What Is Friction Stir Welding and How Have SpaceX Embraced It?

Friction Stir Welding (FSW) is a process of solid-state joining of two metals with a rotating tool (without melting the workpiece material). Friction Stir Welding uses friction, just like you when rub your hands together on a cold day to warm them.

Here's an example of how it works: two aluminium alloy plates clamped together tightly in a machine. A metal tool resembling a drill bit is inserted in between the plates. The tool spinsas it travels along both edges.

The friction created by the spinning tool heats the atoms in the solid metal, making them move around (or diffuse). The metals become deformed and atoms from both plates are bonded together, without any melting. In a matter of minutes, the aluminium plates have been welded together and are cool enough to touch. The bond created by Friction Stir Welding is almost perfectly smooth and as strong as original aluminium plates.

> **"Friction between the tool and the work piece creates the heat, which then allows the material to become softer and become more plastic. So, the plasticized material moves around."**
>
> **Rajiv Mishra, University of North Texas**

In recent years, the field of engineering has experienced a wide variety of innovations that have led to novel manufacturing methods that are much more efficient regarding energy consumption and performance than conventional means.

Arguably, the professionals most affected by such developments are design engineers; the very people who are responsible for the design and fabrication of every complex device and structure we see and use in our daily lives.

Friction Stir Welding 20mm Copper DHP using MegaStir designed pin tool (Densimet). 250 RPM traveling at 6 ipm.

With design engineers always deeply concerned about the optimal utilisation of material and financial resources, and the overall quality of their inventions, such engineering innovations are always just around the corner.

This means that professional engineers continuously need to update themselves regarding recent developments in their field, in order to achieve perfection in their projects and stay up to the mark.

This article explores a mechanical welding technique that has gained significant popularity in modern times and discusses how engineers at Elon Musk's aerospace manufacturing company, SpaceX, have put it to use in their recently launched Falcon Heavy rocket.