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MISHIMOTO ENGINEERING REPORT

Testing the Mishimoto 2015+ Subaru WRX Oil Cooler Kit



Figure 1: Test vehicle

Test Vehicle:

2015 WRX with CVT transmission

Modifications:

Mishimoto Plug-N-Play Performance Aluminum Fan Shroud Kit

Testing Conditions:

Temperature range 79° F-80° F and 62% humidity

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Apparatus:

For temperature and pressure monitoring 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. Sensor locations were installed in line with the oil lines directly before and after the cooler.



Figure 2: Mounting locations for temperature and pressure sensors. (Sensor reads approximately 10 times per second.)



Figure 3: PLX sensor modules were used to monitor engine pyrometers.

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Design Background:

The 2015 WRX comes equipped with stock liquid-to-liquid oil cooler. It works by sending oil from the oil filter through the heat exchanger, which has two separate ports that are fed with coolant from the engine. Since oil temperatures are higher than engine coolant (when fully warmed up), the oil will lose heat and transfer it into the engine coolant. Liquid-to-liquid coolers work very well, so Mishimoto engineers wanted to keep this stock oil cooler and add an additional 19-row liquid-to-air oil cooler to the system.

A special Mishimoto oil sandwich plate was designed specifically for the WRX. Our standard sandwich plate made the stock oil filter too tall and hit the lining of the hood. The engineers designed a plate that added only 19mm (about $\frac{3}{4}$ ") of height, which is 37% lower than our standard plate. Since the stock oil cooler is retained, Mishimoto engineers decided not to put a thermostat in the oil sandwich plate. Instead, the stock oil cooler can also act as an oil warmer when the engine is warming up or driven in cold temperatures. The engine coolant would heat the oil from the Mishimoto oil cooler before it returned to the engine, so basically the stock oil cooler acts as the thermostat by regulating oil temperatures with engine coolant.

No drilling or cutting is necessary to mount the Mishimoto oil cooler kit. The kit includes a direct-fit bracket that mounts the 19-row oil cooler in the lower passenger-side air dam. This was the best location for the oil cooler to receive the largest amount of airflow without getting blocked by the stock crash bar.



Figure 4: 3D CAD model of 2015 WRX oil cooler kit

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Experiment:

The test compares the stock oil temperatures versus the Mishimoto oil cooler. Engineers drove the WRX on a highway at approximately 65 mph and cruised for approximately eight miles. Special attention was given to the space between the Subaru 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.

As shown in Figures 8 and 9, the Mishimoto WRX Oil Cooler provided a significant amount of cooling over the stock setup. The supplemental oil cooler dropped oil temperatures by 25 degrees with only 5 psi of pressure loss. It can be reasonably assumed that the supplemental Mishimoto oil cooler would provide a larger temperature drop over the stock setup when the WRX is being driven hard on the road or at the track.

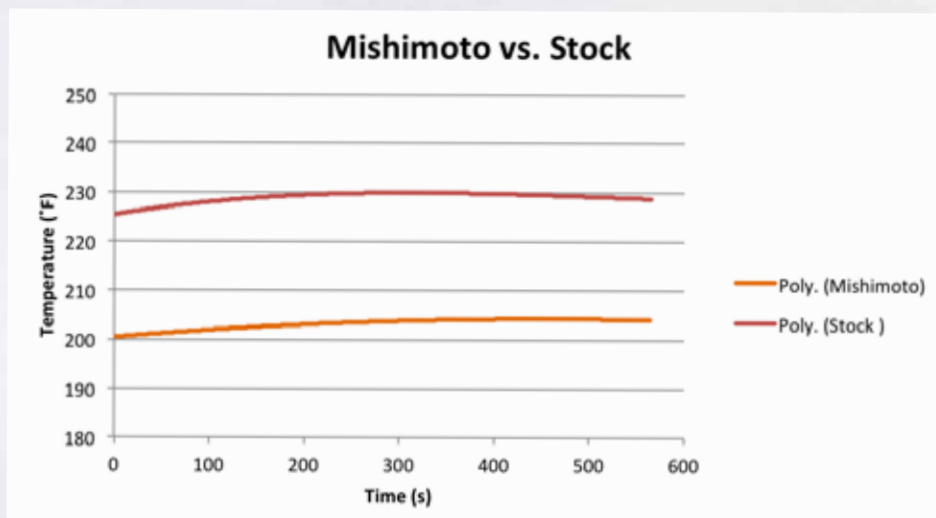


Figure 5: The Mishimoto oil cooler shows a 25° F lower overall oil temperature over stock.

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Conclusion:

The Mishimoto direct-fit oil cooler kit significantly improves overall oil temperatures of the WRX without a large amount of pressure loss. Under a track or racing condition, the additional oil cooler will improve the overall reduction of oil temperatures and allow you to track your car longer on hot days. Turbocharged engines get extremely hot when they're run at high rpm and high loads for a long period of time. The Mishimoto oil cooler kit will help greatly in keeping your oil temperatures at an acceptable level and therefore extending the life of your motor.

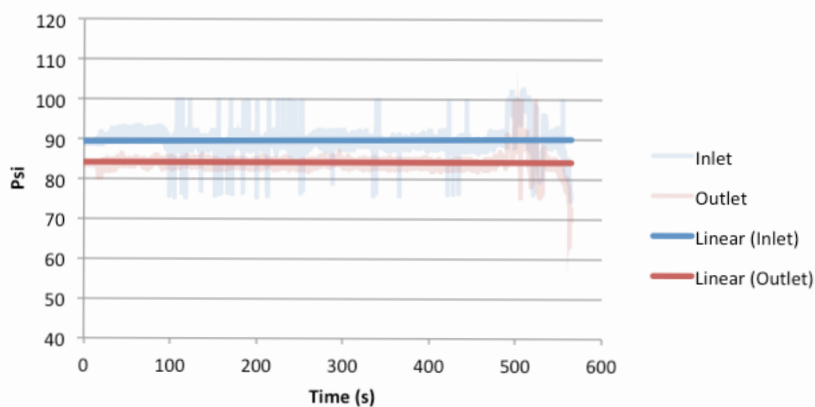
Mishimoto Pressure Loss

Figure 6: The Mishimoto oil cooler showed only 5 psi of pressure loss during the test.

Kevin McCardle
Product Engineer

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