



SOLUTION FOR THE CREATION OF LARGE-SCALE INVAR® TOOLING FOR DRAPING OF COMPOSITE MATERIALS

ARWEN PROJECT

The objective of this project is to develop an alternative process to casting for the production of large mould blanks for the draping of composite materials. This project thus revolves around the development of a hybrid process for the assembly of blocks using robotic welding, coupled with additive manufacturing for the production of shells with a non-developable surface made of Invar®.

TECHNICAL AND ECONOMIC IMPACTS

It is still too early to assess the economic impact, but the results of the project are very encouraging and have already made it possible to offer an alternative that improves the quality of the raw material produced (which greatly impacts the time taken to rectify non-quality) as well as manufacturing/supply times (reduced 5-fold). In the long term, it will enable Loiretech to restore added value in-house by avoiding subcontracting to foundries.

PARTNERS

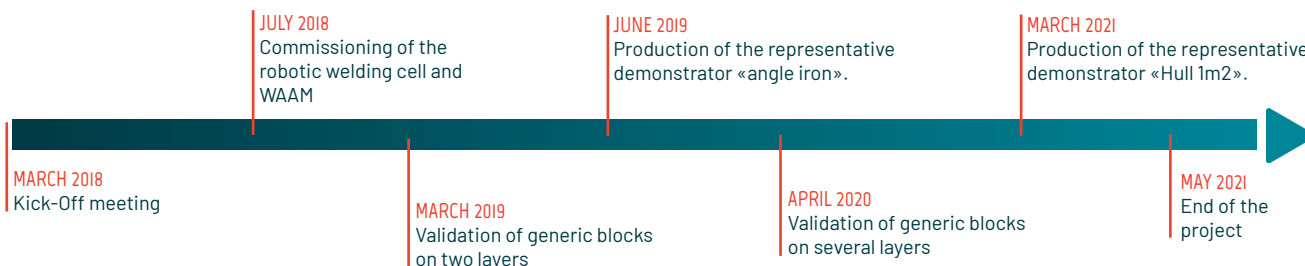
AIRBUS, APERAM, DASSAULT AVIATION, LOIRETECH, IRT JULES VERNE

BUDGET

2 700 K€

KEYWORDS

Wire Arc Additive Manufacturing (WAAM) - Invar® - Robotic welding - Digital simulation - Discretisation - Optimisation - Technical and economic analysis



INDUSTRIAL CONTEXT

This project falls within the field of enhancing industrial output and use of composite materials in the aeronautical sector.

The main objectives of this project are as follows: to provide an alternative to the foundry process and avoid the associated non-quality problems; to reduce tooling procurement times; to reduce tooling costs; to increase procurement possibilities for Invar® tooling.

APPLICATIONS & INDUSTRIAL PERSPECTIVES

Loiretech and IRT Jules Verne are working together within the EU INTEGRADDE project, which aims to further develop the technology at an industrial scale and will enable the identification of potential new barriers associated with scale-up.

IRT Jules Verne also aims to continue work on 100% additive manufacturing applications.

PROJECT ACHIEVEMENTS

- Development of a discretisation algorithm to determine the blocks making up the tooling surface
- Development of optimisation tools coupled with a welding process modelling software to minimise deformation, and with the discretisation algorithm to minimise costs (under business constraints)
- Development of robotic strategies for the implementation of block positioning trajectories, welding and additive manufacturing
- Development of welding and additive manufacturing process parameters
- Strengthening of skills (for IRT Jules Verne) in the field of robotic welding, WAAM additive manufacturing, development of optimisation algorithms and increasing understanding of the physical phenomena associated with the MAG process.
- Acquisition of strategic equipment: WAAM additive manufacturing and welding cell.

Note: Invar® is a registered trademark of Aperam

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