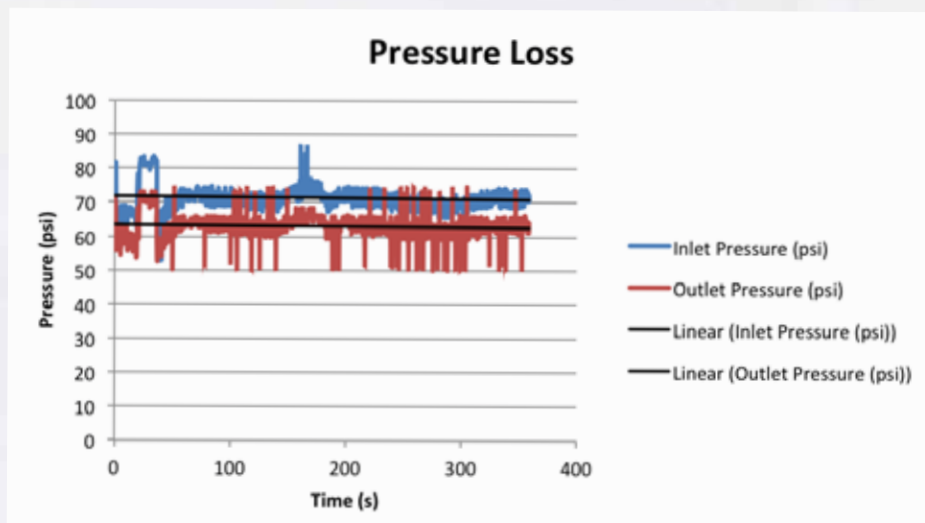


Figure 8: An average pressure loss of 7 psi was found with the oil cooler installed. This is an acceptable number and will not harm the engine.

Summary

The testing results show that the Mishimoto oil cooler works well to reduce temperatures while losing only 7 psi of pressure. An optimal location for the oil cooler was found behind the lower grille of the front bumper, as this allows the most airflow. With the Mishimoto 25-Row Oil Cooler in place and the car driven at a steady speed, the oil temperature decreased 35°F compared with the stock. This oil cooler is an excellent addition to the 2011+ Mustang 5.0L and will keep the oil temperature significantly cooler under both street and track conditions.

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