

Virtual Welding & Assembly Solution for Body Manufacturing

End-to-end simulation software to control distortion and residual stresses in hot and cold joined assemblies

BENEFITS

- Virtual control of real distortion, due to stamping and welding & assembly process
- Optimize welded assembly design at the earliest stage possible
- Minimize spending for manufacturing planning, try-out, and fabrication validation
- Ensure dimensional accuracy and overall performance of assembly
- Easy-to-use tool with no advanced FEM knowledge required

“Simulating the steel welding sequence using ESI software significantly reduced the manufacturing cost and time. The simulation results allowed us to control the dimensions of critical parts and avoid rework in our assembly line.”

André Luis Petry
Engineering Supervisor
Comil

ESI Welding & Assembly Simulation Software

ESI Welding & Assembly Simulation Software is an end-to-end simulation chain that accounts for stamping, welding & assembly manufacturing effects right from the start, in the design phase. It gives you the ability to control and validate distortion tolerances, and material characteristic & residual stress in order to allow better predictions for product performance.

ESI Group co-created and verified this predictive solution with key European and Asian automotive manufacturers before its launch to ensure it satisfied customers' requirements. Welding & Assembly simulation minimizes the cost of manufacturing planning, try-out and fabrication validation and time to market. This allows our customers to spend the majority of their time creating new, innovative products.



Comil's versatile vehicle and its door frame

Local deformation of the welded assembly before (left) and after (right) the use of Virtual Welding & Assembly Solution

Images courtesy of COMIL

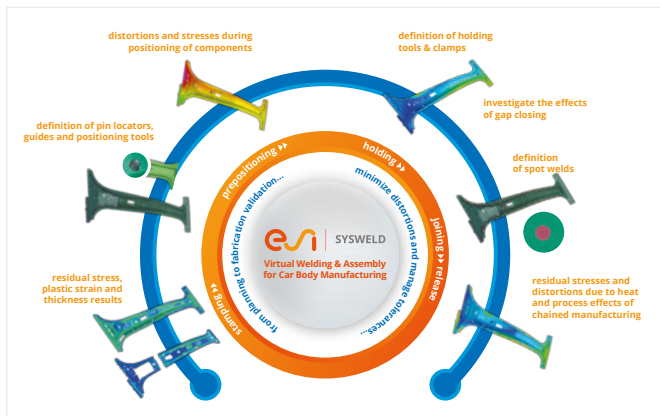
ESI Welding & Assembly Simulation Software can help with the following challenges in the ground transportation industry:

- Increased challenges in reducing overall time and cost of design & development because of lightweight materials with more springback and less formability
- Dimensional inaccuracies of the assembled components due to weld distortion and residual stresses in the structure

Design engineers can now compensate for the deformed shape on the welded assembly side ("body shop") because doing so on the stamping side ("press shop") is either very costly or highly impractical.

KEY PROCESSES

- Dedicated workflows to include every design feature of a welding assembly process (pre-positioning, holding, joining chained manufacturing)
- Incorporate the manufacturing history of stamping (plastic strain, stresses and variable thickness) in welding & assembly simulation
- Position the components with pin locators & guides inside the reference point system (RPS), close the gaps and ensure that the geometrical tolerance are satisfied before joining
- With all included manufacturing history, simulate seam (laser and arc welding) and spot welding to control distortion and residual stress

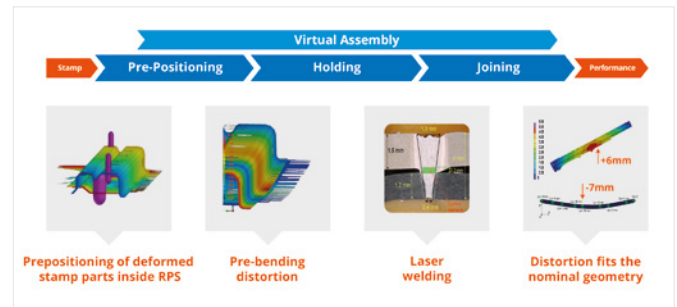


Virtual Welding & Assembly's complete workflow

- Manage and evaluate variable weld sequences and clamping conditions
- Accounting for all mechanical load effects of the assembly processes and hot/cold spots and seam joining effects
- Realistic material properties, residual stresses and distortions are provided throughout the virtual manufacturing process
- Moreover, the user gets realistic input for advanced/refined performance validations

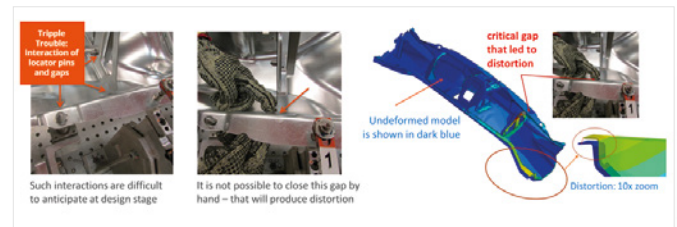
KEY APPLICATIONS

- Distortions are minimized by optimizing the welding process parameters, clamping system, and/or weld sequences
- Identify the amount of required pre-deformation to be applied on the assembly to prevent distortions, caused by stamping and welding processes in the design stage, without a physical prototype



Compensation of deformation

- Identify the influence of gaps (due to deviation from nominal shapes or processes before joining) and the gap closing process (spot welds or rivet joints) on assembly distortions.
- Identify the critical joints before a prototype is built and to take countermeasures to apply costly precision engineering only for parts and joints that are instrumental for distortion – not for all of them.



Control of distortion tolerances



Customer Portal
myesi.esi-group.com



ABOUT ESI GROUP

ESI Group is a leading innovator in Virtual Prototyping software and services. Specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products. Coupled with the latest technologies, Virtual Prototyping is now anchored in the wider concept of the Product Performance Lifecycle™, which addresses the operational performance of a product during its entire lifecycle, from launch to disposal. The creation of a Hybrid Twin™, leveraging simulation, physics and data analytics, enables manufacturers to deliver smarter and connected products, to predict product performance and to anticipate maintenance needs.

ESI is a French company listed in compartment B of NYSE Euronext Paris. Present in more than 40 countries, and addressing every major industrial sector, ESI Group employs about 1200 high-level specialists around the world and reported annual sales of €141 million in 2016. For more information, please visit www.esi-group.com.