



Linear friction welding for TOD Project

In November, TWI announced the start of the production of complex aerospace parts through linear friction welding. Linear friction welding is an emerging technology for the manufacturing of titanium and aluminium alloy aerospace components.

Text & images by TWI

High integrity welded components can be produced within seconds through linear friction welding (LFW). TWI's LFW machine, of 250 kN capacity, has been used to produce the first batch of aerospace parts. This activity is part of the TOD Clean Sky project, which focuses on the development of full-scale innovative doors, surrounds and sub-structures for regional aircraft fuselage barrel on-ground demonstrators. The TWI coordinated project is funded as part of the Clean Sky initiative under grant agreement number 821192. The collaborative consortium also includes the Topic Manager Leonardo, DEMA and CETMA.

What is linear friction welding?

Linear friction welding involves moving one component in a linear

reciprocating motion, through a small amplitude at a suitable frequency, across the face of the second, rigidly clamped component.

Reciprocation is maintained until adequate heat, and metal flow has taken place, then the moving part is brought into alignment while the axial load is maintained or increased to finalise the weld sequence.

Linear motion normally produces a sinusoidal velocity profile changing from zero to maximum in one direction, then repeating in the opposite direction. However, other velocity profiles are possible on TWI's 'Linfric' machine.

As with other friction welding processes, no additional filler material is used, and welding takes place in the solid phase, i.e. no macroscopic melting is observed.

Linear friction welding is most suited to rectangular and irregular cross-sections and is used in complex parts with several weld sites and multiple parts, e.g. welding blades to discs in aero-engines and for additive manufacture of components. Materials which can be welded with this process include carbon-manganese and stainless steels, aluminium, nickel alloys and titanium. In principle, any material which can be rotary friction welded can be linear friction welded.

For more details on the TOD project and to view a video of the LFW process, visit the project website at www.todproject.eu/