TOP SECRET

MISHIMOTO
RESEARCH & DEVELOPMENT

MISHIMOTO ENGINEERING REPORT

Testing the Mishimoto BMW E46 M3 Oil Cooler

Figure 1: Test vehicle

Test Vehicle:
2004 BMW M3 with manual transmission

Modifications:
Exhaust, air intake

Cooling System Upgrades:
Oil thermostat delete kit, Mishimoto 16" electric fan kit.

Testing conditions:
Temperature range 69˚F–70˚F and 20% humidity

DO NOT COPY

TOP SECRET

MISHIMOTO

RESEARCH & DEVELOPMENT

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 in front of and behind the cooler.

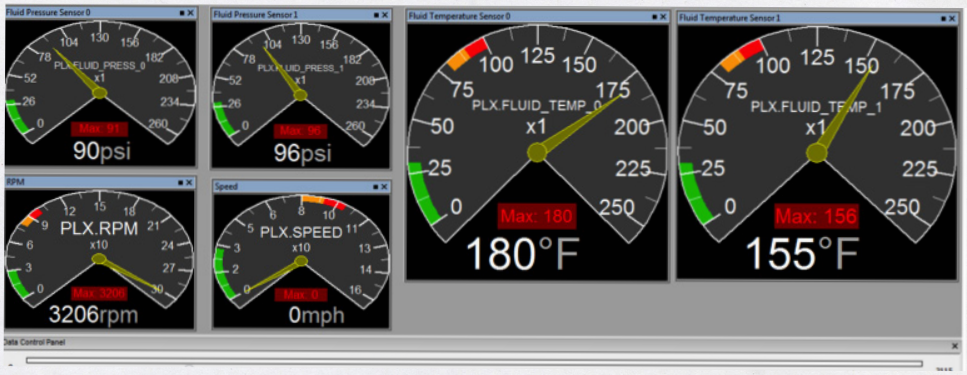

Figure 2: Mounting locations for temperature and pressure sensors. (Sensor reads approximately 10 times per second.)

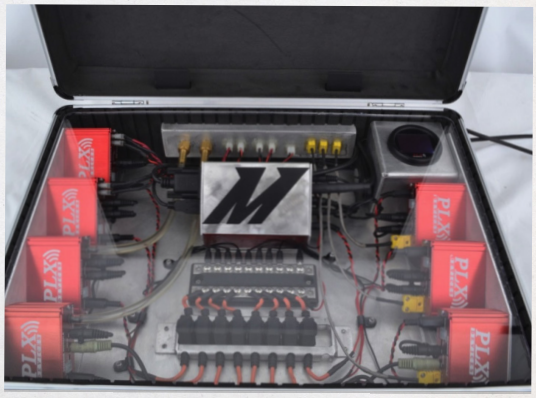

Figure 3: PLX sensor modules were used to monitor engine pyrometers.

DO NOT COPY

TOP SECRET

MISHIMOTO
RESEARCH & DEVELOPMENT

Core Information: Compared to the stock core, the Mishimoto core has several changes to improve the conductance of the oil cooler. Improvements include decrease in fin height, which allows for more oil passage, and increase in the overall core size. The figures below represent the changes in overall core volume. Internal capacity in terms of volume for the stock oil cooler is 0.34 quarts, while the Mishimoto oil cooler showed a 129% increase to 0.78 quarts.

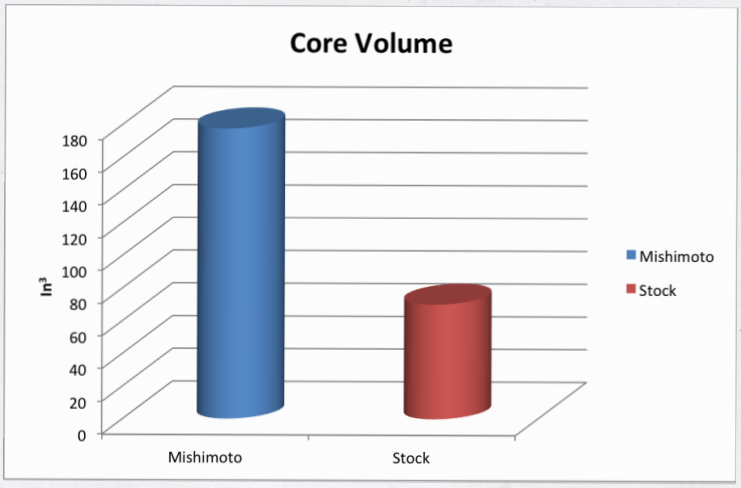

Figure 4: Core volume is increased by 152%.

The larger size causes the weight of the Mishimoto oil cooler to increase to 7 lb, compared to 3 lb for the stock. Because of the extra weight, Mishimoto designed a special mount to support the new oil cooler. Using Finite Element Analysis (FEA), software engineers designed a bracket that would support the oil cooler without the need for additional brackets from the stock-designed mounting points.

DO NOT COPY

TOP SECRET

MISHIMOTO

RESEARCH & DEVELOPMENT

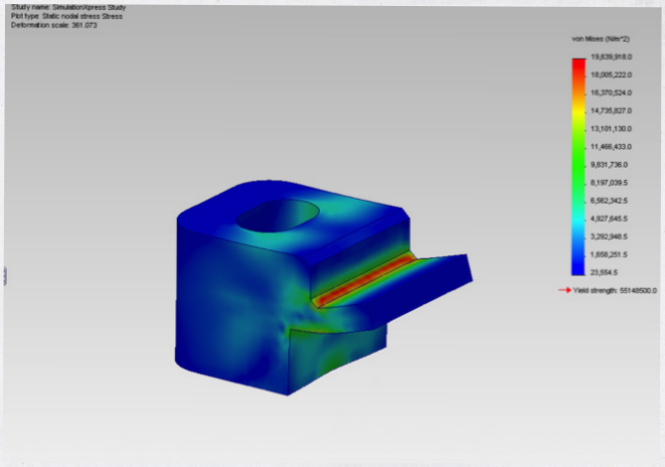

Figure 5: FEA stress testing of oil cooler mount

Figure 6: 3D CAD model of Mishimoto oil cooler

DO NOT COPY

TOP SECRET

MISHIMOTO

RESEARCH & DEVELOPMENT

Experiment:

The test compares the oil cooler temperatures of the stock versus the Mishimoto. Engineers drove the M3 test vehicle on a highway at approximately 65 mph and cruised for approximately five miles. Special attention was given to the space between the BMW 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. (Note: The oil thermostat was removed and replaced with a thermostat delete block. This allowed engineers to monitor the oil temperatures under any condition without the thermostat interfering with flow.)

Results:

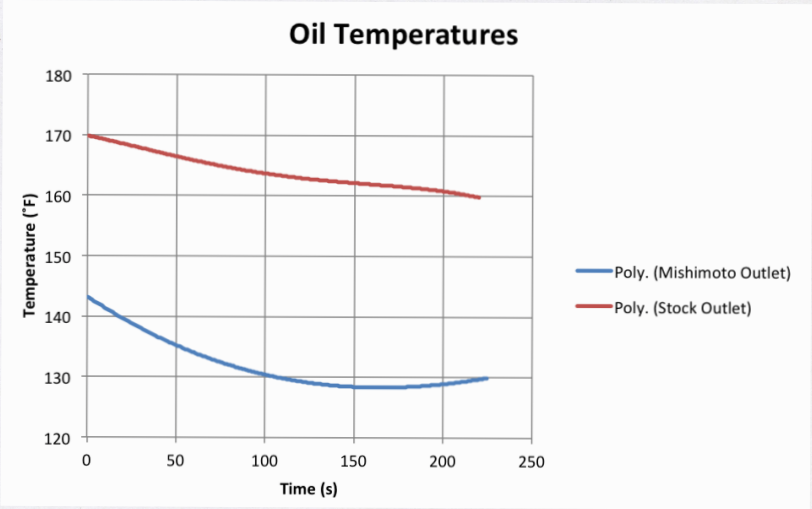

Figure 7: The Mishimoto oil cooler shows a 30˚F lower outlet temperature compared to stock.

DO NOT COPY

TOP SECRET

MISHIMOTO

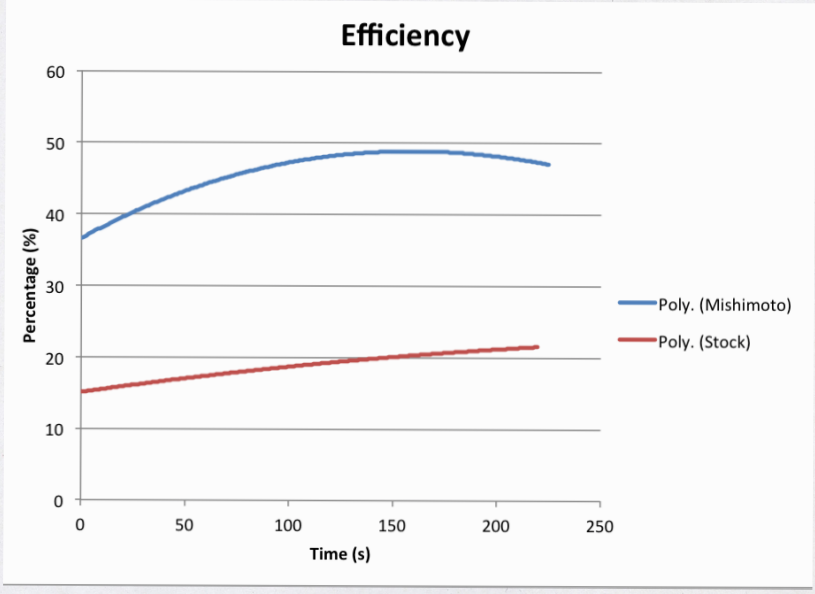

Figure 8: The Mishimoto oil cooler shows a 29% increase in efficiency.

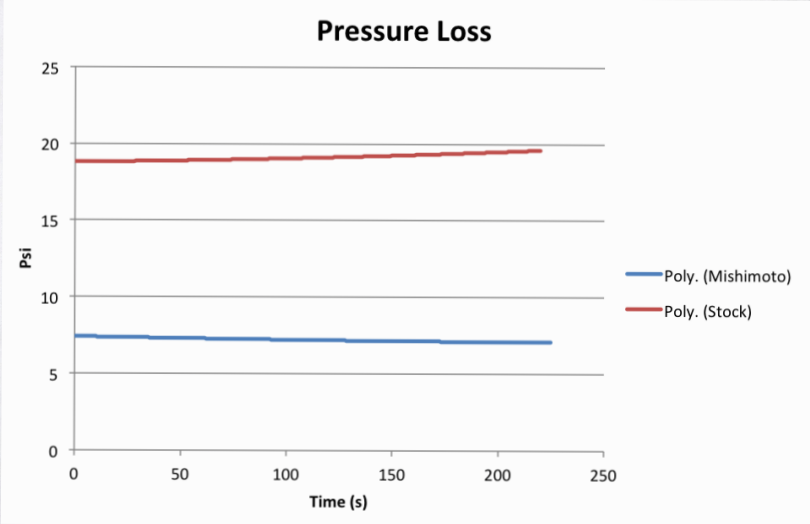

Figure 9: The Mishimoto oil cooler shows a dramatic 11 psi reduction in pressure loss.

DO NOT COPY

TOP SECRET

MISHIMOTO

The Mishimoto oil cooler kit outperformed the stock oil cooler in every test. It reduced oil temperatures more efficiently, and it had significantly less pressure drop than the stock oil cooler.

Conclusion:

The Mishimoto direct-fit oil cooler kit improves overall efficiency and reduces losses in oil pressure when compared to the restrictive stock cooler. The Mishimoto kit also replaces the hard rubber lines of the stock cooler with durable -10AN braided stainless steel lines and fittings. This is a great product for improving optimal oil temperatures when pushing the M3 hard at the track.

Kevin McCardle
Product Engineer

DO NOT COPY