PERMAS Optimization - Multimodal

Free-form optimization

Shape + topology optimization

Optimization

Conceptual Design

Topology optimization
Position change
Bead design

Design Optimization

Sizing optimization
(with free sizing)
Shape optimization
(free-form or with shape basis vectors)

Robust Design

Sampling
Reliability analysis
Robust optimization

Multimodal

Simultaneous execution of solvers

Sizing + shape optimization for amplitude reduction in frequency domain

Optimization of ply shapes and stacks

Optimization of weight under displacement constraints and ply failure criterion

Topology optimization of a gear wheel body

Bead design for maximum eigenfrequency

(by courtesy of Daimler AG)
Shape Optimization of Wheel Spokes with Plasticity

Effective Plastic Strain before Optimization

Effective Plastic Strain after Optimization

Coordinate Change

Minimize Effective Plastic Strain

Topological Optimization of Machine Tool in Frequency Domain

~10% weight reduction of Y axis slide and table

Positioning and Sizing of Absorbers on Beam under Pressure Load

Frequency response of displacement amplitude at mid node on top side

Optimization of absorber’s position and properties

Rolling, Blanking, and Beading Combined in One Multimodal Optimization

Shell model under torsional load

Two symmetry planes

Maximum stiffness under given weight

Design by Simulation of an Engine Bracket

Normal thickness change

Minimized stresses

Design time < 8h

Process Steps

Analysis Results

TOPO Wizards Re-analysis FREEDFORM

Total Compliance (Nmm) 2488 2388 2541

Weight (kg) 0.915 0.917 0.918

Max. Displacement (mm) 1.020 0.975 0.961

Max. von Mises stress (MPa) 362 174

Calculation time * 2h 3h < 6h

Preparation time using wizards < 30 min < 30 min < 20 min

Shaping, Sizing, and Robustness

Rib and wall thickness, and rib height for optimization and reliability

Robust design of charge air cooler

Contact between Header and Tank foot

Inner pressure: 2.25 MPa

More information about PERMAS optimization:

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