

Capabilities of SimWeld

SimWeld 3.2.2 from 18.01.2018

The software package SimWeld was developed for the numerical simulation of the weld seam formation and temperature field in gas-shielded metal arc welding of steel and aluminum alloys for single sided, single pass welding. The metallurgical weldability is not within the scope of this software.

The following process types can be simulated:

- Normal process,
- Impulse process with U/I-modulation,
- Impulse process with I/I-modulation.

In the program the control properties of a manufacturer-independent current source simulation is taken in account. The control properties of a user-specific current source simulation can be implemented if the user provides its control properties as a dll-file.

Ar, CO₂, their mixtures can be considered as shielding gases in the simulation.

The most commonly used joint types of the standard DIN-EN-ISO 9692-1 are available in SimWeld.

The material database of the program package includes steel types as well as aluminum alloys as basic materials and additional materials. The user can edit the material database with the Material Database Editor of SimWeld. This includes modification as well as adding new materials.

The program is a MS Windows® application, which contains the following modules:

- I/O-System for simulation experiment parameter sets
- Preprocessor (welding task definition)
- Combined arc, heat and weld seam formation solver
- Postprocessor (result visualization)
- Material Database Editor
- PDF-Report
- Help System

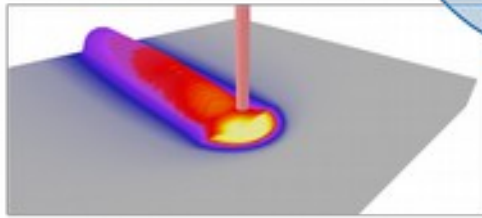
In preprocessor mode the whole welding task to be simulated is defined.

The combined solvers executes the simulation of the joint formation processes, see Figure 1. This includes the transient calculation of the processes in the wire-droplet-arc-system and the coupled calculation of heat transfer, melting, weld seam geometry formation and solidification.

SimWeld Model Structure

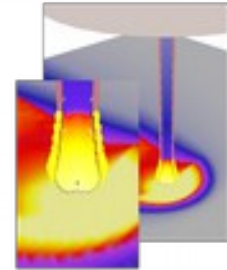
Heat Flow

- Nonlinear equation
- Cathode, drop + arc heat sources
- Material properties (temperature dependent)
- Latent heat of fusion
- Influence of non-flat surface
- Fast 3D solution method



Wire-Drop-Arc-Model

- Heat conduction in wire
- Ohmic heating, contact resistance
- Anode, cathode and arc column
- Electromagnetic force



Weld Pool and Seam Formation

- Arc pressure distribution
- Gravitation
- Mass balance
- Melting isotherm (constraint)

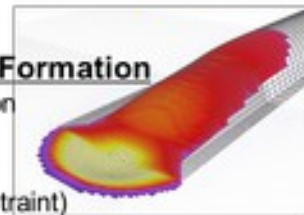


Figure 1: SimWeld Model Structure

The postprocessor mode is used for the representation of the simulation results. The following output data can be used to determine the welding process and its stability:

- Energetic results (energy input, thermal power, evaporation losses etc.)
- Weld cross-section incl. measurements
- Cooling time
- Temperature time curves
- Heat source and pressure source distribution
- Wire deposition rate
- Dilution level of workpiece and wire material

Also different exports are available:

- Goldak Equivalent Heat Source
- MR10 Equivalent Heat Source
- Cloud of points of weld seam and workpiece
- Chemical composition of weld seam
- Temperature matrix for MICRESS
- Surface temperature
- Temperature cycles

These exports can be used to investigate the welding results with other softwares for metallurgy and structural simulations.

Hardware and software requirements

The following hardware and software requirements must be met:

- Operating system MS Windows2000, MS Windows XP / Vista / 7 / 8
- Processor with 1 GHz or higher
- At least 4 GB RAM or higher
- At least 200 MB free hard disk space for the installation of the package
- Monitor resolution of at least 1280*1024 pixels
- OpenGL-capable graphics card

Installation and Licensing

SimWeld can be installed for all users of a computer (requires administrative rights) or for a single user. More information about the installation process can be found in the SimWeld Installation manual.

SimWeld can be licensed for a single computer or concurrently for multiple computers in a network. More information about the licensing can be found in the SimWeld licensing manual.