



ENGINEERING REPORT

2013+ Ford Focus ST Intercooler Pipe Kit | SKU: MMICP-FOST-13K

By Steve Wiley, *Mishimoto Engineer*

REPORT AT A GLANCE

- **Goal:** Design direct-fit intercooler piping that reduces system restriction and improves durability over the stock components.
- **Results:** The Mishimoto intercooler piping showed respectable power gains of up to 8 hp and 10 ft-lb of torque. This increase is likely due to the mandrel-bent aluminum piping's ability to reduce overall system restriction, and its resistance to expansion under full boost.
- **Conclusion:** This piping kit is far more durable than the stock plastic and rubber pieces, and will fit in the Focus ST without any cutting or permanent modification needed. The Mishimoto intercooler pipes help to improve power and flow and increase durability.

CONTENTS

PG	1	— DESIGN OBJECTIVES
		— DESIGN AND FITMENTS
PG	2	— PERFORMANCE TESTING

DESIGN OBJECTIVES

The design requirements assigned to this project are as follows:

- Design intercooler piping that improves flow and reduces overall system restriction
- Must be a direct fit with no cutting or permanent modification necessary

DESIGN AND FITMENTS

We began the R&D process by evaluating the stock piping and finding potential room for improvement. The stock hot-side pipe is

relatively small until it reaches the intercooler inlet. The Mishimoto hot-side pipe increases internal volume by 14% and is made to reduce bends where possible to improve flow. The same approach was used when designing the cold-side hose. Internal volume was increased by 10% and the hose was made from silicone due to fitment constraints.

More information on the R&D process for the intercooler piping can be found on the Mishimoto engineering blog:

[MISHIMOTO ENGINEERING BLOG](#)

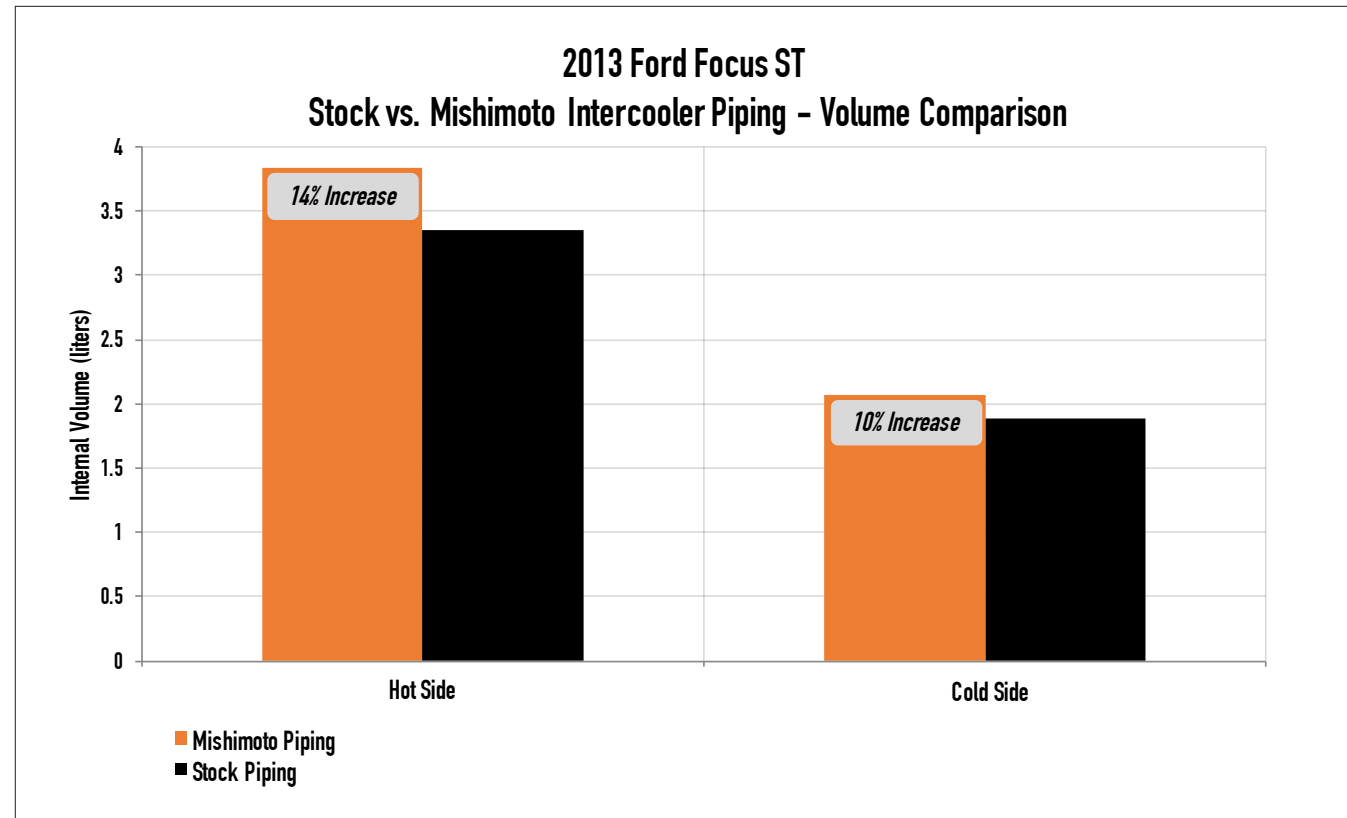


FIGURE 1: Internal volume increases can be seen on both the cold-side and hot-side pipes when compared to stock.

PERFORMANCE TESTING

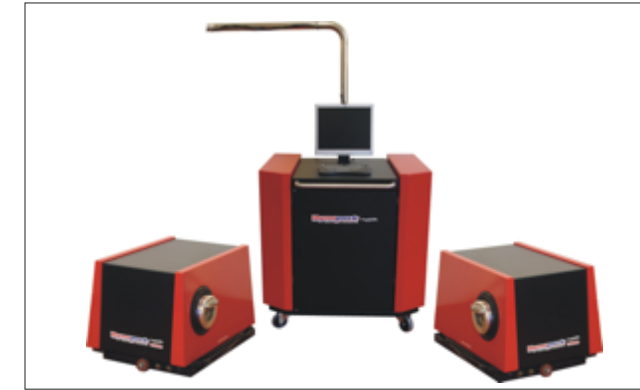


FIGURE 2: A Dynapack dynamometer was used for vehicle testing.

A 2013 Focus ST with Mishimoto intake and intercooler was used for testing the stock piping as well as the Mishimoto piping. The ambient temperature on the day of testing was approximately 72°F (22°C) with 65% humidity. To test the performance increases of the intercooler pipes, a Dynapack™ dynamometer was used to record horsepower (HP) and torque (TQ) output of the vehicle.

To test the performance gains of the Mishimoto intercooler piping, the Focus ST was bolted to the Dynapack, and baseline pulls were made on the car. The same test was performed with both the Mishimoto hot-side and cold-side pipes installed. The average dyno plot was chosen and plotted against the average baseline pull. These results are shown in Figure 3 below.

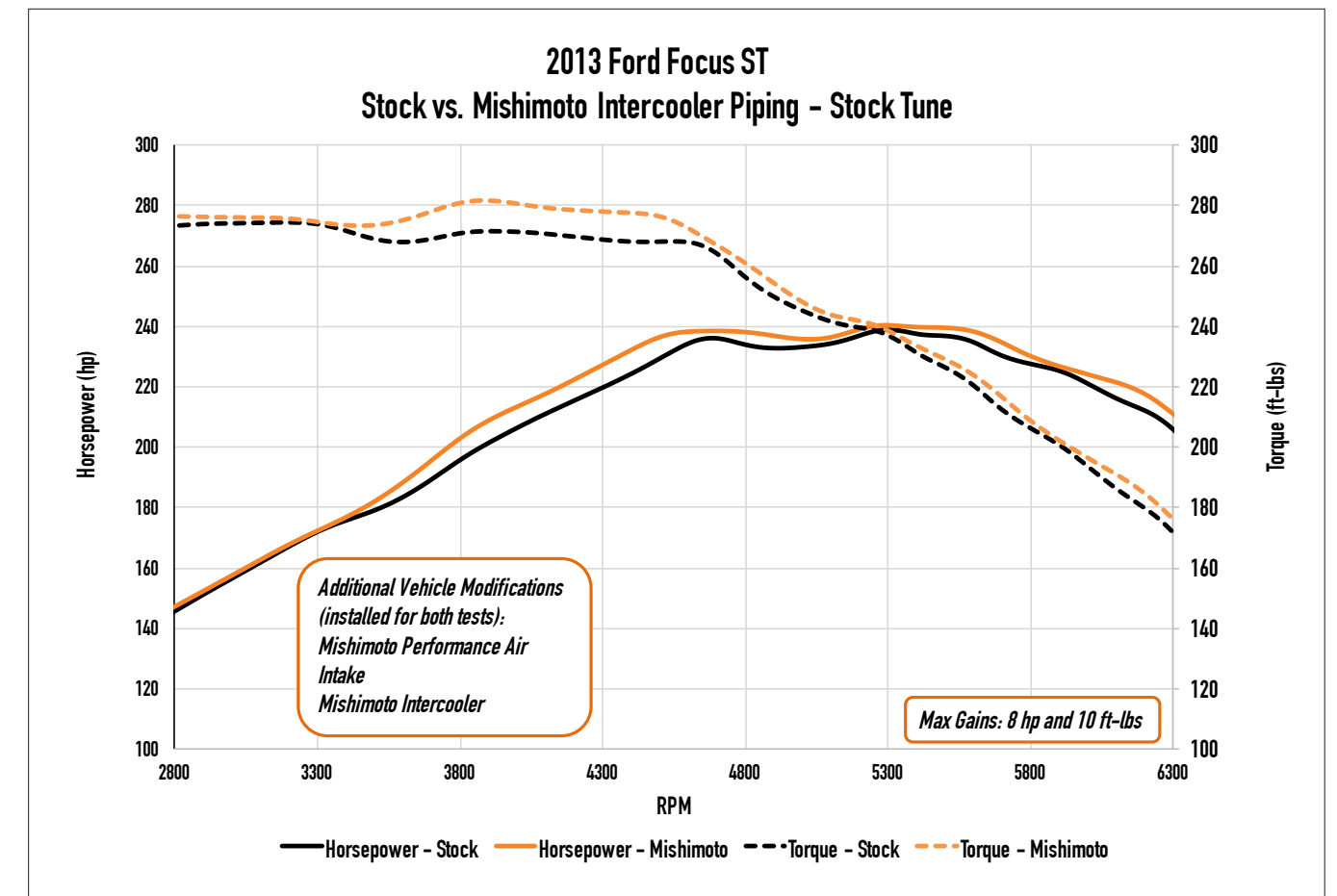


FIGURE 3: The Mishimoto intercooler piping showed power and torque gains when compared to the stock piping.

The Mishimoto intercooler piping created power over stock throughout the entire power band.

Due to less overall restriction in the system and a more free-flowing design, the Mishimoto intercooler piping made max gains of 8 hp and 10 ft-lb of torque.

Because the Mishimoto intercooler piping kit is made from mandrel-bent aluminum and wire-reinforced 5-ply silicone, it better resists expansion under high boost pressures when compared to the stock rubber hose portions.

A flow bench was also used to determine the increase in flow provided by the Mishimoto intercooler piping. The flow bench can measure pressure drop at a specified flow and can therefore show a relative change from the stock to Mishimoto intercooler piping design. The cold-side comparison showed that the Mishimoto design outflows the stock hose by 40%. The hot-side piping showed a flow increase of up to 26%, which is likely due to the increased volume and smoother bend angles. The results for flow testing can be seen below in Figures 4 and 5.

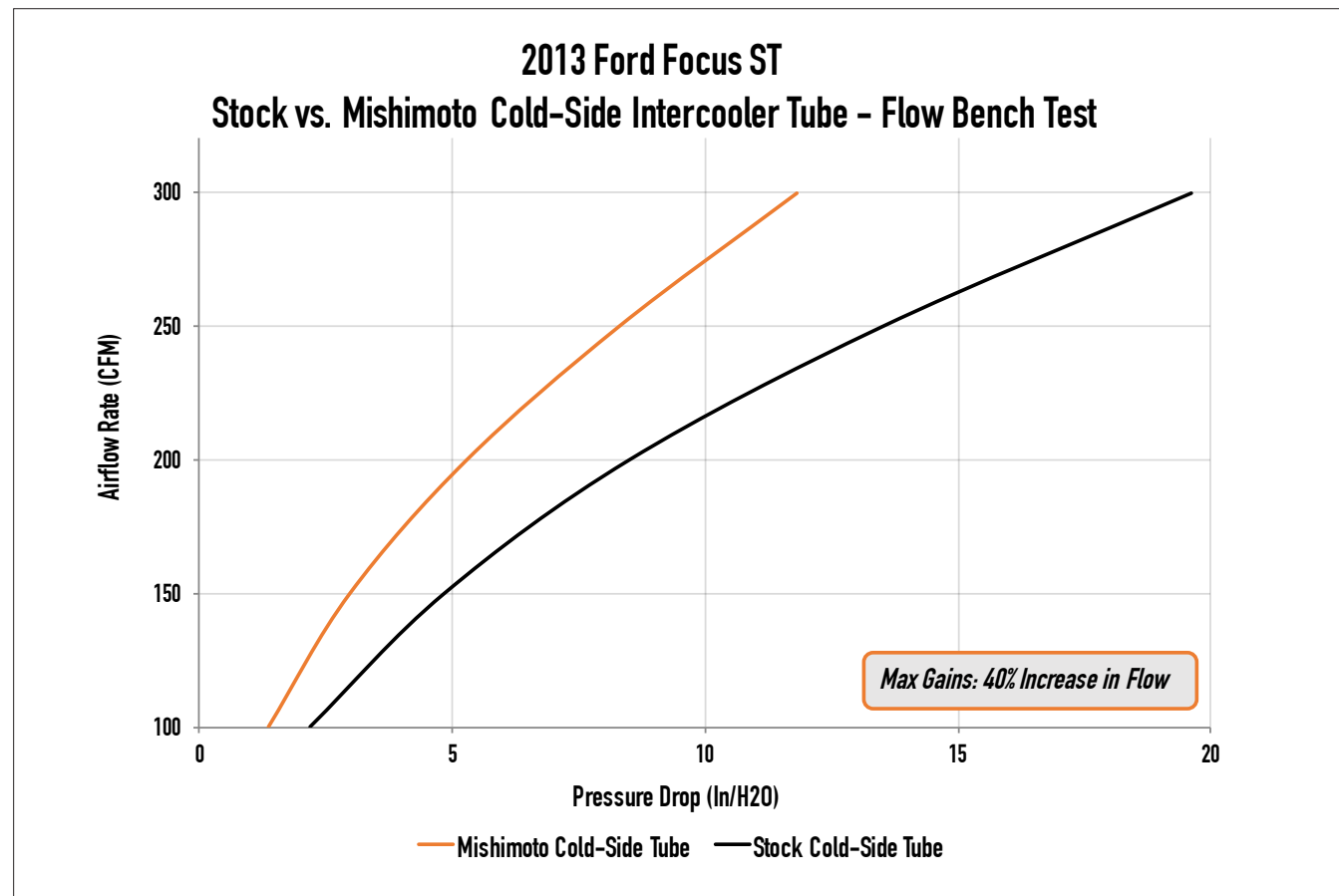


FIGURE 4: The Mishimoto cold-side hose flows up to 40% better than the stock design.

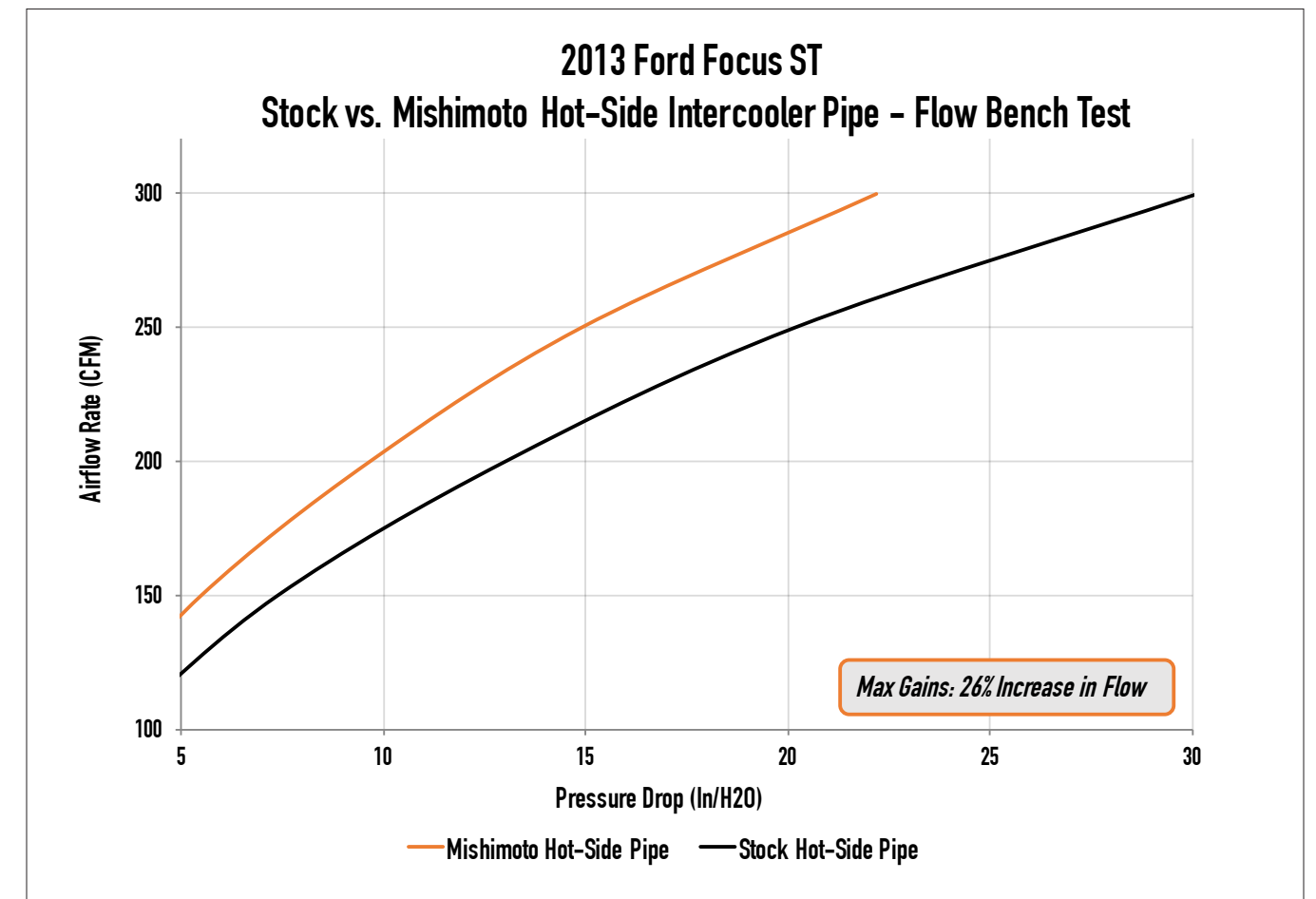


FIGURE 5: The Mishimoto hot-side piping reduces overall restriction by up to 26% when compared to stock.

The Mishimoto intercooler piping reduces pressure drop, which translates to reduced restriction. This reduced restriction allows the engine to breathe better as it requires less effort to move the air from the turbo to the throttle body.

Steve Wiley
Product Engineer, Mishimoto Automotive



Rely only on high-grade performance engine parts on our virtual shelves.