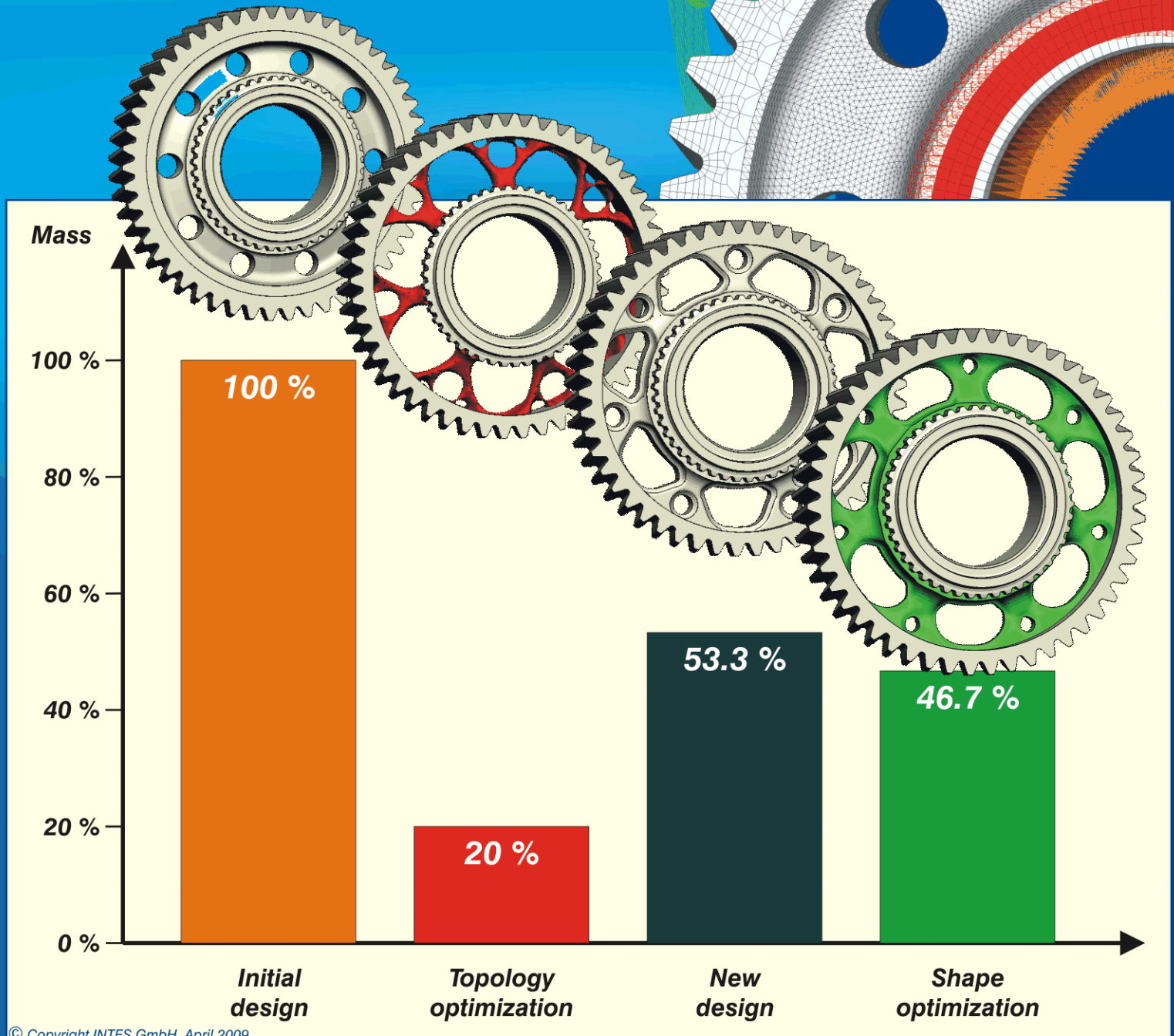# PERMAS

Weight Optimization of Gear Wheels
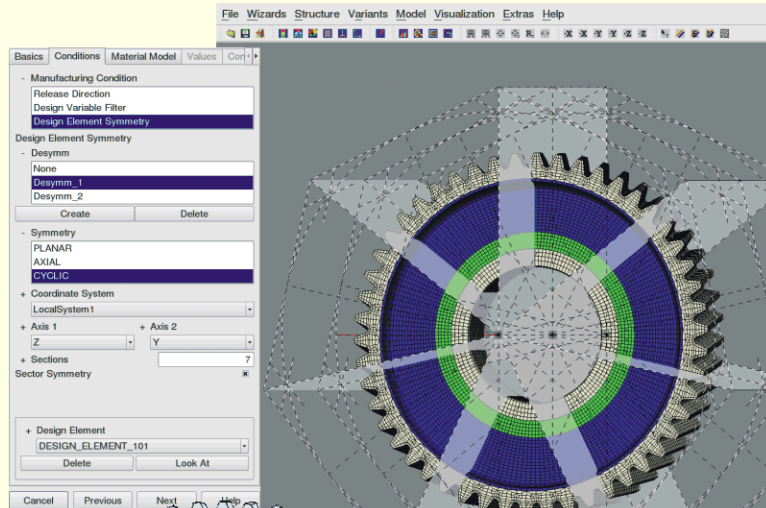
Procedure:

- **Topology optimization of gear wheel body to reduce weight**
- **New design of gear wheel with stress analysis**
- **Shape optimization of new gear wheel design to reduce stresses**
- **VisPER to specify optimization model and evaluate results**

Radial support, axial support, four load cases for tooth engagement

Mass

100 %	Initial design
20 %	Topology optimization
53.3 %	New design
46.7 %	Shape optimization

Topology Optimization

Filling ratio >70%

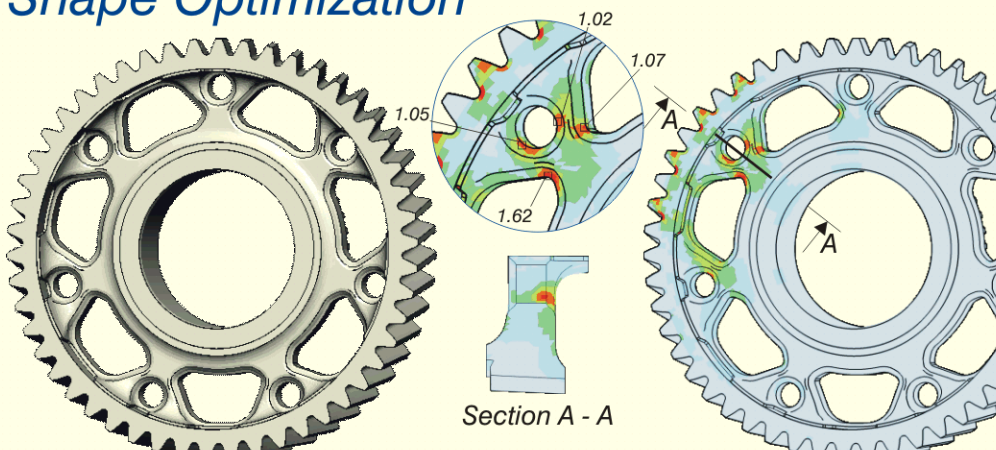Smoothed hull
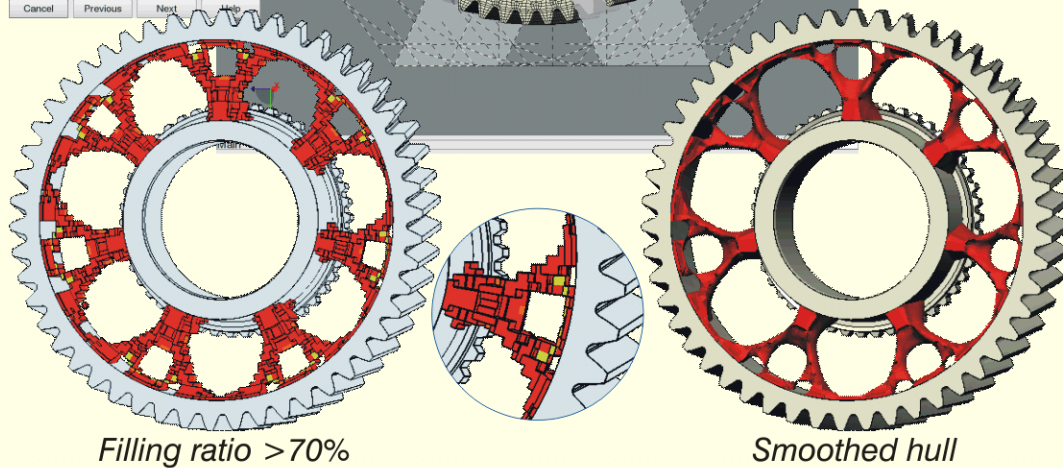
VisPER

VisPER features the graphically guided description of optimization models:

- Definition of design space and design parameters
- Selecting objective function and design constraints
- Defining manufacturing constraints and symmetry conditions
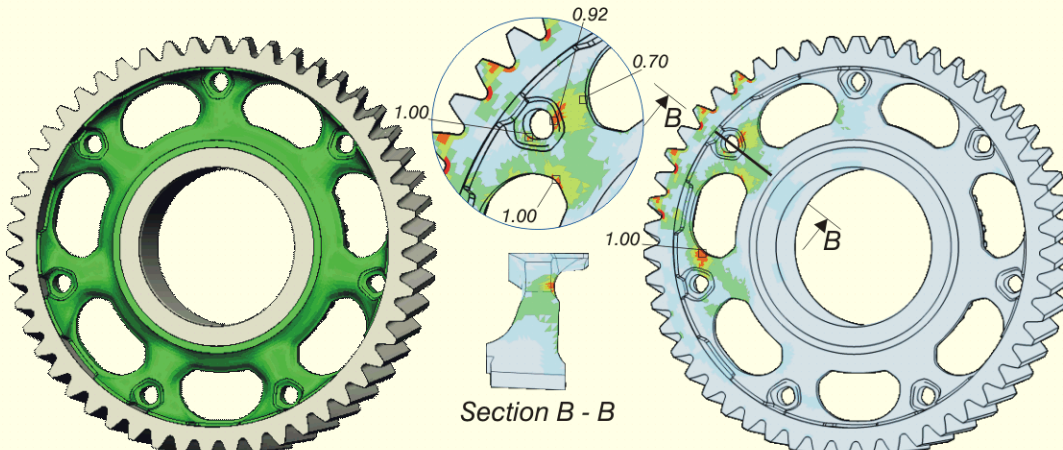- Generation of a smoothed hull

Shape Optimization

1.02
1.07
1.05
1.62

Section A - A

Geometry and normalized equivalent stresses in initial model

0.92
0.70
1.00
1.00
1.00

Section B - B

Optimized geometry and normalized equivalent stresses

Simple definition of basis vectors for shape modifications

Beside max. allowed stress, keeping symmetry conditions

Objective function: lowest weight

For more information about PERMAS and VisPER contact:

International: INTES GmbH
Schulze-Delitzsch-Str. 16
D-70565 Stuttgart
Phone +49-711-78499-0
Fax +49-711-78499-10
E-mail: info@intes.de
Http://www.intes.de

In France: INTES France
40 rue Sadi Carnot
F-78120 Rambouillet
Phone +33-1-3483 1989
Fax +33-1-3483 2028
E-mail: permas@intes.fr
http://www.intes.fr