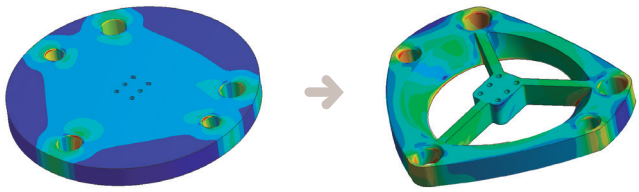
IDONIAL
TECHNOLOGY CENTRE

NUMERICAL SIMULATION

The Numerical Simulation Unit of IDONIAL has a wide experience in the field of simulation. With a highly qualified technical team, the Unit offers to its customers the most advanced design and analysis technology for conducting structural, thermal, fluid-dynamic or coupled studies as well as the simulation of industrial processes.

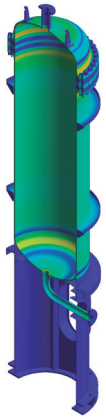
PARAMETRIC DESIGN

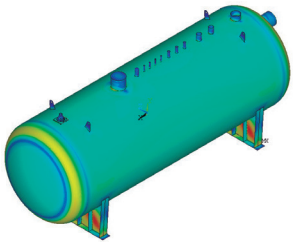
- 3D CAD design: SolidWorks, Catia, SpaceClaim, AUTODESK Inventor, ANSYS DesignModeler
- Topological Optimization: Altair OptiStruct



THERMO-MECHANICAL ANALYSES (FEA)

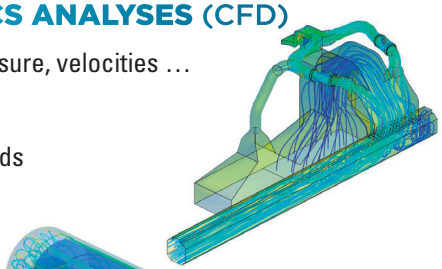
- Structural (linear and non-linear): static, dynamic, fatigue, buckling, creep …
- Thermal: steady-state, transient, conduction, convection and radiation
- Wide experience with **design codes**: ASME VIII, ASME III, RCC-MR, RCC-RMx, PD5500, AD 2000-Merkblatt, API 650, API 579-1/ASME FFS-1, EN Standards, TEMA…

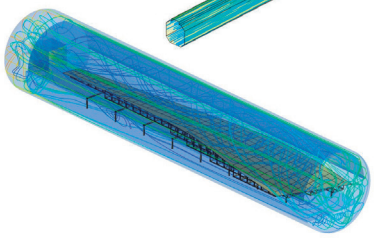




FLUID-DYNAMICS ANALYSES (CFD)

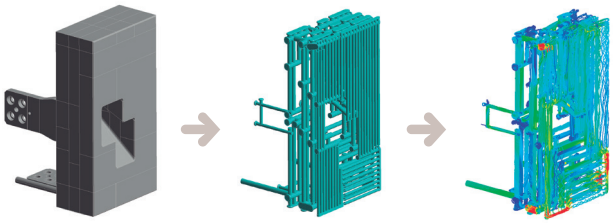
- Flow analysis: pressure, velocities …
- Particle drag
- Non-newtonian fluids
- Heat transfer
- Contamination
- Multiphase flows
- Turbulence



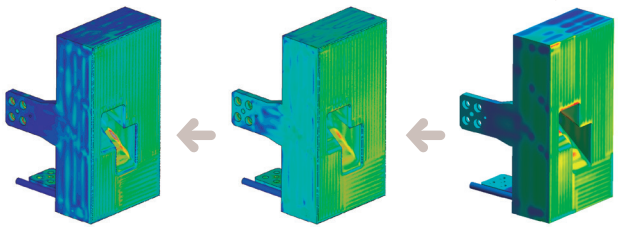


COUPLED ANALYSES

- Thermo-mechanical analysis
- Thermo-hydraulic analysis
- Fluid structure interaction (FSI)



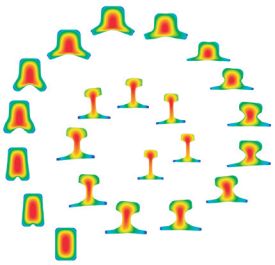
Geometrical model — *Inner cooling channels* — *Fluid velocities*



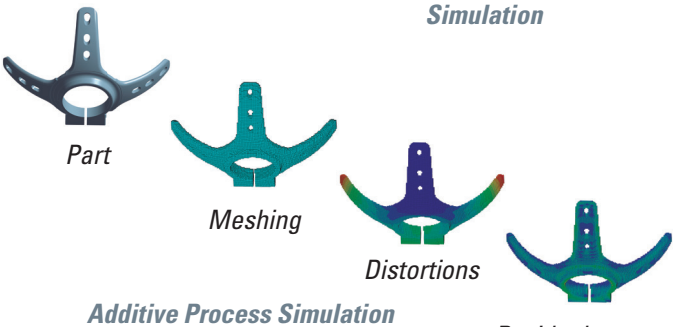
Strain distribution — *Stress distribution* — *Temp. distribution*

PROCESS SIMULATION

- Forming structural elements (rolling, stamping …)
- Welding simulation
- Additive manufacturing
- WAAM
- Thermal cycles simulation (solidification, heat treatments, cooling, etc.)



Hot Rolling Process Simulation



Part — *Meshing* — *Distortions* — *Residual stresses*

Additive Process Simulation

For more information, please contact us:

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IDONIAL
TECHNOLOGY CENTRE

RED-WELDS

Rapid Evaluation of Distortions in Welded Structures.

ANSYS® ACT developed and validated at IDONIAL. Tool to predict welding distortions in large welded structures in a fast and accurate way.

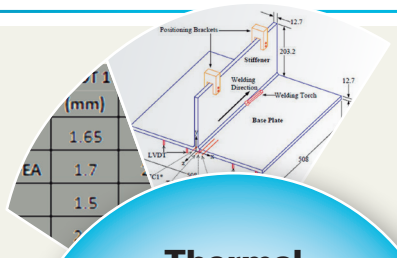
- ➜ Small amount of material data
- ➜ Short preprocessing and computation times
- ➜ Very good quantitative results

OPTIMAL WELDING SEQUENCE

The implementation of Artificial Intelligence algorithms in **RED-WeldS** for the management and analysis of the possible welding sequences provides the tool the capacity to predict the optimal sequence under two assumptions:

a) Optimal solution, minimum distortion.

b) Acceptable solution, distortion below the tolerance allowed by the user.



Tool to predict welding distortion in large welded structures in a fast and accurate way

Thermal Shrinkage Model

This model allows to analyze the influence of welding sequence and direction or change of clamping conditions on the distortion saving time and money.

Now available as a vertical tool in ANSYS ®

Background

Welding is the main joining technology in many industry sectors where a lot of parts are merged by means of hundreds of weld seams and beads to obtain a final welded assembly. If the resulting distortion exceeds the admissible tolerance, additional processes are required and these increase the times and costs.

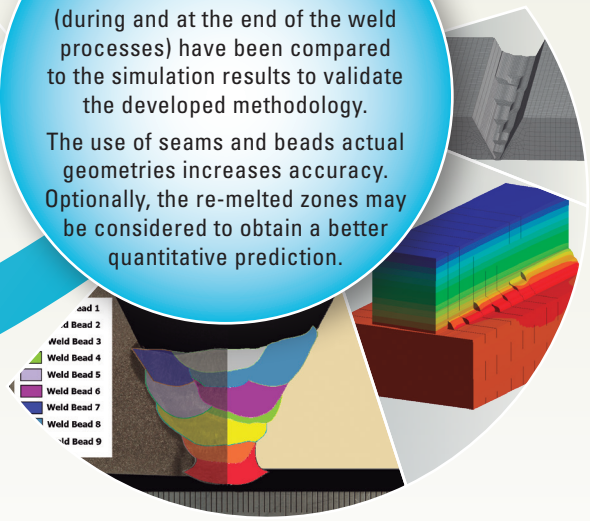
Experimental Program

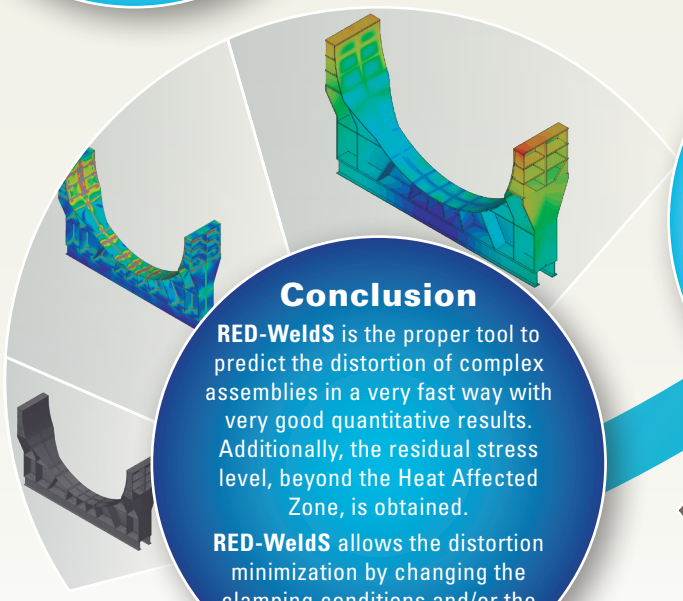
A wide experimental program (welding coupons and macros) has been performed in industrial workshops and laboratory considering different steel grades, thicknesses (heavy plate & thin sheet), welding joints and welding processes.

Model Validation

The distortion measurements (during and at the end of the weld processes) have been compared to the simulation results to validate the developed methodology.

The use of seams and beads actual geometries increases accuracy. Optionally, the re-melted zones may be considered to obtain a better quantitative prediction.





Conclusion

RED-WeldS is the proper tool to predict the distortion of complex assemblies in a very fast way with very good quantitative results. Additionally, the residual stress level, beyond the Heat Affected Zone, is obtained.

RED-WeldS allows the distortion minimization by changing the clamping conditions and/or the welding sequence.

GOBIERNO DE ESPAÑA MINISTERIO DE CIENCIA E INNOVACIÓN
CDTI

CDTI project (Expte.: CER-20191001)

MIRAGED DIGITAL TWINS

For more information, please contact us:

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