

Loiretech Pilot Line: Invar WAAM (Wire Arc Additive Manufacturing)

Factsheet

Project Genesis

Based on its experience of tooling engineering & manufacturing, Loiretech joined the INTEGRADDE project to enlarge its ability to build high quality tooling.



An initial project with IRT Jules Verne (ARWEN) has demonstrated the benefits of WAAM technology for Invar Material. Invar (Iron alloy with 36% of nickel) is used in the Aeronautics & Space industry thanks to its CTE (Coefficient of Thermal Expansion) very close to CRFP (Carbon Fiber Reinforced Polymer).

Invar welding is sensitive to process external variation: gap between components to be welded, weld path inclination, torch speed. Any discrepancy will involve cracks, porosities, lack of fusion.

In Spite of manual welding being allowed to have less porosities than casting, these porosities are discovered at the end of the manufacturing process jeopardizing activities time plan.

Pilot Line Expectations

To optimize cost, Loiretech is discretizing the shape of the tooling to simple elements : a 100% additive manufacturing is not realistic due to wire cost. This discretization methodology has been patented by Loiretech, IRT Jules Verne has developed a software to automatically get the simple sub elements.

The pilot line has to be flexible: all the built tooling at Loiretech is different. The pilot line has to be able to build a standard size of tooling. The dimensions have been set at 4m x 3m x 2m. The full line footprint is 12m x 10 m x 5 m.

To improve pilot line efficiency, worker accesses in the cells have to be limited to feed the equipment with raw material.

Welded tooling will have to be milled : WAAM process will not be able to reach the final excepted tolerance on tooling surface $\pm 0,2\text{mm}$ with a roughness $Ra < 0,8\mu\text{m}$.

Company: Loiretech

Founded: 1988

Location: Bouguenais, France

Technology: Engineering & Manufacturing of tooling for Composite, Thermoplastic & Metallic parts

Industry: Automotive, Construction, Energy, Manufacturing, Maritime, Metalworks, Space, Tooling



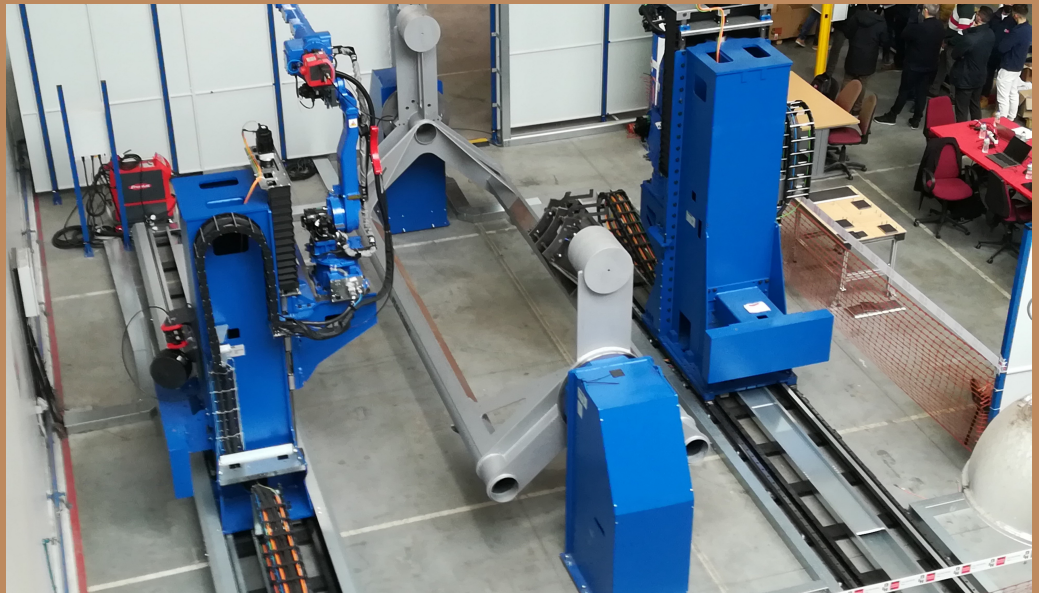


Project Collaboration

Not being an expert in WAAM, different partners of the INTEGRADDE project have supported Loiretech: West University, IRT Jules Verne, ESI, University of Coimbra to develop the welding process

DGH was in charge of welding cell engineering based on Yaskawa equipments.

Loiretech has been starting this project from scratch: relying on partners was a key parameter to succeed in the project.



DEMONSTRATOR

To demonstrate the ability of the cell to meet technical expectations, two small scale components will be built (april 2022, june 2022), a full scale component is planned for end of 2022.

Validation of the process will be done in several steps Distortion due to welding process measurement

- Absence of porosities in the welds after milling
- Vacuum tightness

