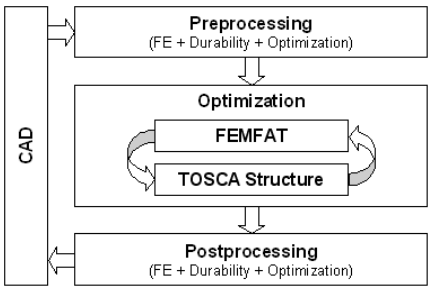
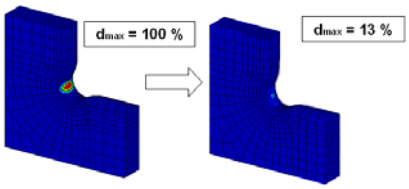
TOSCA Structure.shape

TOSCA Structure is a modular system for non-parametric structural optimization. Topology, shape and bead optimization of FE models with an arbitrary number of load cases and boundary conditions can be performed with TOSCA Structure. A parameterization of the model is not needed, which reduces the modelling effort and allows greater flexibility in the optimized structure. The optimization algorithms are based upon mechanical optimality criteria, which makes the optimization fast and robust.
Shape optimization is often used to improve the lifetime of a component. If fatigue life calculation is already performed with a durability solver, the simulation disciplines may be coupled for a direct optimization on the damage distribution of a component.



The fatigue solver calculates the damage distribution based on the stresses due to the unit load cases determined by the finite element solver. TOSCA Structure reads the damage values and modifies the design area of the component surface such that the damage distribution is reduced.



The user can work with his favorite finite element solver in his favorite pre- and postprocessing environment. He does not need additional training for a new solver. Already existing FE models can be used directly in the optimization. A closed development process can be achieved by the interaction of the components of TOSCA Structure from the first concept to the optimized geometry in the CAD system.

FEMFAT Interface

For the coupling of TOSCA Structure and FEMFAT, a complete FEMFAT analysis is integrated in each design cycle of the optimization procedure. The stress distribution required for the fatigue life simulation is calculated in each design cycle by the finite element solver based on the modified FE model.
Additionally to the standard preprocessing of the finite element analysis and the fatigue simulation, the optimization task has to be defined in the TOSCA Structure preprocessor.
All information for the batch processing of FEMFAT is stored in the job configuration file of FEMFAT. The automatic start of FEMFAT in the optimization loop is managed by TOSCA Structure.

Functionality

General

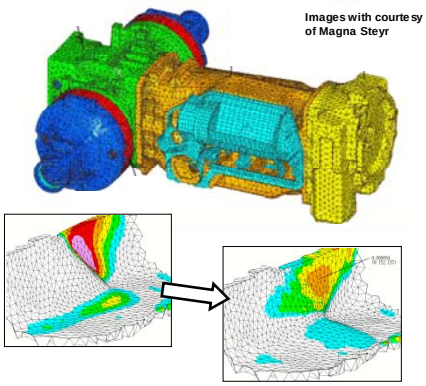
- All finite element solvers which are supported by both systems may be used for optimization of components lifespan
- Interactive graphical user interface TOSCA Structure.gui for definition, start and post processing of the optimization
- Parameterization of the model is not necessary
- Stable and fast optimization algorithms based on optimality criteria
- Optimization with an unlimited number of load cases
- Export of VTF files for the free 3D-viewer TOSCA Structure.view

Objective functions and constraints:

- Minimization of the damage in the component surface.
- Specification of a volume constraint
- Combination of fatigue results and static misuse loadcases possible

Manufacturing Constraints

- Surface-based manufacturing constraints (casting, forging, etc.)
- Minimum and maximum member size
- Symmetry Constraints
- Specification of restriction areas using shell and beam elements
- Mesh adjustment and mesh smoothing in each optimization cycle



Training

TOSCA offers broad capabilities. We recommend a consulting project or an initial training for an efficient use. Current training dates are listed on our website www.fe-design.com.

Contact

Get in touch with us

- if you want to evaluate TOSCA Structure
- if you need more information
- if you are looking for a competent and flexible engineering service provider, who can solve your analysis and optimization problems.

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