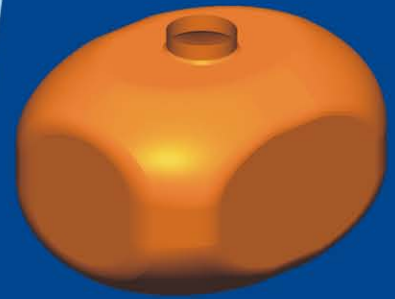# PERMAS

Beads for Optimizing Vibrations
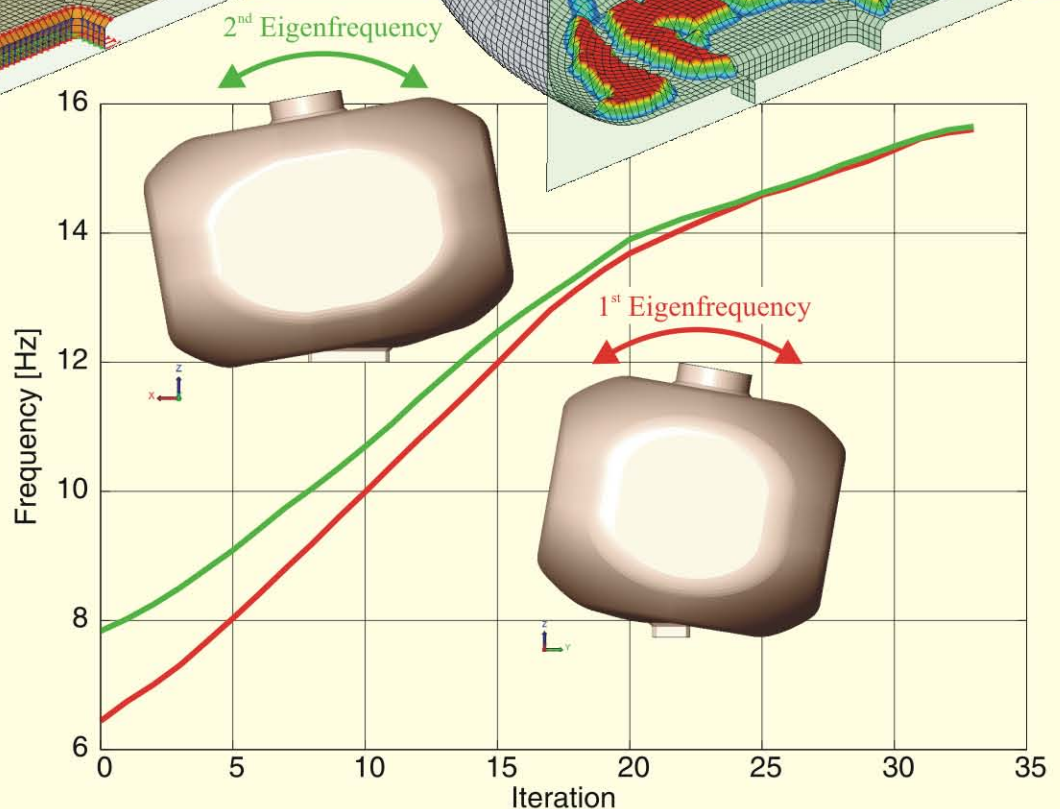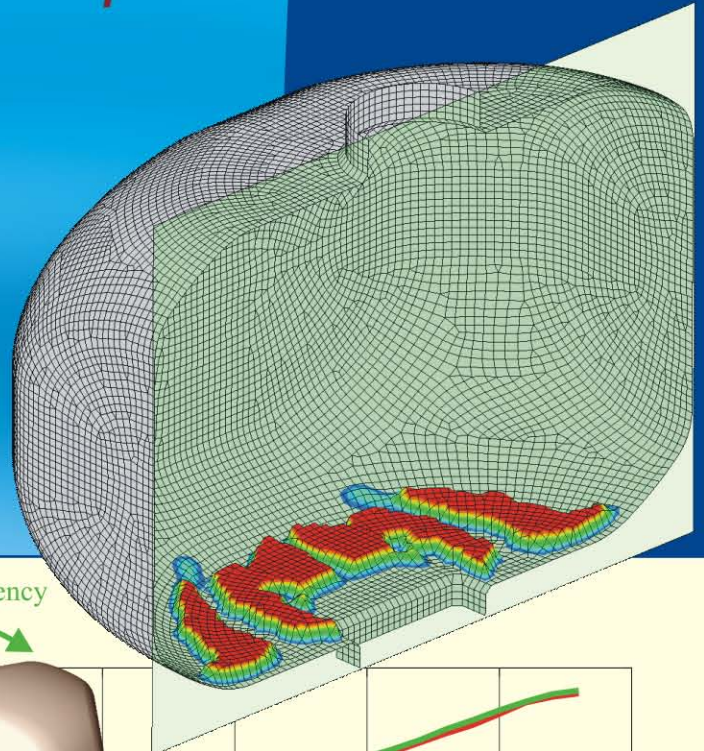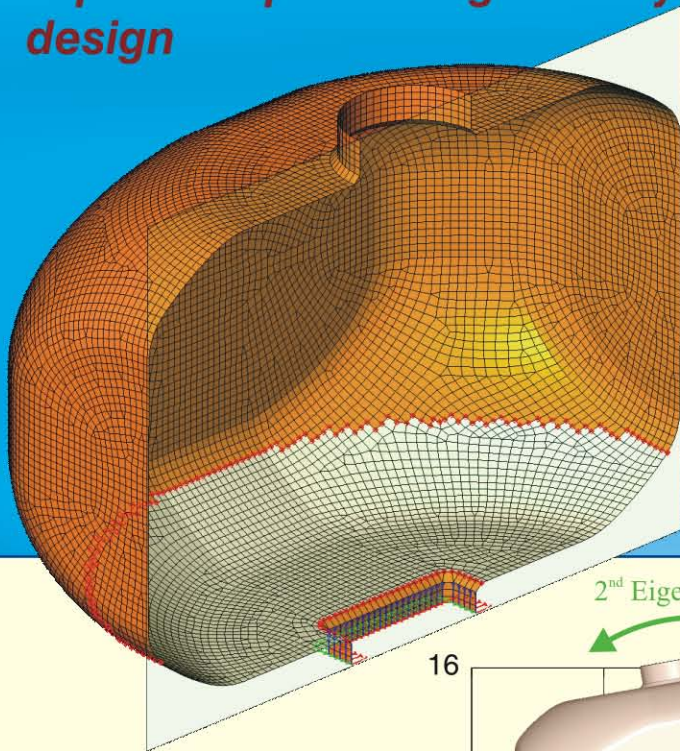
Procedure:

- **Selecting bead area**
- **Selecting width and height of beads**
- **Maximize eigenfrequencies as objective for optimization**
- **Element quality as design constraint**
- **Automatic generation of bead design**
- **Using optimized model for further analysis**
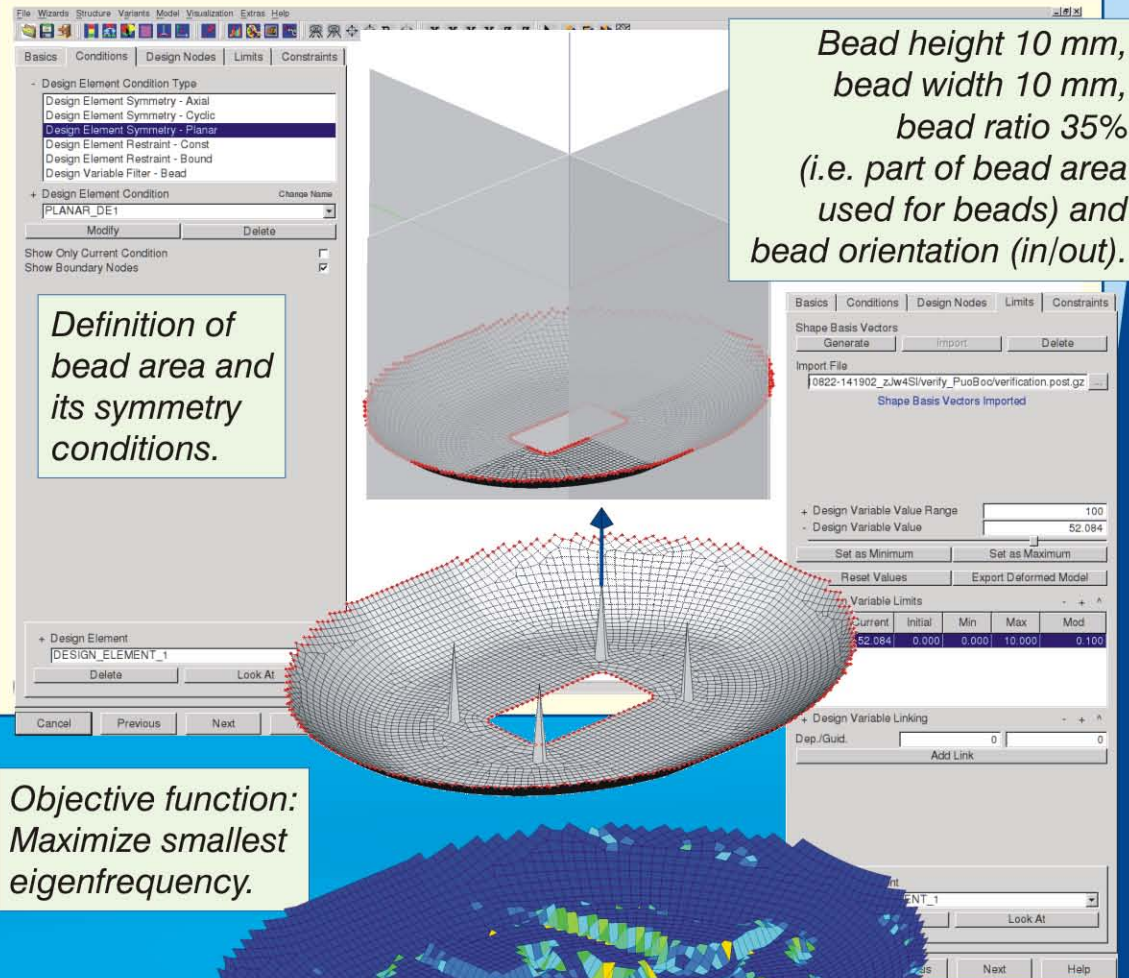- **Export of optimized geometry for new part design**

A plastic tank as an example for bead design in optimizing vibrations

An empty tank is vibrating with its first two eigenfrequencies against the connecting flange at about 6 and 8 Hz, respectively. By an automatic generation of beads around the flange both eigenfrequencies can be raised to about 16 Hz.

Bead height 10 mm, bead width 10 mm, bead ratio 35% (i.e. part of bead area used for beads) and bead orientation (in/out).

Definition of bead area and its symmetry conditions.

VisPER provides the graphically guided definition and evaluation of bead designs:
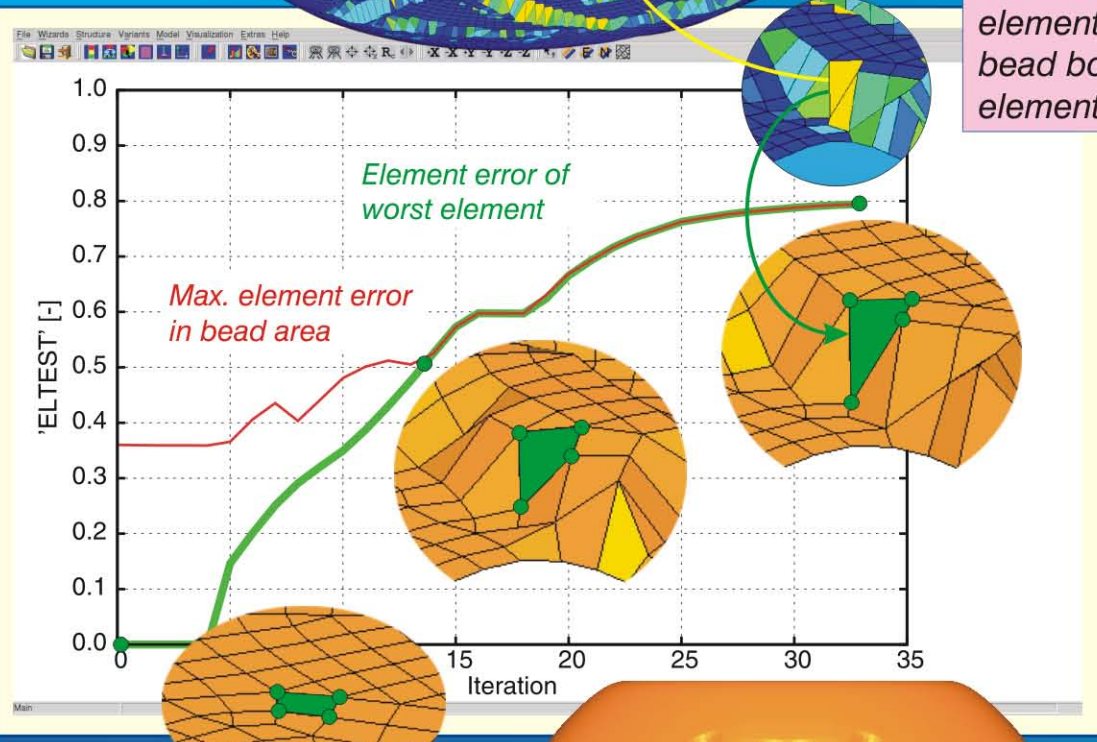
- Definition of bead area and its symmetry conditions
- Definition of bead orientation
- Indication of bead width and height as well as bead ratio
- Indication of objective function and constraints
- Export of new coordinates

Objective function: Maximize smallest eigenfrequency.

By limiting the element error as constraint for bead design large element distortions may occur at bead boundaries without any element failure.

Element error of worst element

Max. element error in bead area

The element error exactly represents the PERMAS element test:
0: element is perfect,
1: element is erroneous,
here the element error is limited to 0,8 as constraint.