

HVMC Friction Welding Capability

Process Summary

The HVM Catapult has three friction welding machines to cover Rotary Friction Welding (RFW) and Linear Friction Welding (LFW). Both forms of friction welding involve one of the parts intended to be welded to be pressed and rubbed against the other to produce heat by friction. The intimate contact alongside the localised high temperature, produces a high quality forging weld with certain advantages over fusion welding processes.

Process Advantages

- No need for any special atmosphere.
- No need for fluxes or filling material.
- Impurities are expelled by the forging action.
- Needs minimal surface preparation.
- Many dissimilar and difficult materials can be welded.
- Welding process lasts a few seconds even for large welding areas.
- The process can be automated, its repeatability is high and it is energy efficient.
- It does not produce fumes or excessive sparkles.
- 100% of the interface is welded area.

The main disadvantages are that the maximum welding area is limited by the welding machine power for each material and also, that the parts have to be mounted in the welding machine using specific tooling and fixtures.



Figure 1 - Steel tubes welded by RFW.



Figure 2 - Nickel alloy welded to steel, welded to aluminium alloys, welded to copper by LFW.

Typical Applications

- Linear Friction Welding of blades on disks (blisks).
- Rotary Friction Welding (RFW) of dissimilar materials on pump shafts (stainless steel/ carbon steel).
- RFW of turbocharger and turbine shafts.
- RFW of airbag containers, electrical contacts (copper/aluminium), suspension dampers.



Figure 3 – Rotary Friction Welding in Action

Friction Welding HVM Catapult capability			
Welding technology	Rotary Friction Welding		Linear Friction Welding
Machine Model	125T	300T	E130
Axial force [kN]	1,250	3,000	1,300
Max velocity	2000 RPM	1050 RPM	5 mm total oscillation amplitude @ 100 Hz
Control Options	Inertia Welding Continuous/ Direct Drive Tri-mode (Hybrid)	Inertia Welding Continuous/ Direct Drive Tri-mode (Hybrid)	Upset displacement
Weld component dimensions	External diam.: 35 – 150 mm	External diam.: 75 – 250 mm	Max. total welding area: 13,000 mm ² for Ti64 and carbon steel

Contact Details

Richard Jessett, MTC

Richard.Jessett@the-mtc.org