Your Benefits

- Methods verified by numerous tests on components and specimens
- Fast definition of welding lines using the VISUALIZER
- Open database structure applicable to new weld types
- Results practically independent of element size
- Supports shell and solid elements
- Assessment of the complete weld seam (start, mid, end)
- Interfaces to all common FEM codes
- Thermo influence due to weld process assessable
- Supports standards like Eurocode, DVS and British Standard

FEMFAT Interfaces

- Abaqus • ADAMS • ADVC • ANSYS • COSMOS • CREO
- DIADEM • DIGIMAT • HYPERMESH • I-DEAS • LS-DYNA
- MARC • MEDINA • MoldFlow • MotionSolve • NASTRAN
- nCode • Optistruct • PATRAN • PERMAS • Pro/MECHANICA
- Radioss • RPC • SIMPACK • TECMAT • TOSCA

FEMFAT weld is an optional module for the fatigue analyses in combination with FEMFAT basic, FEMFAT max and SPECTRAL.

Open WELD database

A database for MAG/MIG steel, laser welds and aluminum is provided. It includes notch factors, S/N curves and Haigh diagrams for more than 60 welding joint types. The database can be adapted and extended by the user with new joint types for special applications.

Weld Fatigue Analysis

- Welds assessment of FE structures
- Advanced analysis methods
- Open database structure

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Weld Fatigue Analysis

Arc-welded components have a considerably reduced ability to sustain dynamic loads; hence, numerical simulation of welded components is an important issue in CAE. To solve this problem, concepts for the automatic assessment of dynamically stressed welds have been developed and implemented in FEMFAT weld. Results are damage/life or endurance safety factors. Detailed results are available in the report file after analysis, or in the FEMFAT visualizer for post processing.

Method

Welds are defined with the help of a simple modeling guideline based on a shell element model (node and element attributes) and solid element models (group attributes). This welding definition can be performed either before or after the FEM analysis. Two different concepts have been implemented, enabling an assessment of welds with the focus on forces or stresses:

Stress-based assessment

During the analyses process the structural stresses are scaled using direction-dependent notch factors originally determined using „RADAJ“ models and then enhanced, including test bench results. These notch stress results are used for further weld fatigue life predictions, taking into consideration mean stress, sheet thickness, load flow, material strength and statistical influence. A valuable option for defining seam welds for fatigue prediction is provided using FEMFAT visualizer. The welds can be defined automatically by a few mouse clicks. Small thumbnails are displayed inside the FE-model to prevent errors.

Features

- Fatigue evaluation of the local weld area, including relevant notch stresses at weld toes and roots
- Special analysis method to consider start/ends of welds
- Methods for shell, solid and mixed FEM models of weld seams are available
- Three-dimensional assessment of seam welds (considering the anisotropic strength of welds)
- Consideration of different types of loading and sheet thickness influence
- Method to reduce mesh dependency of results
- Automated weld sensitivity analysis to check geometry influences (weld penetration ($\eta$), seam thickness ($d$), seam inclination angle ($\alpha$), weld gap)

The latest feature in FEMFAT weld in combination with the module ChannelMAX is a simplified SolidWELD method, which makes a fast and precise evaluation possible. Weld seams are defined on the basis of a relatively coarse volume mesh, without radii, reducing big modelling effort.

Force-based assessment

A second method based on nodal forces is available in addition to the standard method. The benefit of this method is that different situations can be quickly computed. Parameters such as the weld seam thickness or the penetration length can be modified, thus allowing the impact on damage or safety factors to be studied.