# Colorplots

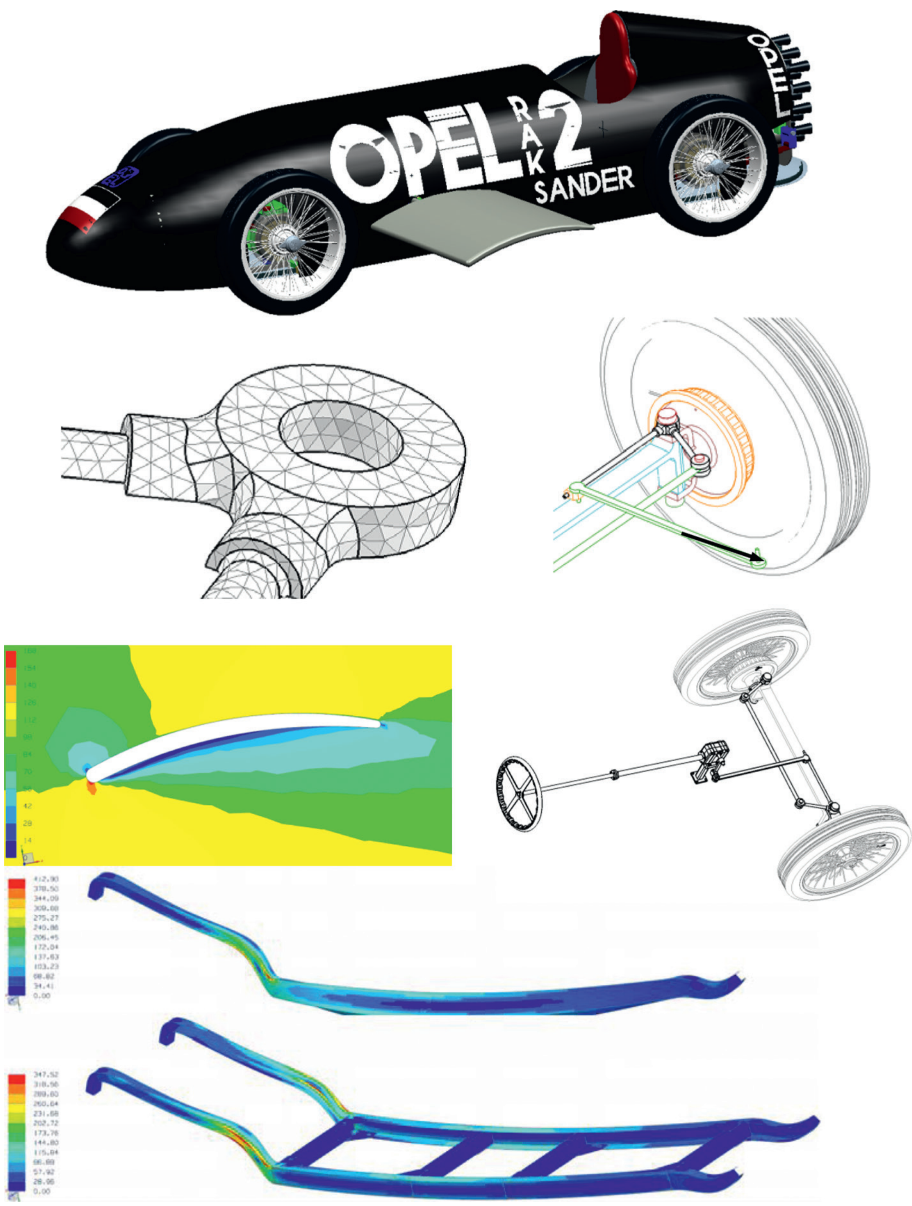


**Figure 1** The CAD model of the Opel RAK2 forms the basis for the learning tasks: The figure shows some sample images.

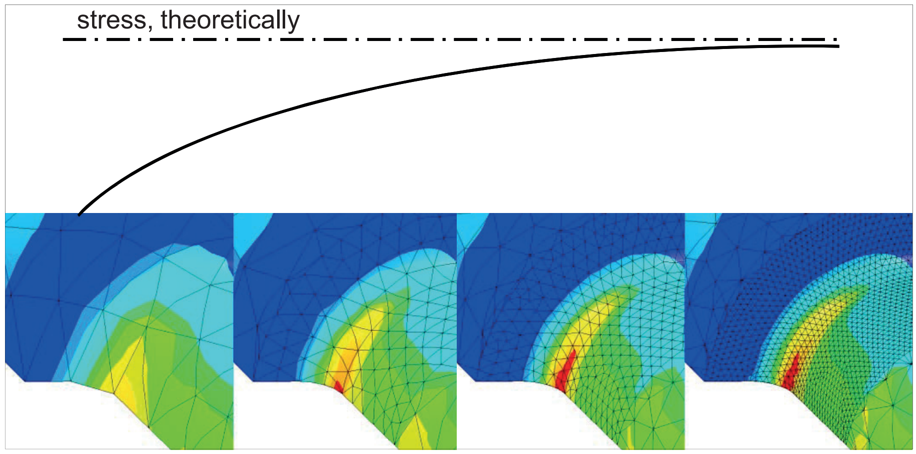


**Figure 2** The examination of convergence helps in assessing the accuracy.

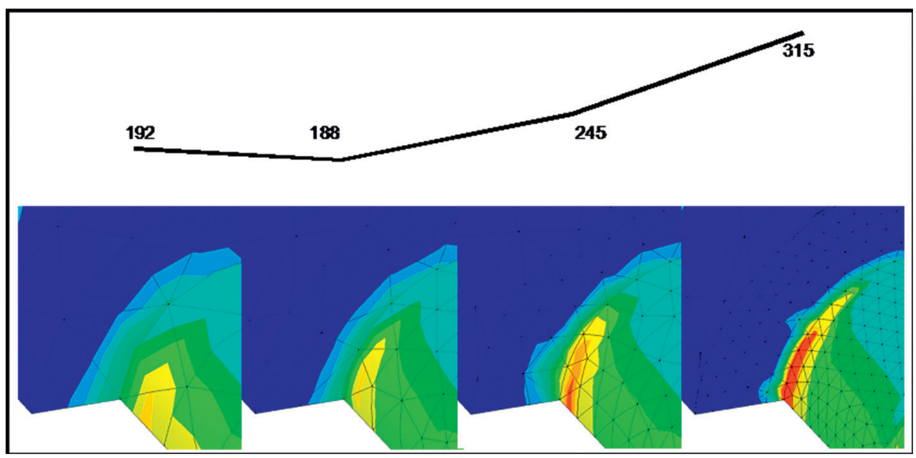


**Figure 3** At a singularity, stresses increase without limits.

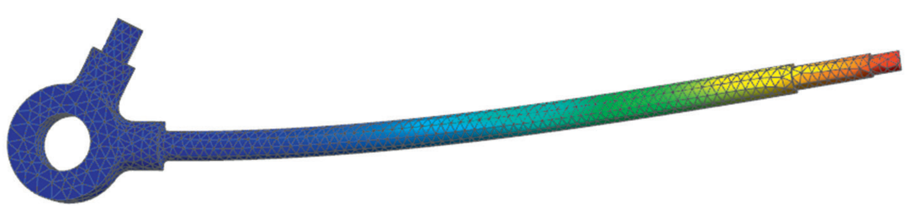

**Figure 4** The deformation should be checked first.

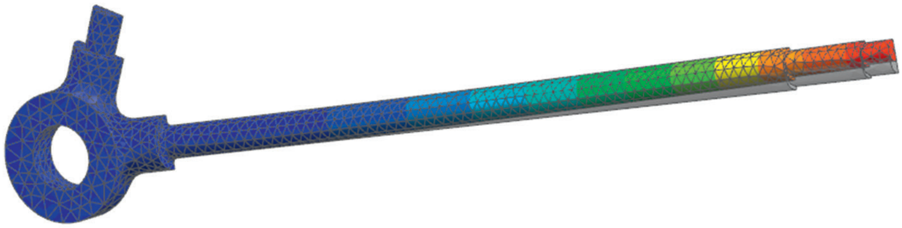

**Figure 5** The nonscaled representation of the deformation shows that in our case small deformations occur.

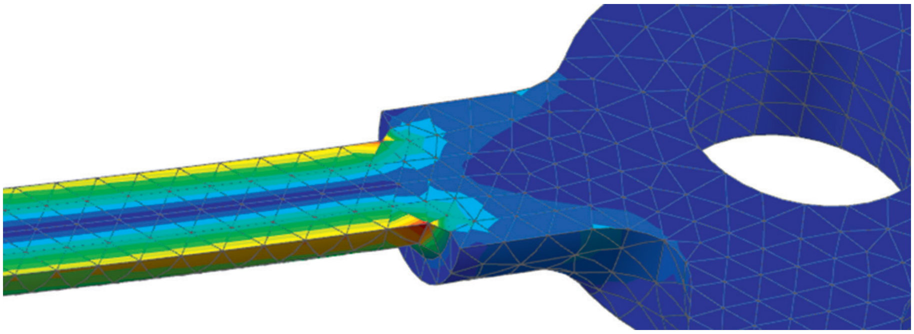

**Figure 6** von Mises stresses in the region of interest: The quality of results is plausible but the meshing is too coarse.

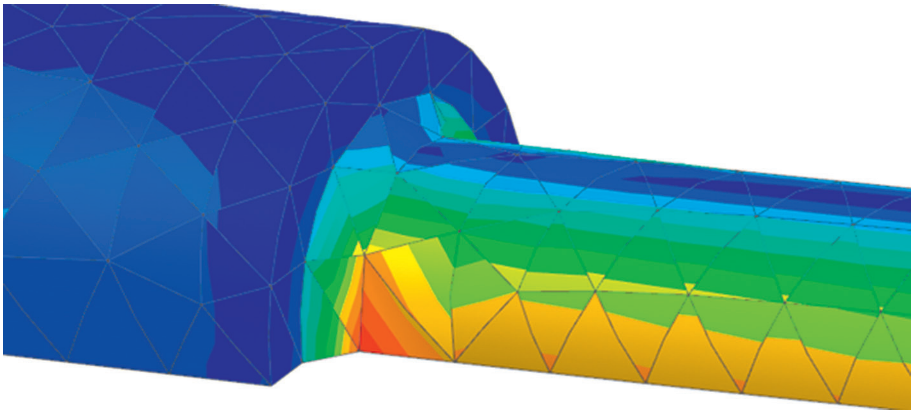

**Figure 7** The critical areas of the mesh should be inspected visually.

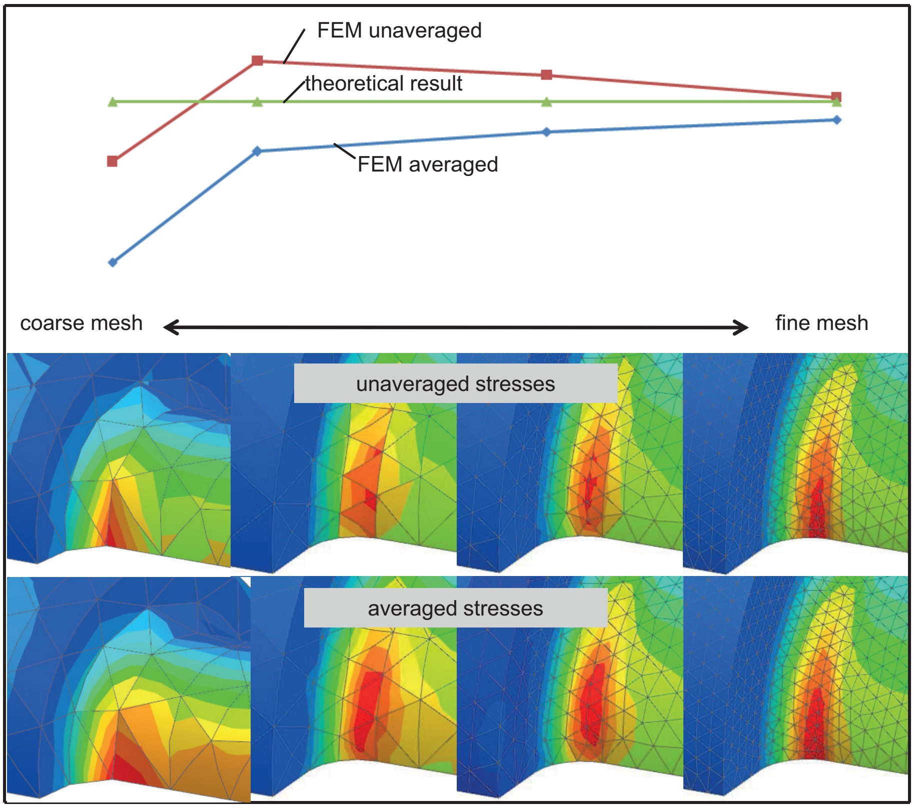


**Figure 8** A successful convergence validation with the typical behavior of the stresses: The averaged stresses are approaching from below to the theoretical result. The unaveraged stresses overshoot the exact result to then approach from top.

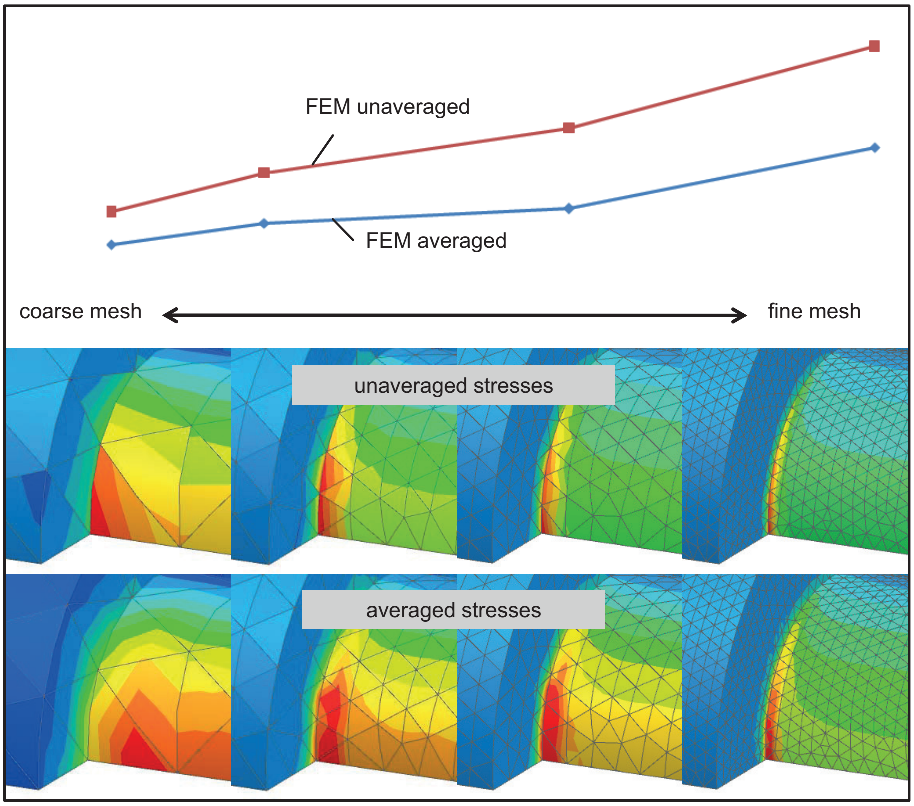


**Figure 9** At a singularity, the stress continues to rise with a finer mesh.

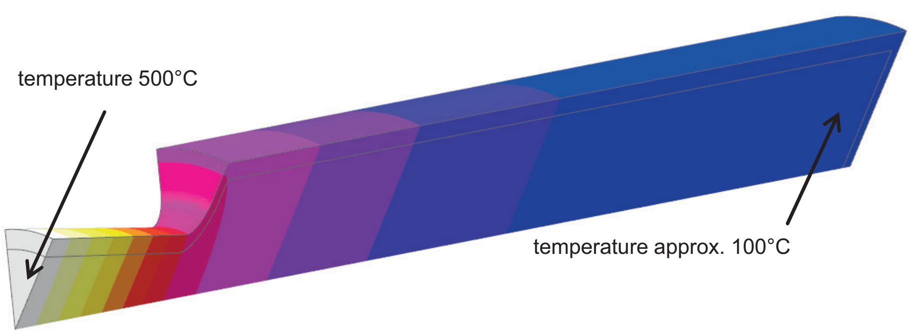


**Figure 10** The temperature profile in the rocket is the result.

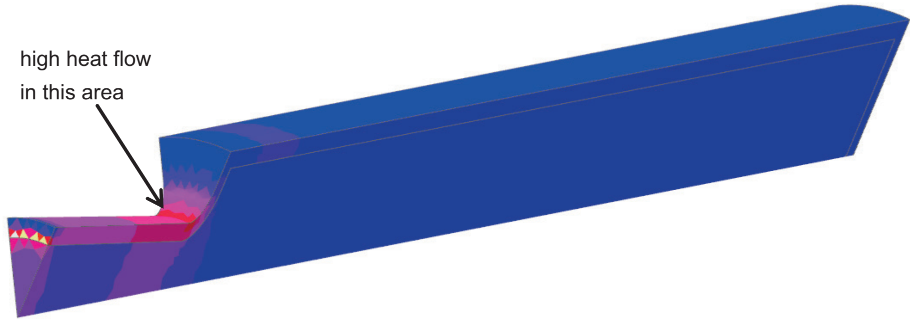


**Figure 11** The heat flux shows the locations at which the heat flow is accumulated.

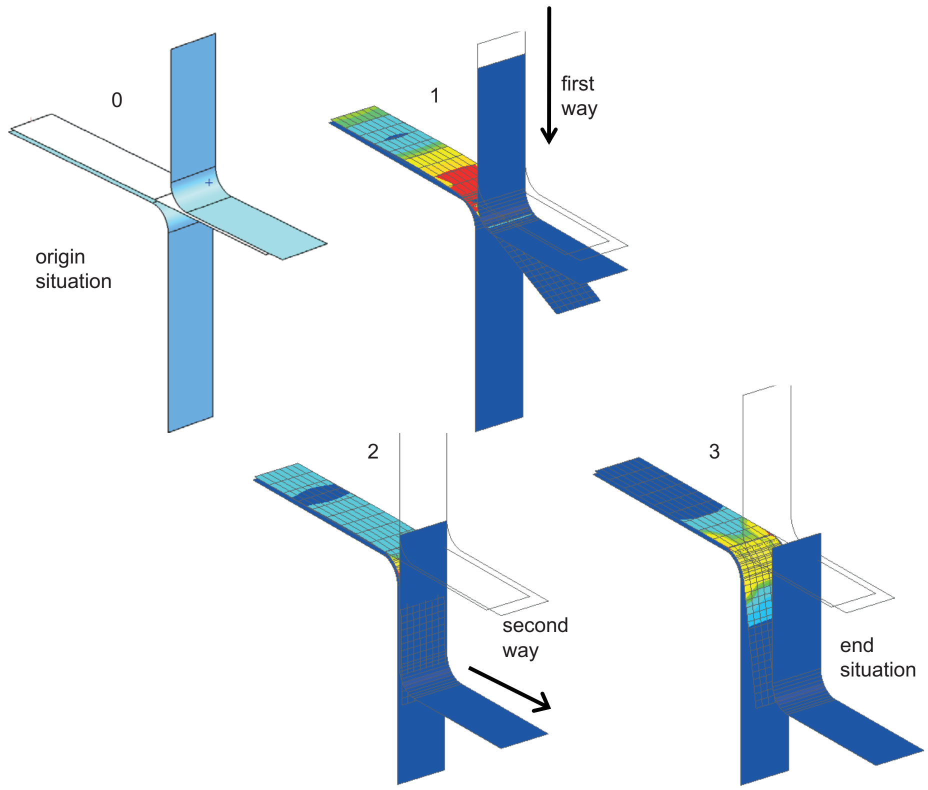


**Figure 12** Forming simulation of a sheet metal: The metal sheet is plastically formed by two L-shaped tools.

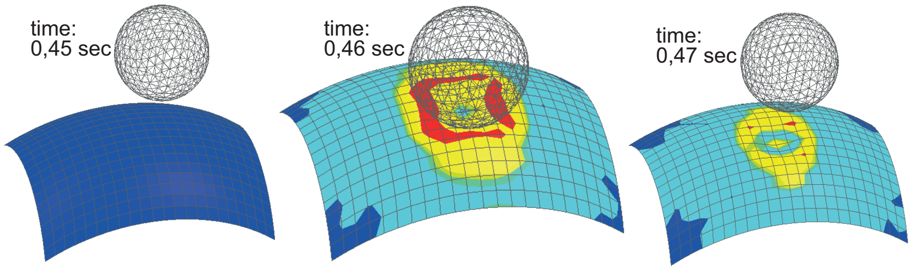


**Figure 13** An impact simulation with plastic deformation that also takes the dynamic influence into account

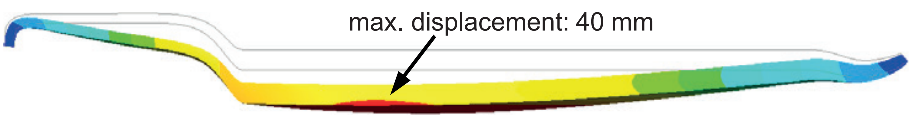


**Figure 14** The deformation of the longitudinal beam is plausible.

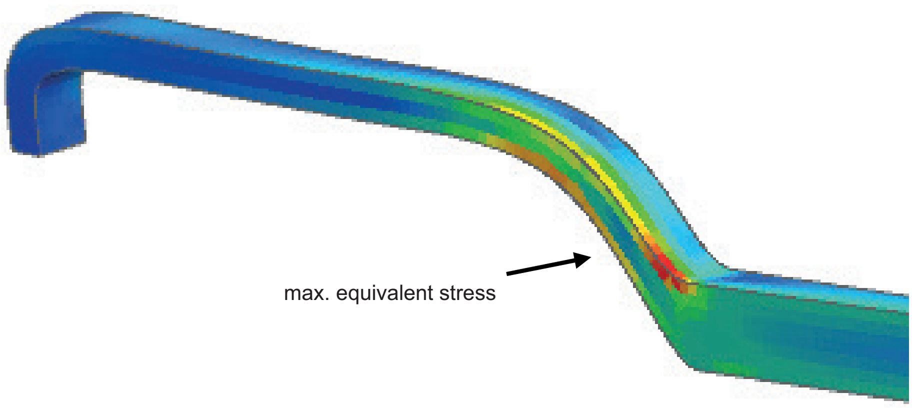


**Figure 15** The highest stresses arise in a transition area of the cross section.

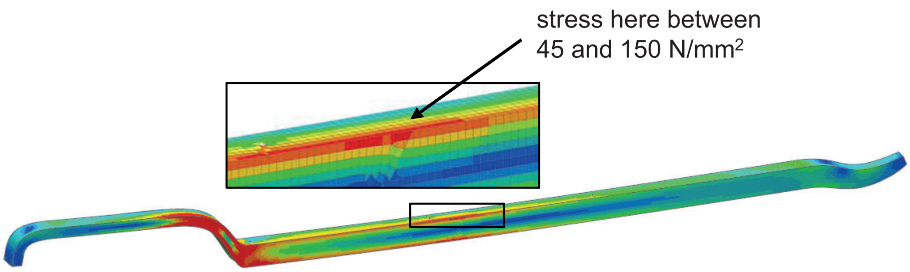


**Figure 16** In the order of magnitude, the hand analysis and the FEM results agree. The differences are explainable: FEM results are more detailed and accurate than classical machine elements formulas.

**Figure 17** The von Mises stresses calculated on the frame

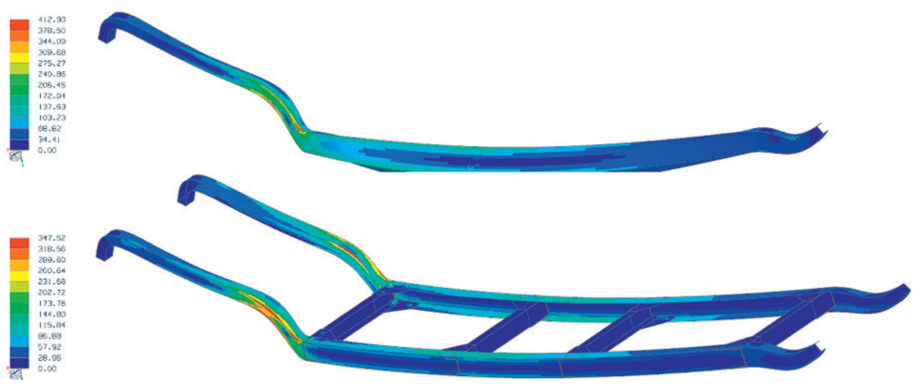


**Figure 18** The additional cross beam has a slightly stress-reducing effect.

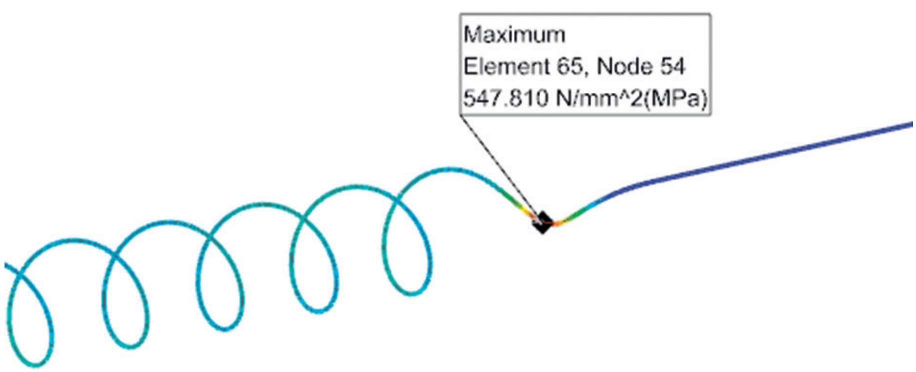


**Figure 19** The safest course is to present the largest of the four calculated stress points.

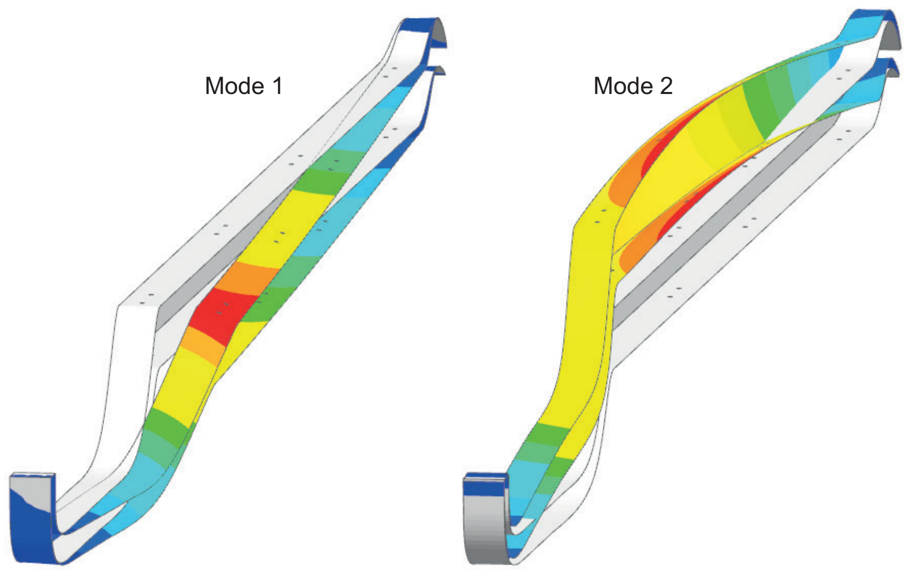


**Figure 20** Animated natural frequency results allow the wave forms to be understood.

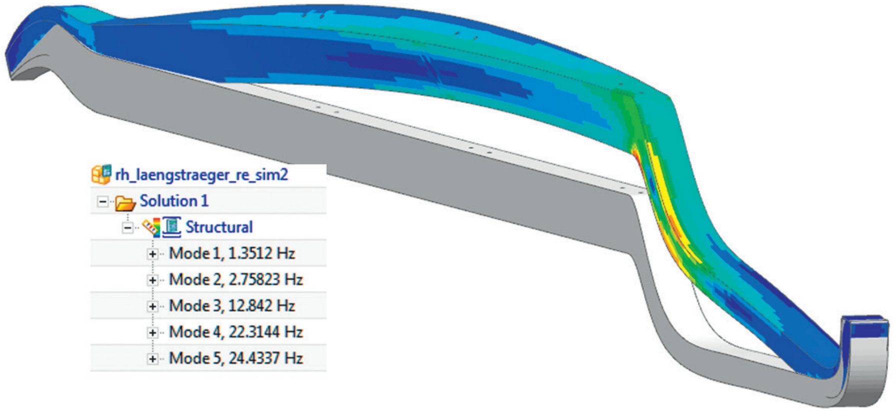


**Figure 21** In modal analysis, the stress profile can be specified only qualitatively.

**Figure 22** The result of contact pressure with tetrahedral meshes trembles a little. This can be improved through better meshings in the second part of this task.


**Figure 23** The von Mises stresses

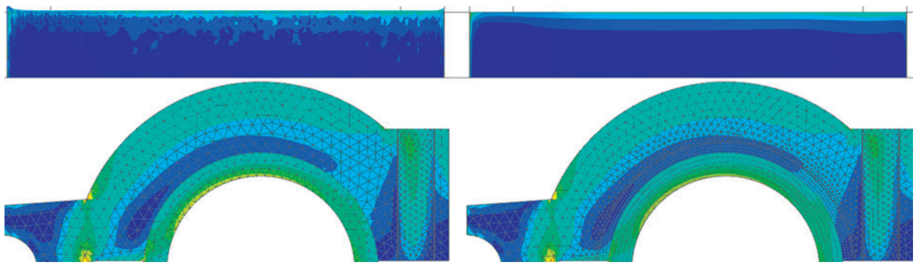

**Figure 24** Left is the simple tetrahedron mesh, right the high quality mesh. At the top is the contact pressure, at the bottom the von Mises stress. The uniformity of the contact pressure is better for the high quality mesh. Otherwise results are very similar.

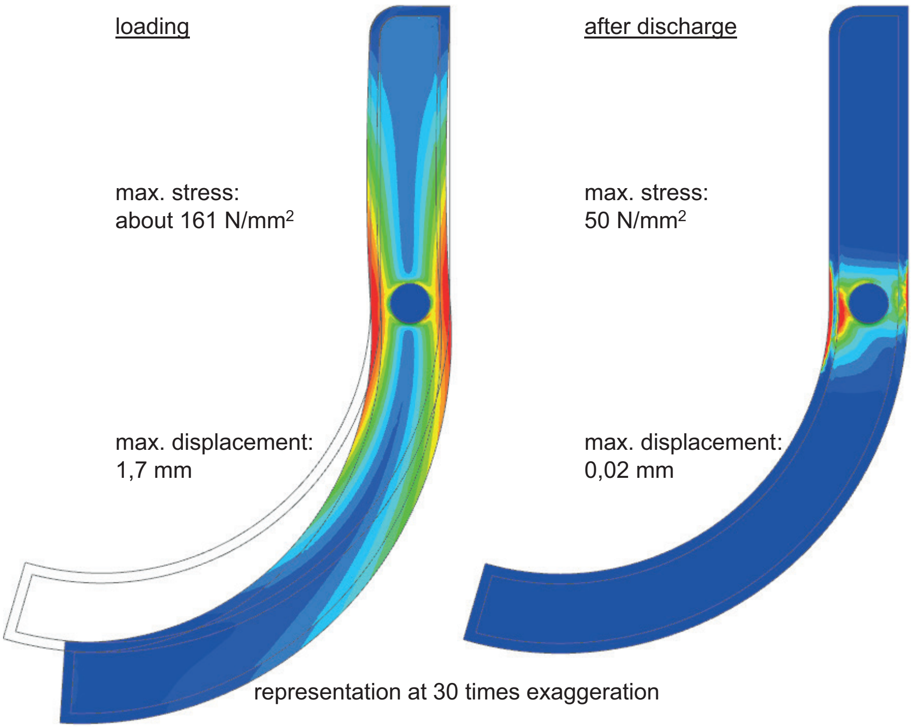


**Figure 25** The stress state and deformation before and after the discharge is shown.

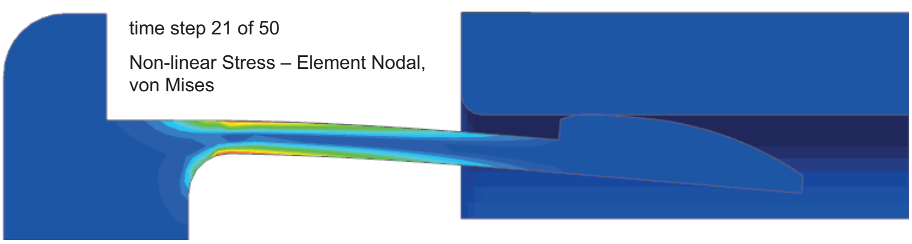


**Figure 26** With ATS, the solution was performed completely.

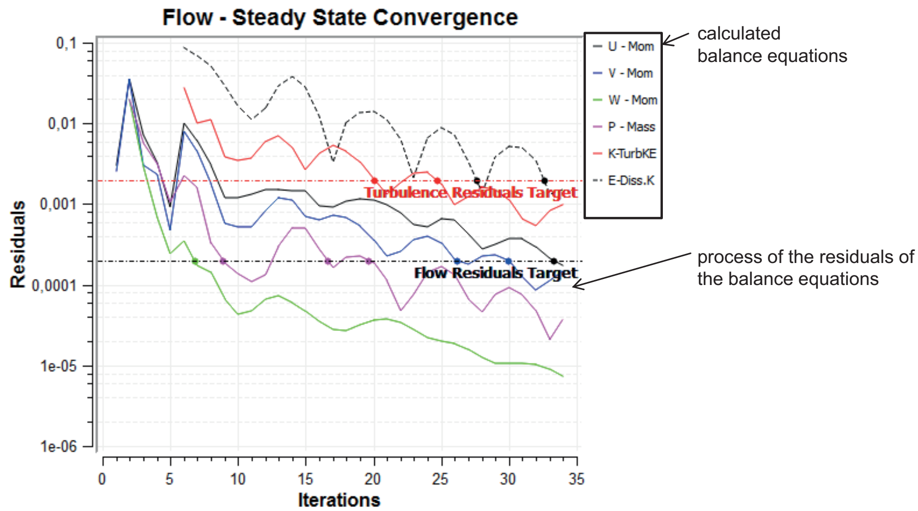


**Figure 27** With the convergence graphs, it can be judged whether the computation converges or diverges. For each calculated balance equation residuals arise which are small deviations. With the course of the residuals, the solving process is controlled.

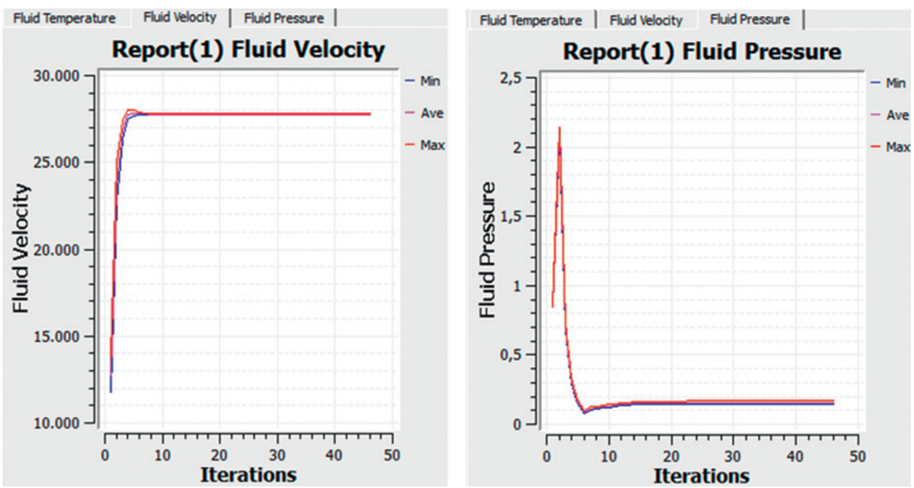


**Figure 28** Via the button *Graph, Traced Flow Results* various graphs are shown in the solution monitor with the course of all requested interim results. These graphs are updated with each time step. Speed and pressure on the end face of the profile end up with calm behavior.

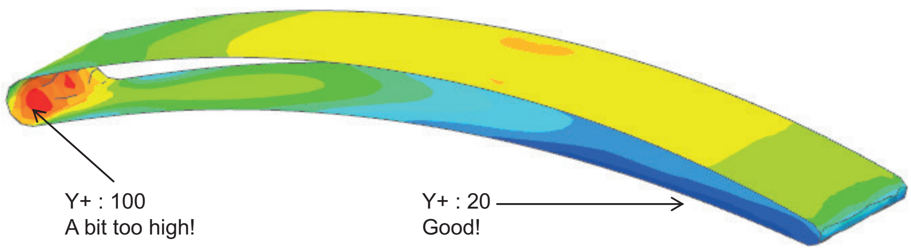


**Figure 29** Important rules for the evaluation of the *Y+* result


**Figure 30** The static pressure distribution is plausible for an airfoil.

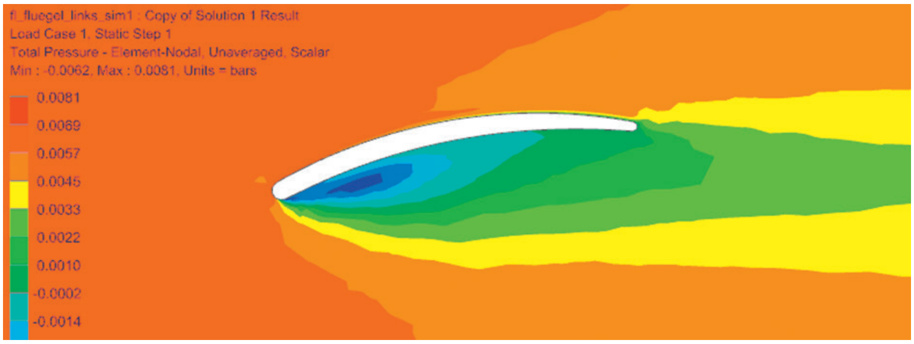


**Figure 31** The total pressure always decreases in flow direction. Reasons therefore are the flow losses in every flow.

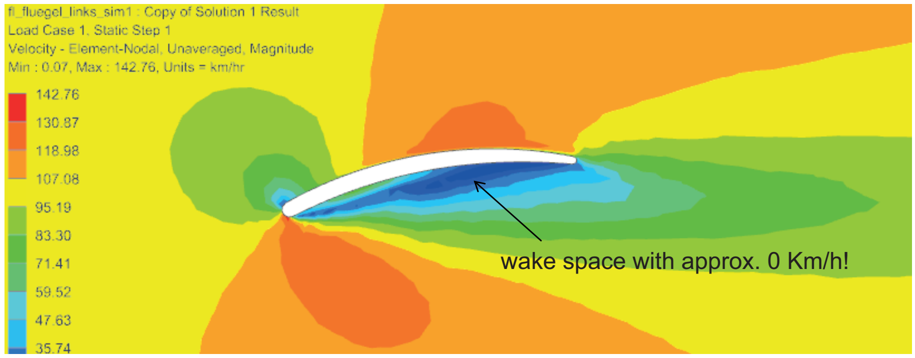


**Figure 32** Calculated velocities in units of km/h

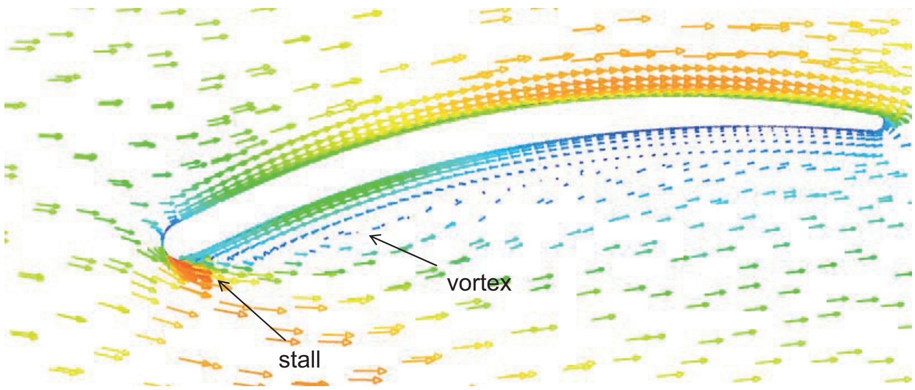


**Figure 33** The display with arrows helps for analyzing the flow directions. The velocity distribution shows the wake space, where the flow detaches from the profile.

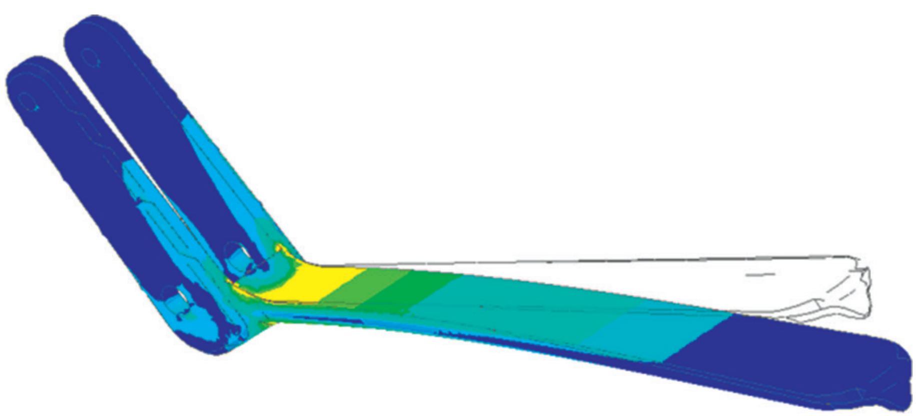

**Figure 34** This is the stress result of the mini FEM analysis with NX Teamcenter.