



ENGINEERING REPORT

2015–2020 BMW F8X M3/M4 Dual Clutch Transmission Cooler | SKU: MMTC-F80-15

By Jason Wettig, *Mishimoto Engineer*

REPORT AT A GLANCE

- **Goal:** Create a Transmission Cooler that outperforms the stock unit. The Mishimoto cooler will fit directly into the BMW without any cutting or modification required.
- **Results:** The Mishimoto Transmission Cooler showed more significant BTU heat rejection on the transmission fluid when compared to the stock Transmission Cooler. The increased fin surface area promotes increased heat transfer while the dual-pass design makes the cooler more efficient in the tight space.
- **Conclusion:** The Mishimoto Transmission Cooler is a valuable upgrade for BMW owners who drive their vehicles hard in hot climates or race scenarios. The improved heat exchanger helps to ensure transmission fluid temperatures stay at optimal values during all driving conditions.

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DESIGN OBJECTIVES

The design requirements assigned to this project are as follows:

- Create a Transmission Cooler package that reduces fluid temperatures when compared with the stock configuration.
- Must be a direct fit, with no cutting or permanent modification necessary.

DESIGN AND FITMENT

The R&D process began by evaluating the stock system and understanding how the team at BMW chose to package the cooling stack. We determined that the cooler could be thicker than stock but not quite as long. A dual-pass design was also utilized to maximize core efficiency. Internal fluid turbulator fins would also be necessary to improve on the stock setup. Also, by using an external louvered fin would be essential to promoting improved heat transfer.

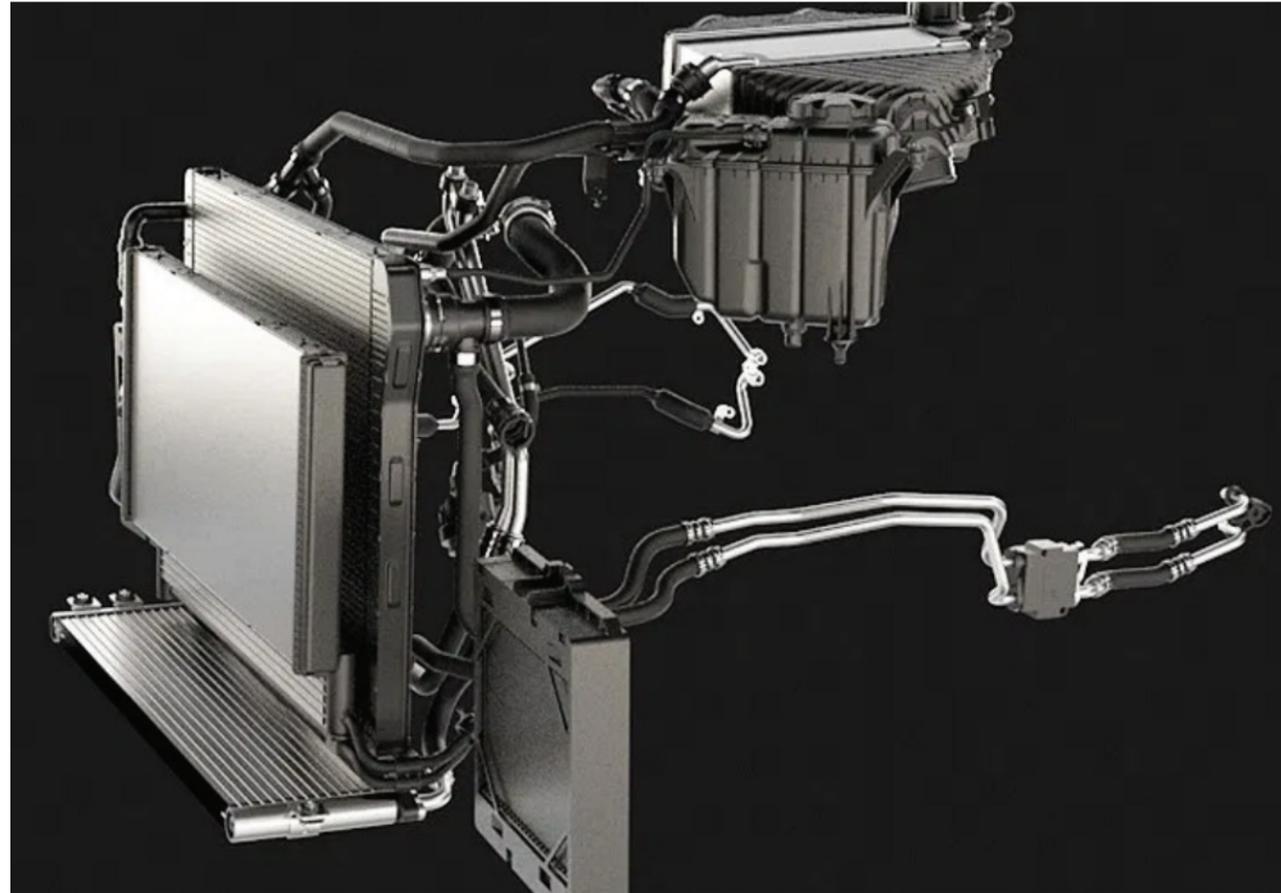


FIGURE 1: The F80 cooling stack showing location of DCT Cooler.

The Mishimoto Transmission Cooler increases core volume by 42% when compared to the stock unit. The Mishimoto cooler is thicker with more rows; therefore, it has a larger volume than the

stock unit. Figure 2 below shows the fluid capacity comparison between the stock and Mishimoto Transmission Coolers

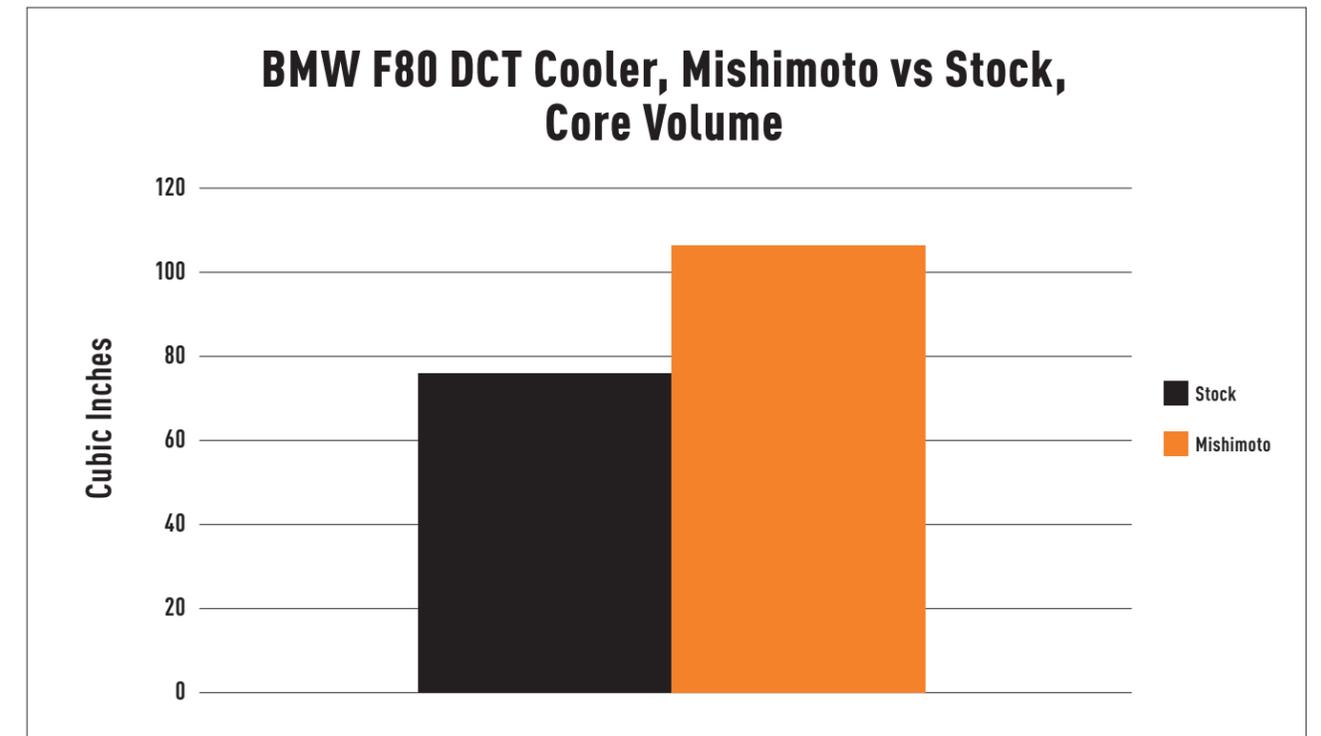


FIGURE 2: The Mishimoto Transmission Cooler features an increase in core volume, which promotes greater heat transfer.

The Mishimoto Dual Clutch Transmission Cooler also increases the fin surface area by with the thicker core and addition of rows. The combination of these additions yields a 69% increase in fin

surface area when compared to the stock transmission cooler. Figure 3 displays this difference between the stock and Mishimoto Transmission Coolers.

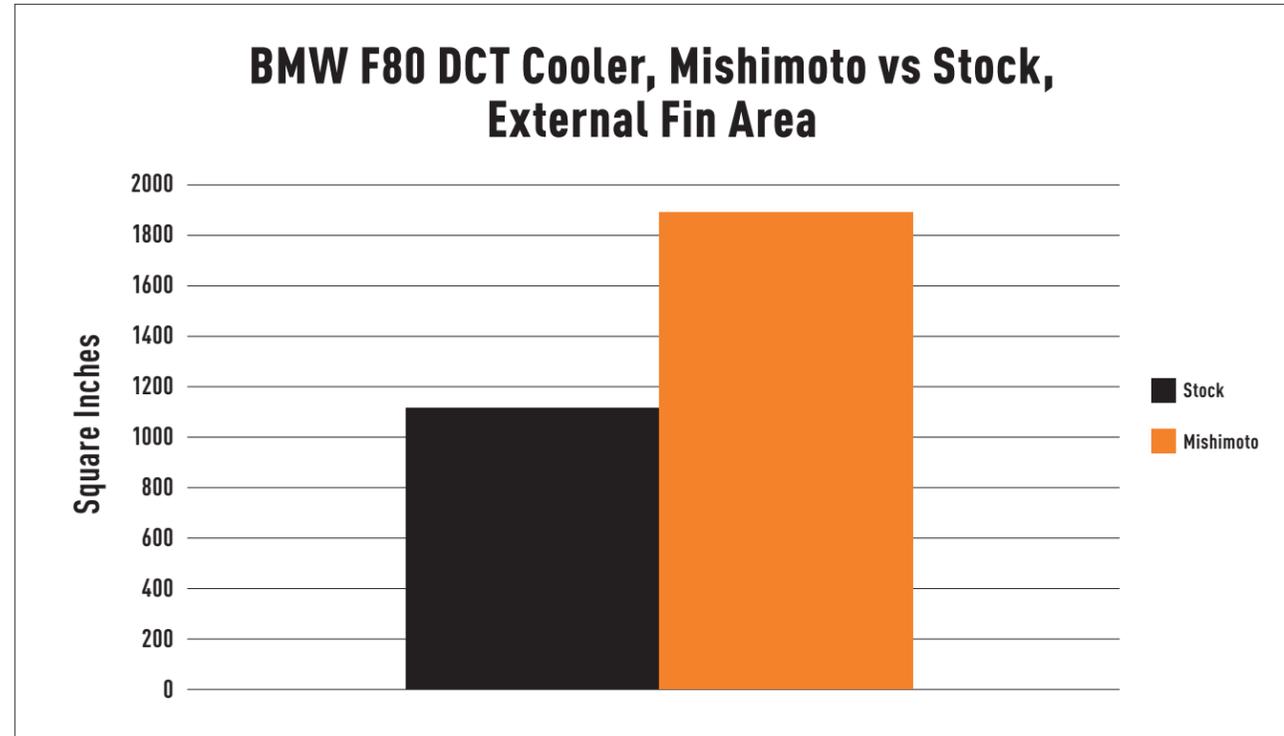


FIGURE 3: The Mishimoto Transmission Cooler features an increase in Fin Surface Area, which promotes greater heat transfer.

PERFORMANCE TESTING

A controlled laboratory test was put in place to ensure all environmental and fluid variables were accurately controlled from test to test. The transmission fluid was heated up to 206°F, and the pump was set to 4 GPM flow rate. A fan was used to push 70°F air at 20MPH across the cores. The tests were performed under the same conditions for stock and the Mishimoto core. Temperature and pressure sensors were placed on the inlet and outlet of the cooler to ensure data was accurately collected. From this data, we can accurately determine and compare the heat rejection for each

core. The more heat that a core can reject, the greater its thermal efficiency; this helps keep transmission fluid temperatures lower for a more extended period. When compared, the results showed that the Mishimoto core was able to reject more heat than the stock core by 15%. Figure 4: The Mishimoto core also showed lower temperatures during the test. With these two figures, the Mishimoto core has the ability to cool more than the stock unit and keep the temperatures down for longer.

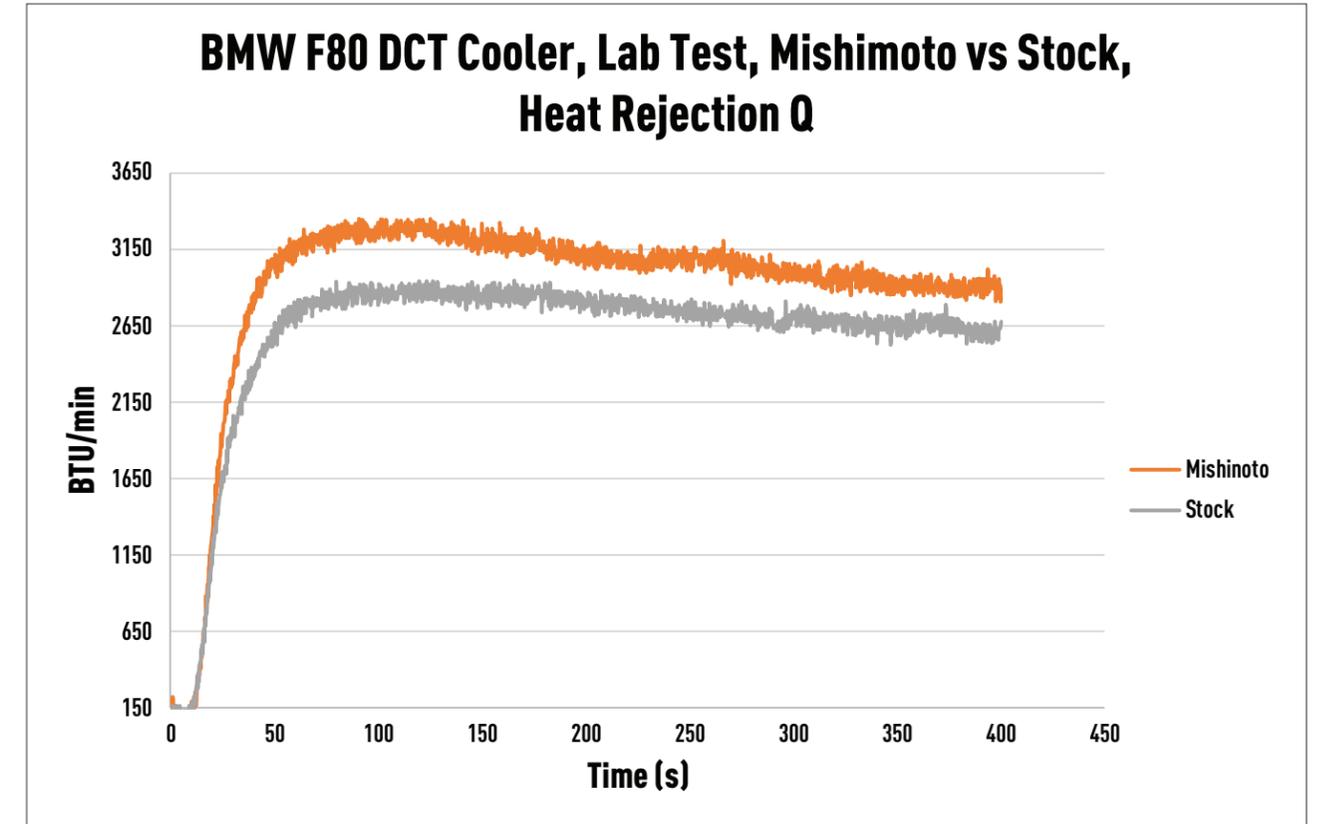


FIGURE 4: The stock Transmission Cooler and Mishimoto Transmission Cooler were tested using the same technique. Mishimoto's core showed an increase in heat transfer when compared to stock.

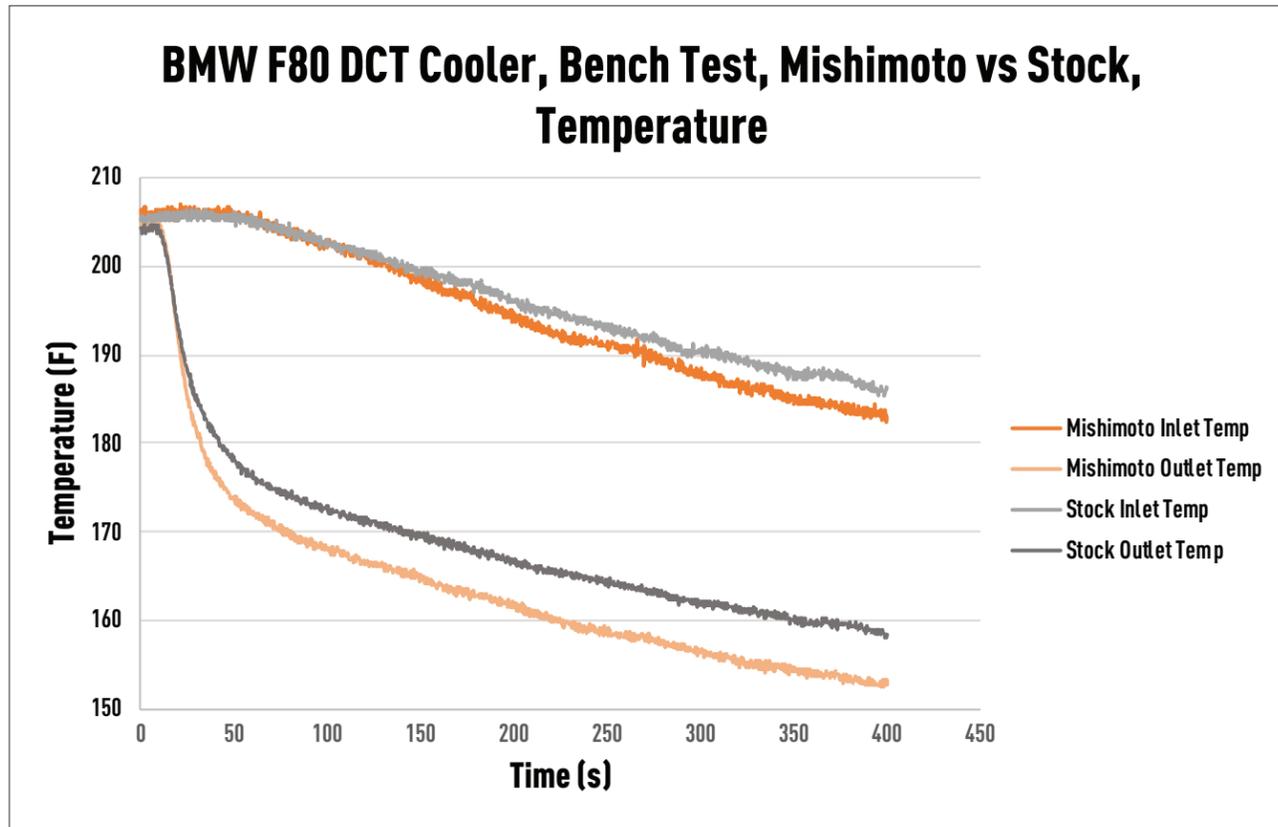


FIGURE 5: The stock Transmission Cooler and Mishimoto Transmission Cooler were tested using the same technique. Mishimoto's core showed an increase in heat transfer when compared to stock.

CONCLUSION

As seen in Figure 5, the Mishimoto core outperformed the stock core by lowering transmission fluid temperatures and increasing the amount of heat rejected from the system. This transmission cooler lowers transmission fluid temperatures, increases core volume, and fin surface area, and features a durable, all-aluminum construction. All these features will help your BMW perform better when driving in hot weather or under strenuous driving conditions.

Testing done by

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