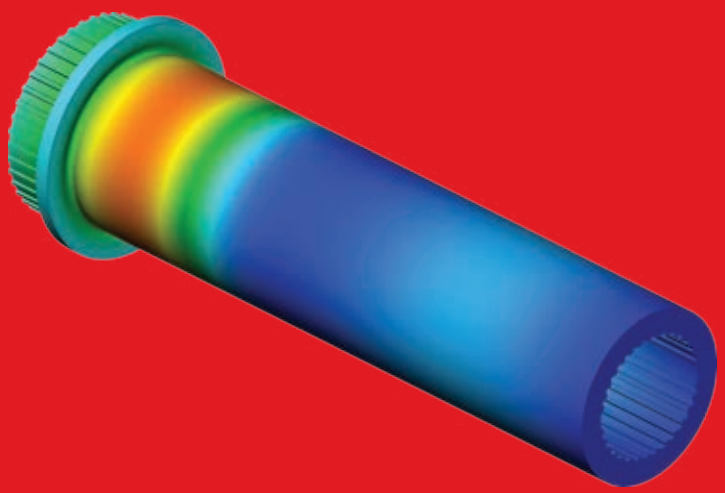
QFORM HEAT TREATMENT

STEEL | ALUMINUM ALLOYS | TITANIUM ALLOYS | NICKEL ALLOYS

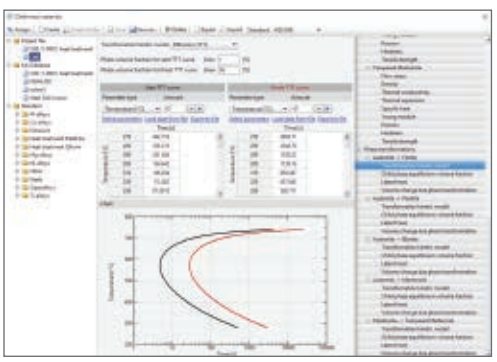
QForm Heat Treatment module allows prediction of:

- Hardness
- Ultimate strength
- Phase volume fraction
- Residual stresses
- Thermal stresses
- Distortion
- Quench cracks

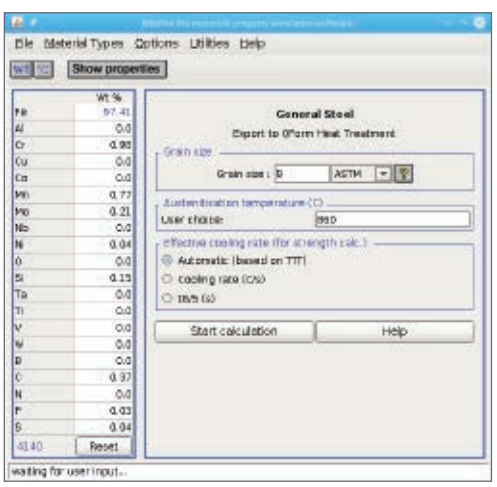


An integral part of QForm is the module for heat treatment simulation. It predicts phase transformations and their thermal and mechanical effects in the part during heat treatment such as distribution of residual stresses, distortion, quench cracks, phase volume fraction, hardness and ultimate strength. The heat treatment module has three different models of phase transformation: JMAK, Koistinen&Marburge and Leblonde&Devaux. The user can select the most appropriate model depending on the task and available data. The module provides simulation of diffusion and martensitic phase transformations during material cooling or heating and takes into consideration the latent heat of phase transitions and volume changes.

The new module has been successfully implemented to different industrial processes of quenching and tempering of steels, annealing, solution treatment and aging of aluminum alloys. It allows users to conduct sensitivity analysis on a computer to find the optimum process to get the best mechanical properties with no distortion or cracks and reduced residual stresses.



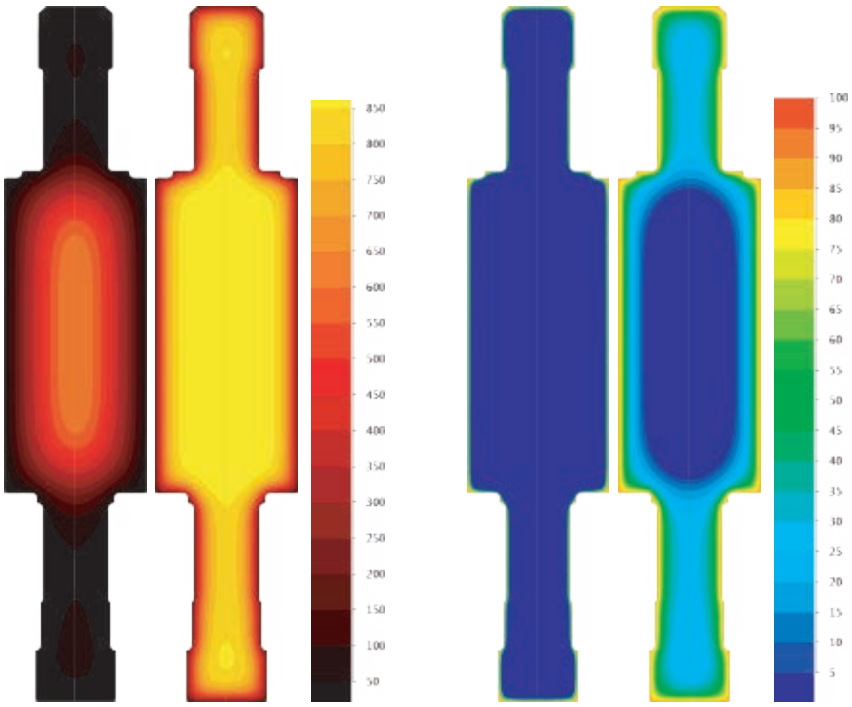
Material database. Phases properties and phases transformation kinetics can be flexibly specified by the user or imported from any source.



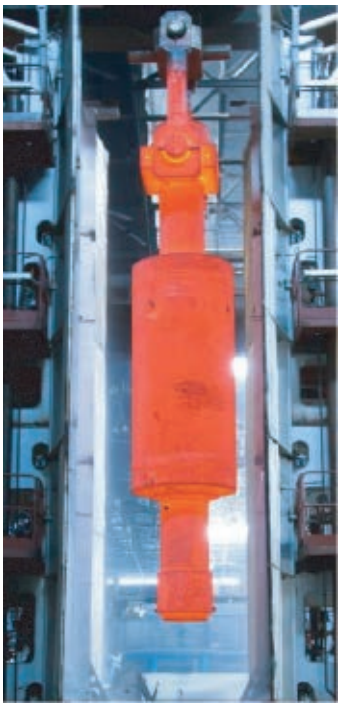
Direct interface with JMatPro software for export of material data to QForm.

www.qform3d.com

Quenching of the rotor



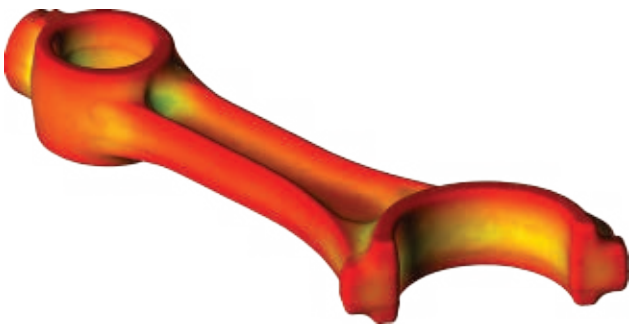
Temperature (left, ºC) and martensite content (right, %) during quenching process



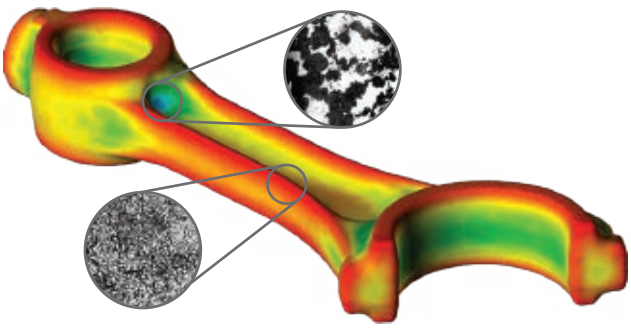
Quenching of the rotor in the sprayer device

With permission of PJSC «EMSS», Kramatorsk, Ukraine

Quenching of the connecting rod

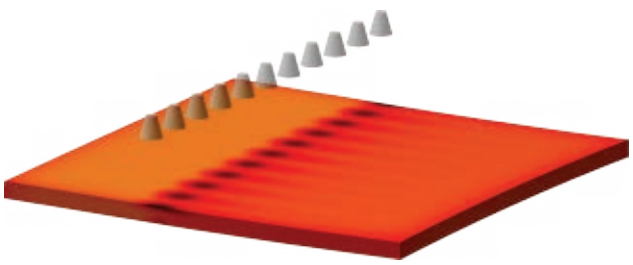


Ultimate strength distribution in the connecting rod

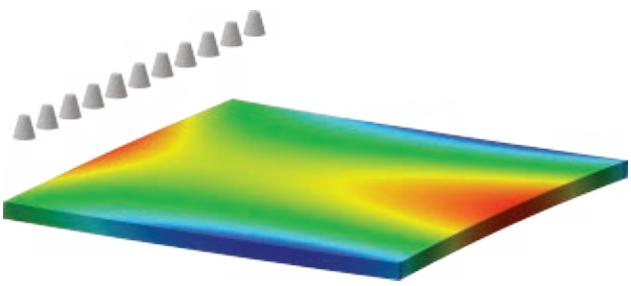


Hardness distribution after quenching. Bainite and martensite phases are shown

Quenching of the steel sheet



A special type of boundary conditions for spray quenching simulation. Temperature distribution is shown



Thermo-elastic-plastic problem simulation. Distribution of vertical displacement shows distortion of the quenched steel sheet