

CADFEM Consulting

Simulation of Parts with Enclosed Gas Volumes Under Changing Pressure

Easy to Use Application in ANSYS® Workbench™

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Task

If gas volumes are enclosed in parts that undergo large deformation, the compressed gas significantly influences the deformation behaviour, reaction forces and stress distribution (for example in tires, gaskets, balls, PET bottles, ...). But in general, enclosed gas volumes are not regarded by structural FE-Analyses.

Solution

CADFEM developed an easy to use approach to solve problems like this:

An APDL command block must be added into the ANSYS Workbench tree of a current model.

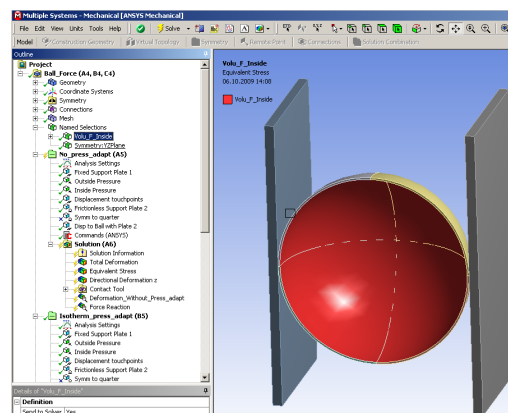
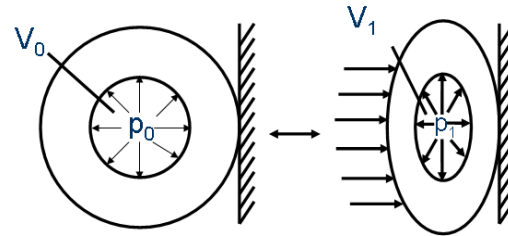
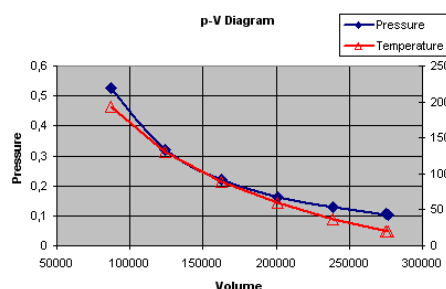
The APDL module then

- Tracks the enclosed gas volume
- Applies the pressure caused by the gas
- Iterates the pressure via a chosen gas law (isothermal, adiabatic, ...) until gas equilibrium
- Returns the final result back to the Workbench environment.

No mesh of the enclosed gas volume is needed. Hence, there are much fewer restrictions in deformation. Even collapsing to a small final volume with then high inside pressure and temperature is possible.

Customer Benefit

- Easy application and problem set up.
- No additional software features needed.
- Relevance of enclosed gas volumes can be determined: Changing reaction forces, deformation, stress, pressure and temperature



Without gas enclosed ↔ With gas enclosed

