



Ford

Use Case – Ford Mustang Quarter Glass Alignment Fixture

Customer Profile

Ford Motor Company, founded by Henry Ford in 1903, is a leading American automobile manufacturer headquartered in Dearborn, Michigan. The Ford Mustang line has been produced since 1964, making it the longest-produced Ford car.

Challenge

The fixture used to accurately position and install the quarter glass in the Ford Mustang had several problems that needed optimization.

- Costly – manufacturing the tool required time-consuming CNC machining and welding
- Inefficient – the current configuration restricted sight lines, adding difficulty to the installation process; external pneumatic air lines added to the fixture’s bulkiness
- Heavy – the complete metal fixture with air lines and locating fixtures was heavy, not ergonomic and difficult to use

Solution

Making a new fixture using FDM additive manufacturing enabled several design improvements:

- A trigger-style on/off switch for improved ergonomics
- Reusing current fixture locator details, mounting brackets, and pneumatic controls
- Integrated pneumatic tubing retainers and optimized pneumatic valve and switch mounts
- Ergonomic handles
- Added material where strength is needed, and lower density where not needed

Impact

After producing the first design iteration, Ford was able to see additional improvements to be made. The line of sight to the window hanger details were blocked by the main frame’s upper bar. In addition, deflection was found in the lateral direction when the main vacuum cup was activated. To address these, the upper rail was moved up and detail brackets were redesigned to provide better sight lines for production. An internal rib was also added to reinforce the frame and increase lateral stiffness without changing the external geometry. Nylon 12 Carbon Fiber was used for this fixture which reduced its weight, without compromising strength or rigidity.

The 3D printed alignment fixture was reduced to 10.65 lbs. fully assembled, easing the burden on its operators. Additive manufacturing enabled Ford to implement design improvements, test them out, and make additional changes, lower cost and faster than using CNC machining.



Alignment fixture before using additive manufacturing



Alignment fixture made using additive manufacturing

Weight Reduction



15%

Cost Savings vs. Traditional Manufacturing



70%