Meshing of a detailed DrivAer Body with ANSYS Meshing and ANSYS ICEM CFD

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DrivAer Body
DrivAer Body

• The shapes of simple car models differ very much of the actual car geometries, so optimizations are often done on real car geometries.

• This geometries are only available to a small number of people.

• To close the gap between the strongly simplified models an the highly complex production cars, the generic DrivAer model was introduced.
The DrivAer Model is provided by the Technical University of Munich.

Several kinds of the model are available:
- Fastback
- Notchback
- Estateback
- Detailed underbody
- Smooth underbody
- With/Without mirrors
- Detailed wheels
- Smooth wheels
Geometry preparation

ANSYS DesignModeler
• After geometry import, only a surface model is available. This has to be corrected for *ANSYS Meshing* import.

• If a closed surface model is available, the *body operation sew* can fill it and turn the model to a solid body.

• The *repair functions* can help to detect defects of the geometry.
Geometry preparation

- Sometimes it's easier for modifying a geometry to go back to a surface model.
- Delete the faces you do not need, close the model again and sew it.
- The wheel and the rim is just prepared once. The finished model is copied.
Geometry preparation

- The fluid volume has to be extracted. Therefore it’s impossible, that all bodies are solid bodies.

- A body of influence is created to allow local refinement.

- The rims are separated to allow a rotational definition in the fluid solver.
Mesh generation

ANSYS Meshing
Mesh generation in ANSYS Meshing

- The patch independent mesher is used for complex geometries with many small faces.
- The patch dependent mesher is used to mesh the rims, bottom-up the existing mesh.
- Body of influence to refine the mesh close to the car.
- Inflations are created in a later step.
Pre mesh modification

ANSYS ICEM CFD
Pre mesh modification with ANSYS ICEM CFD

- The mesh quality can be increased before creating the prism layer.

- Some nodes, projected to points or curves can be reprojected to surface to increase their degree of freedom.

- Moving some nodes manually can help to fix bad elements.

- Working with subsets will guarantee a better overview.
Prism layer generation

ANSYS ICEM CFD
Prism layer generation with ANSYS ICEM CFD

- Only one prism layer is extruded.
- This prism layer can be split into several layers.
- No pyramids are generated.
- Auto reduction avoid collisions.
Post mesh modification

ANSYS ICEM CFD
After the generation of the prism layer, the mesh has to be smoothed again.

The layer itself should not be smoothed with high quality to avoid high jump factors in the layers.

A minimum Quality of 0.21 could be achieved.
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<th>Exp. Factor</th>
<th>Aspect Ratio</th>
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|                  | ! | ok | !OK | ! | !ok | !OK | ! | !ok | !OK |
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| FeigeVorne       | 0 | 1 | 99 | <1| 4  | 96 | 0 | 0  | 100|
| FluidSteady     | 0 | 1 | 99 | <1| 11 | 80 | 0 | 0  | 100|
| Global           | 0 | 1 | 99 | <1| 9  | 91 | 0 | 0  | 100|
Thank you for your attention

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