

# Iter "One shot" welding: pushing back the limits

With the aim of ratifying future welding operations on complex-shaped stainless steel pipelines installed in confined areas around the reactor core, Iter commissioned Cetim to validate the considered solutions.



© Iter

## OUR CUSTOMER

**Corporate name**  
Iter Organization

**Workforce**  
Several thousand international engineers and scientists.

**Business activity**  
The aim of the Iter programme is to design an experimental machine that uses fusion power, the same energy that powers the sun and stars. The Iter agreement, signed by the members in 2006, stipulates that the seven members (China, the European Union, India, Japan, Korea, Russia and the United States) will share the costs of building, operating and dismantling the facility. They will also share the experimental results as well as any intellectual property created by the operation phase, planned from 2022 to 2042.

The Iter nuclear fusion reactor that is being built in Saint-Paul-lez-Durance (Bouches-du-Rhône, France) is one of the most ambitious international projects in the energy sector. Upon completion, it will be the world's largest nuclear fusion reactor. 35 countries are participating in the project to build the largest ever tokamak (reactor core). The aim of Iter is to demonstrate that nuclear fusion (energy from the sun and stars) can be used as a large-scale energy source to produce electricity with no CO<sub>2</sub> emissions. However, the construction

of this megaproject calls for extraordinary expertise and know-how. There is no place for hesitation, everything has to be planned, calibrated and tested! "We have worked with Cetim on various mechanical engineering projects for many years which is why we approached Cetim's experts regarding a highly specific welding issue, explained Remi Carrat, head of welding operations. Our objective was to validate the feasibility of the orbital TIG welding method on stainless steel parts and structures planned on drawings. The major difficulties had to do with the narrowness of the welding area, the geometry of the parts and the extreme severity of the tolerancing issues. We wanted to validate several welding options with

or without filler metal and at the same time make sure that no distortion exceeds the specified limits."

## Over one hundred tests and fit-up strategies

To this end, Cetim's experts prepared and carried out over one hundred tests on models based on various fit-up strategies while ensuring that any distortions during or after treatment were less than the specified limits. "Based on the tests carried out by Cetim, we ultimately reconsidered our approach and added a part to the structure to fine-tune the joining tolerances, added Remi Carrat. The assembly will be installed by "One shot" orbital welding without filler metal."

## Cetim's asset



Cetim brings together experts in welding, material characterisation, non-destructive testing and metrology. Accordingly, it can provide a comprehensive technological solution to the welding issues faced by its customers, with the aim of practical implementation through mass production.