



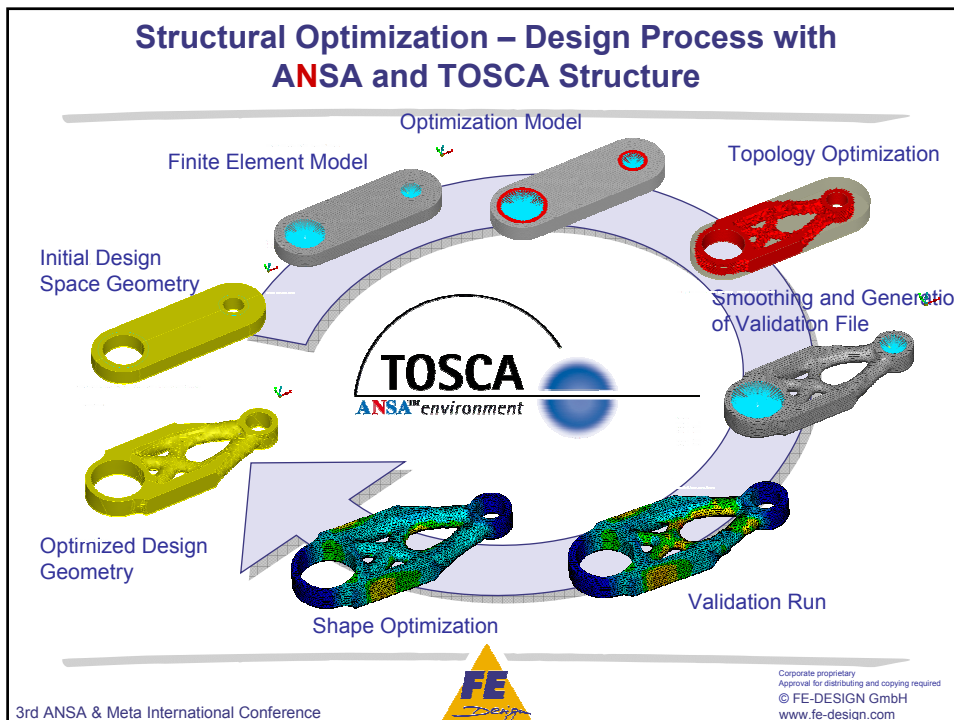
ANSA – A perfect Tool for Structural Optimization

Boris Lauber, FE-DESIGN GmbH, Germany

3rd ANSA & Meta International Conference
September 9-11, 2009, Olympic Convention Center
Porto Carras Grand Resort Hotel, Halkidiki, Greece

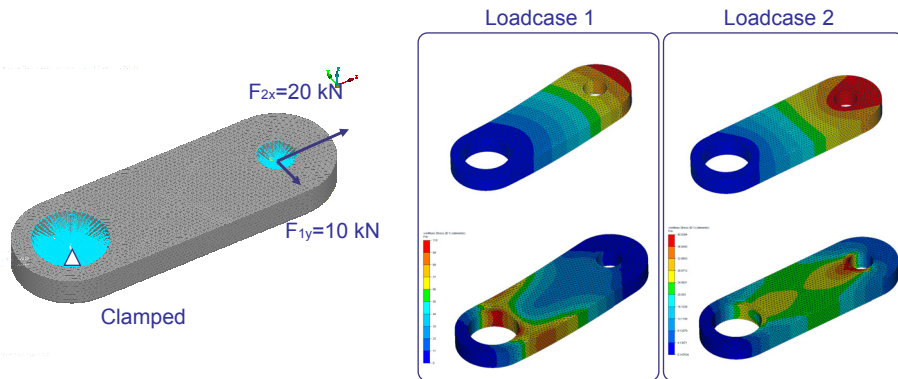
3rd ANSA & Meta International Conference

Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com



Generation of Design Space Model in ANSA

- The Design Space Model is representing the maximum allowed design space for Topology optimization.
- All relevant loadcases for Optimization are defined on the design space model

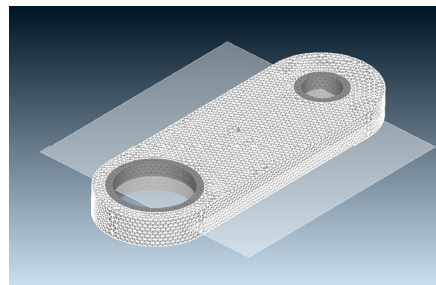
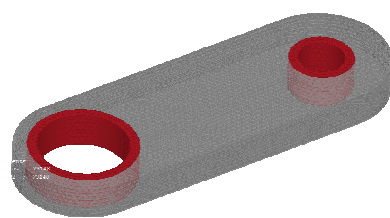


3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

Setup of TOSCA Structure Topology Optimization Task



- Design area
- Non-Design area

Optimization Target

- Minimization of compliance (resp. Maximization of stiffness)
- Target volume = 40% of initial design space
- Casting Constraint (0,0,1) and parting plane

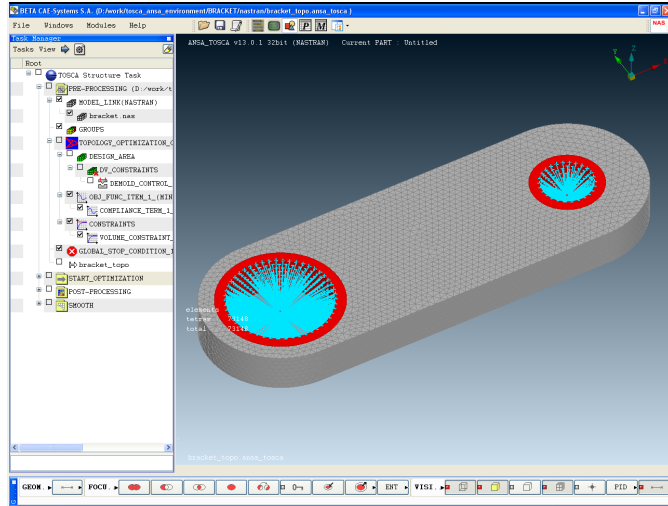
3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com



Setup of Topology Optimization Task in TOSCA ANSA environment

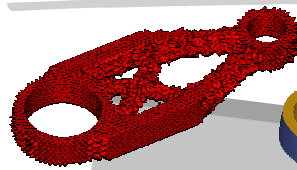


3rd ANSA & Meta International Conference

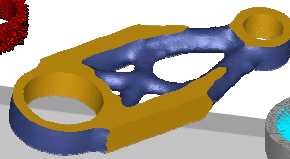


Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

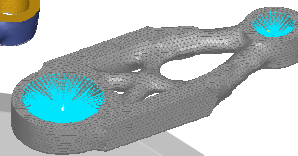
Topology Optimization Results Smoothing and Generation of Validation Input



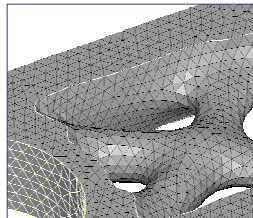
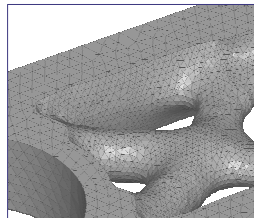
Rough Topology Optimization result



Smoothed design representation



Solid Mesh with transferred boundary conditions for validation run



- Generation of homogenous solid mesh based upon smoothed design representation
- Consideration of feature lines of initial design space
- Automatic transfer of loadcases to the validation file

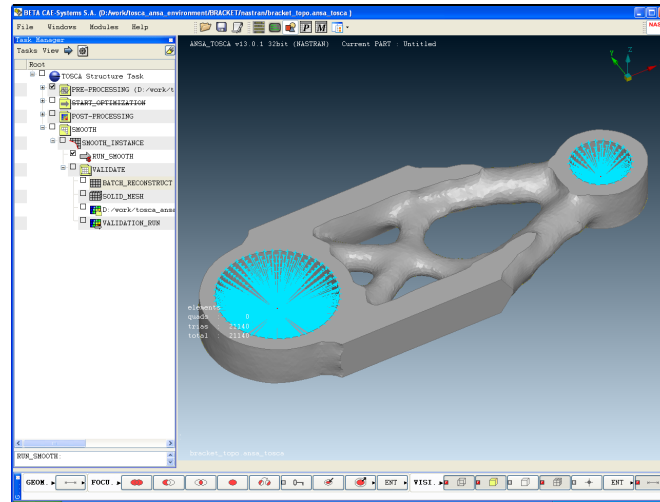
3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com



Generation of Validation Files for Topology Optimization Results



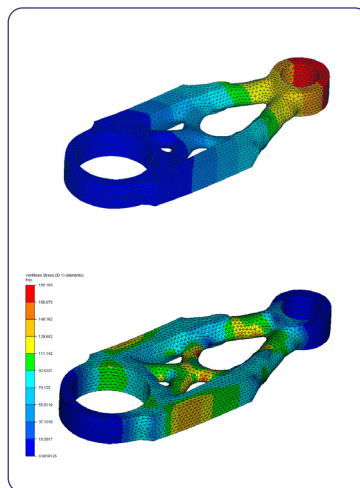
3rd ANSA & Meta International Conference



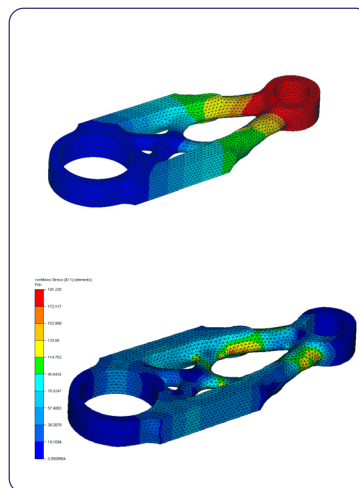
Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

Results of Validation Run

Loadcase 1



Loadcase 2

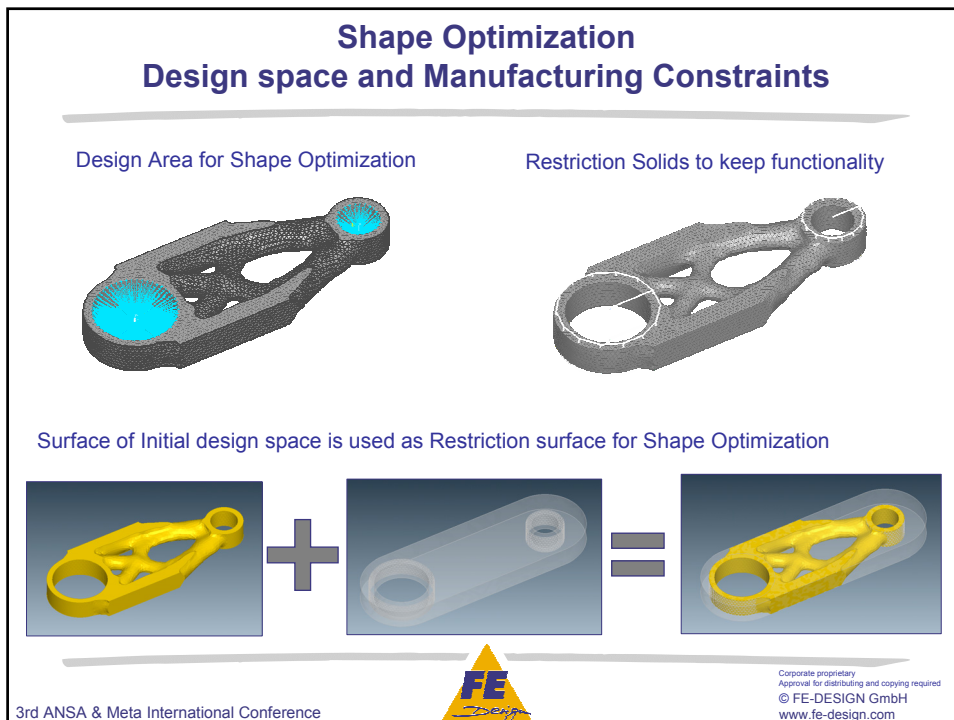
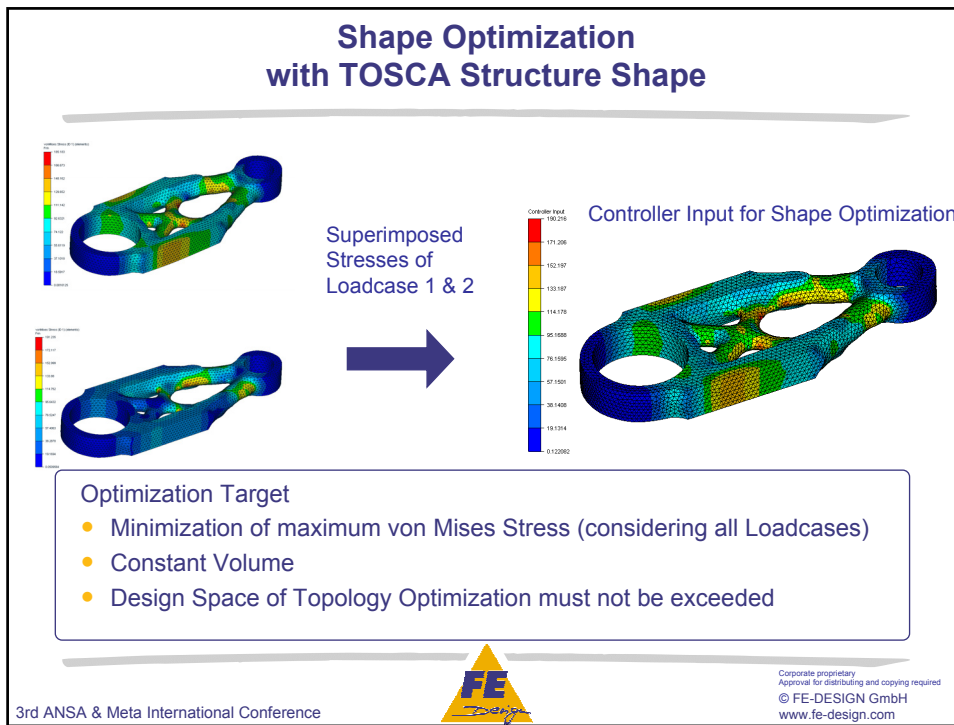


3rd ANSA & Meta International Conference

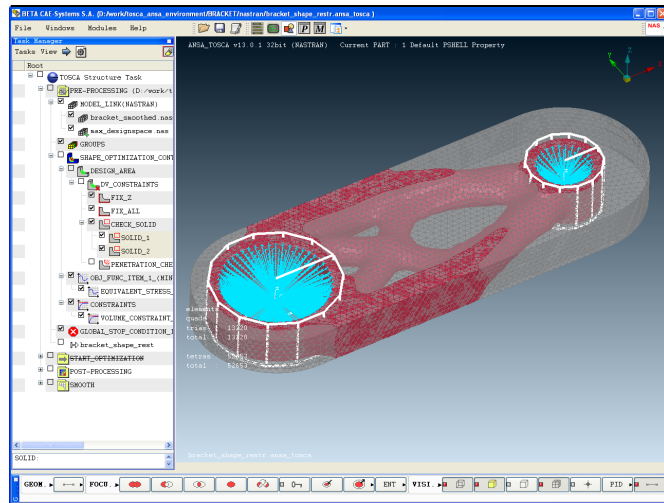


Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com





Setup of Shape Optimization Task in TOSCA ANSA environment

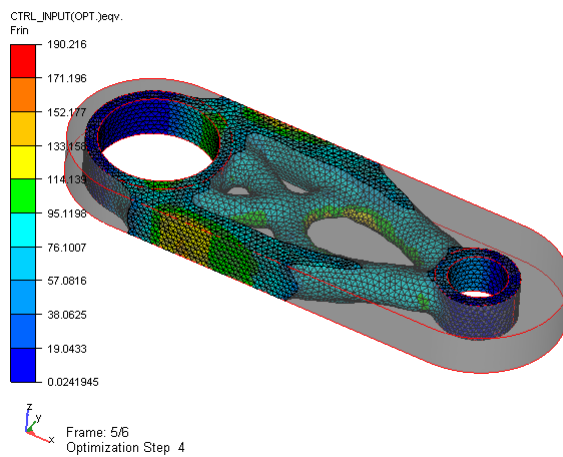


3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

Shape Optimization Progress



3rd ANSA & Meta International Conference

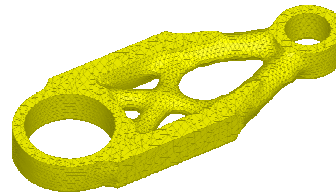
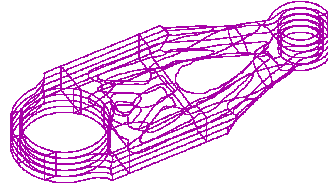


Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com



Result - Transfer to CAD Systems

1. TOSCA Smooth generates cutting-surfaces through the Smoothed model. The boundaries of these cutting splines can be exported as IGES or STEP Spline information, that may be read into CAD systems.
2. The patched surfaces may be exported as STL or IGES Faces to be imported directly to CAD systems.



3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

Conclusions

- The Combination of Topology and Shape Optimization allows to optimize components considering global stiffness aims as well as local stresses.
- The Optimization workflow is supported completely in the TOSCA ANSA environment.
- A fully automatic generation of validation files based upon the smoothed results from topology optimization is available. All loadcase definitions of the initial design space model are automatically transferred to the validation file.
- The optimization process is documented and can be stored in order to execute it on similar optimization tasks.
- The presented workflow extremely simplifies the Optimization Setup

3rd ANSA & Meta International Conference



Corporate proprietary
Approval for distributing and copying required
© FE-DESIGN GmbH
www.fe-design.com

