

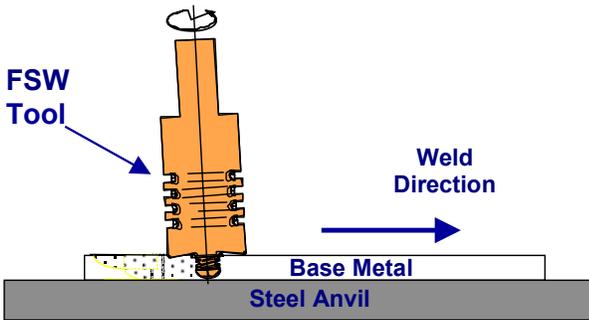


FRICION STIR WELDING FACILITY

Purpose:

To investigate the friction stir welding process superior mechanical properties and lower cost for application to space vehicles.

Friction stir welding is a solid state weld process which uses a rotating pin tool to join two pieces of metal. The pin tool rotates against the work piece and generates the frictional heat required to bring the metal into a plastic state (approximately 400 degrees Fahrenheit below melting in aluminum alloys). The material is "stirred" into a homogenous and defect free weld.



NASA has demonstrated joining a wide range of aluminum and copper alloys in the Friction Stir Welding Facility at MSFC, and has developed the process for the Space Shuttle External Tank.



Full Scale 27' Friction Stir Welded Barrel welding using the MSFC Building 4707 vertical weld tool

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Three systems in this facility are used to investigate critical elements of the process for different applications. A research system can weld small test panels up to 0,375" thick in aluminum, with joints up to 18" in length, using specially designed instrumentation to measure process parameters.

The vertical weld tool can make linear welds up to 15 feet in length on parts up to 1.00" thick in aluminum. It can be used to assemble tank barrel sections from 7 ft. to 33 ft. in diameter. Joints that change in thickness along their length can be welded using the Retractable Pin Tool, invented at MSFC.



14' Aluminum Lithium Friction Stir Welded Tank using the building 4707 Circumferential Weld Tool

The Circumferential Weld Tool has been used to weld a prototype 14 ft. diameter aluminum tank, and could be adapted for tanks from 8 ft. to 20 ft. in diameter. It welds flat test panels up to 30" in length, and has retractable pin tool capabilities. The system can be outfitted with a conventional anvil to react the forces associated with the process, or can be configured in the new "self-reacting" mode, where tooling associated with the anvil is not required.