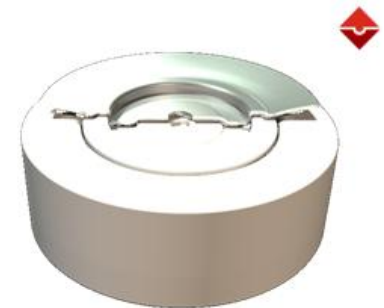
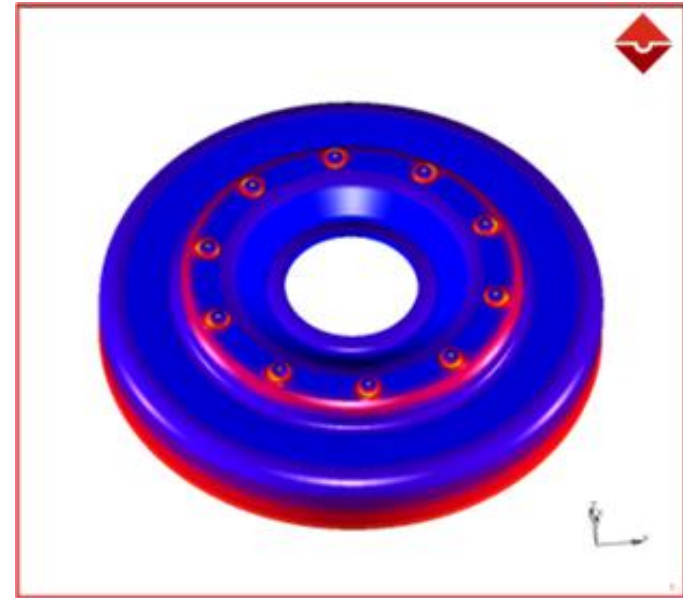
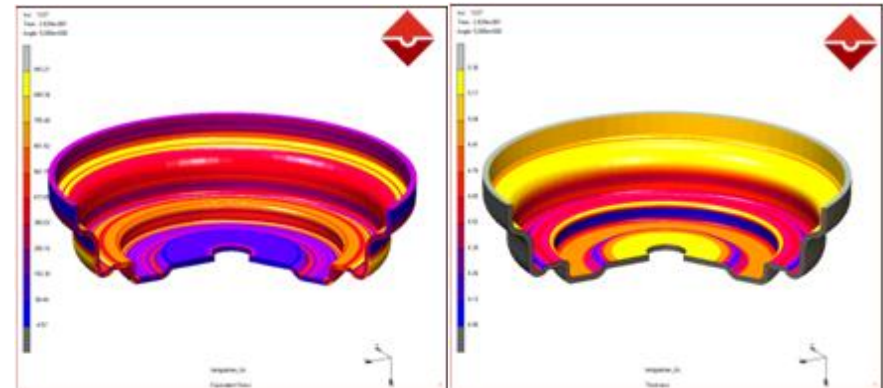
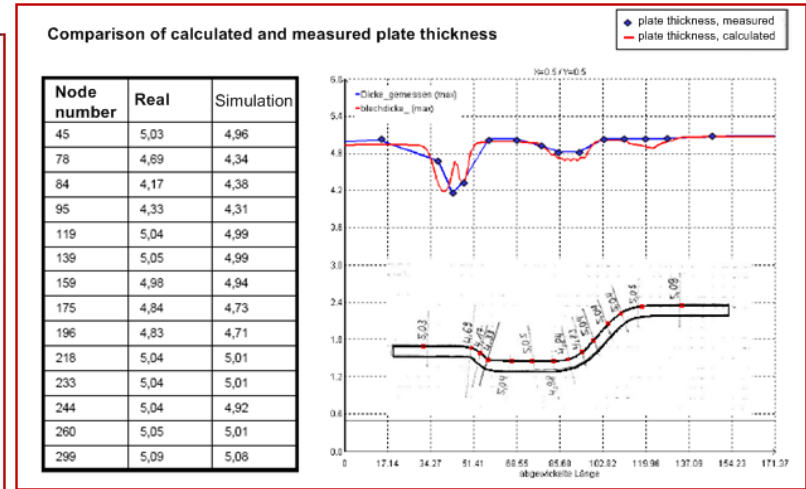
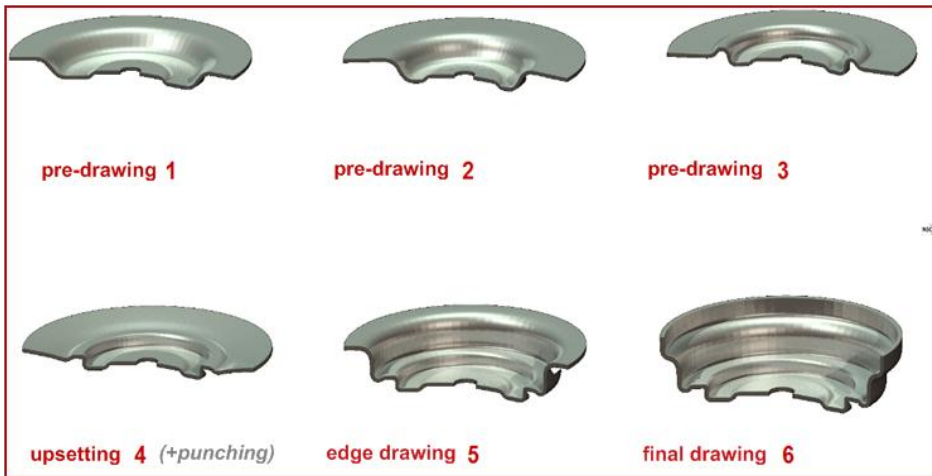


- ◆ Thick blanks are metal sheets where the sheet thickness in relation to the sheet dimensions is not insignificant anymore.
- ◆ As in bulk forming, significant stresses and strains occur in the through-thickness direction.
- ◆ As in bulk forming, simulation of these processes is done by means of volume elements.
- ◆ This results in excellent prediction of residual stresses, thickness changes and spring-back behavior.



\* courtesy of ZF-Sachs

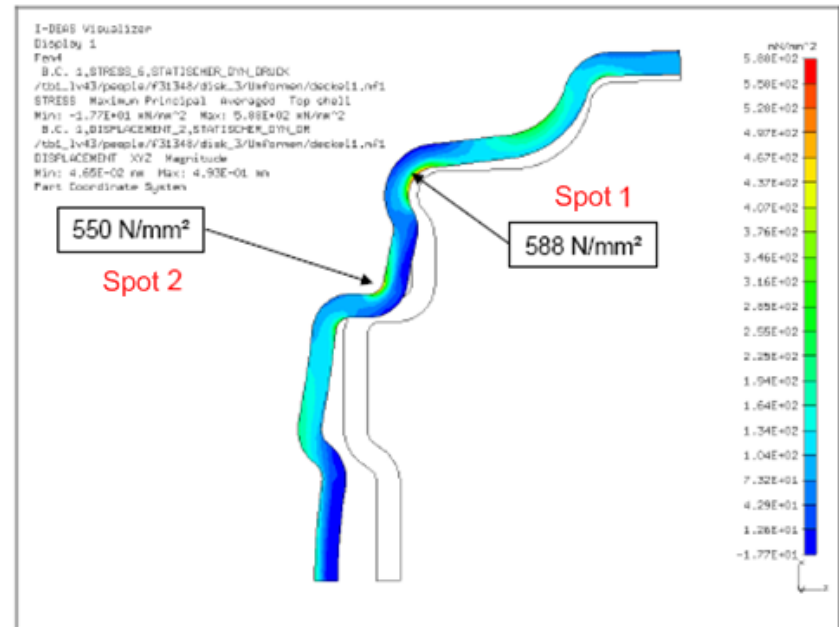
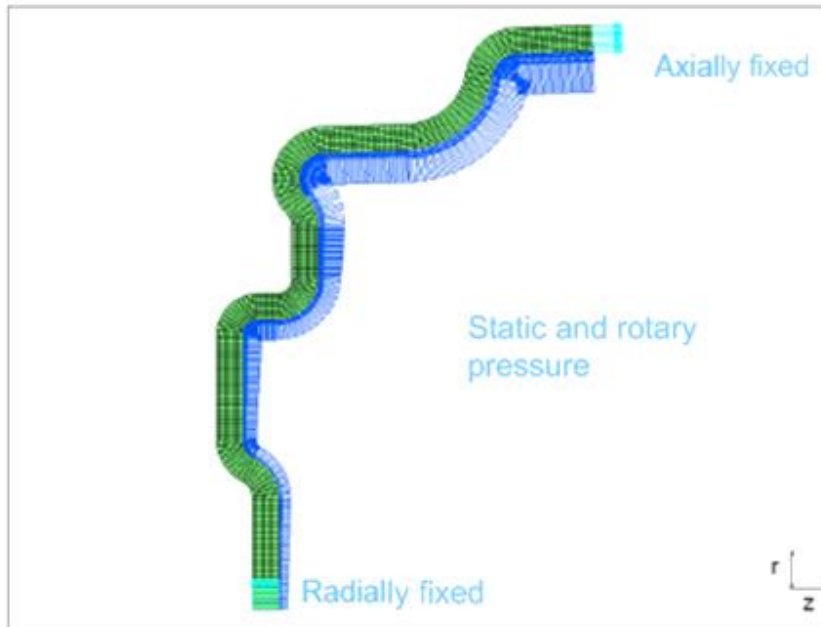
- ◆ Manufacturing process of a torque converter cover, followed by a transfer of the component characteristics to a structural analysis for a component lifetime prediction



\* courtesy of ZF-Sachs

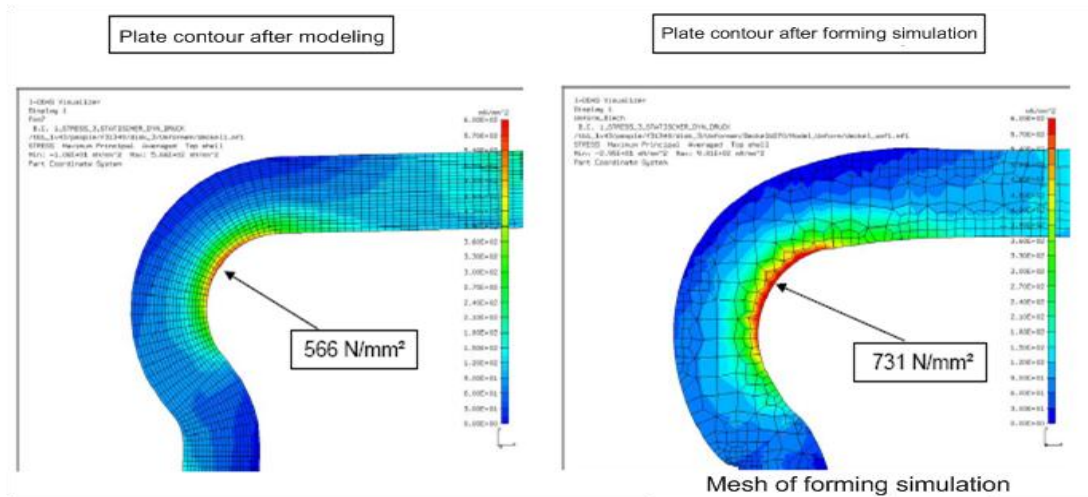
- ◆ Loads & Boundary Conditions:
  - Ends are clamped
  - Pressure load applied

Loads, boundary conditions:

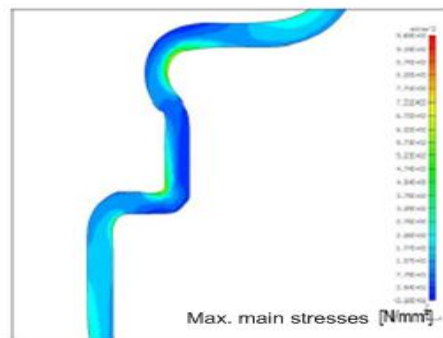


\* courtesy of ZF-Friedrichshafen

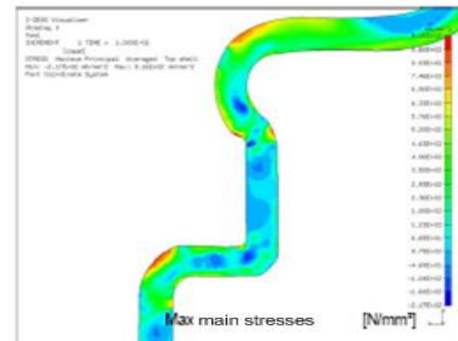
◆ With/without consideration of forming history



Static FE: Load stresses



Forming simulation residual stress



Possible overlapping of tensile stress and compression stress

\* courtesy of ZF-Friedrichshafen