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 **simufact**

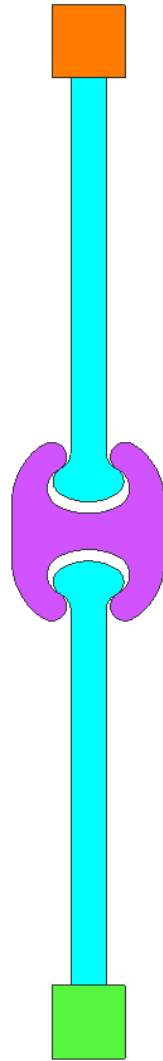
FEM simulations of MDF

Consulting project for SteelWall ISH GmbH

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SteelWall[®]
Schlossprofile für Stahlpundwände



MDF = DF + 2x M140

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Problem description

- A simulation study of ideal straight and symmetric tensile loading was conducted for MDF clutch bar consisting of the components DF and 2x M140.
- The simulations were set-up as 2d planar analysis assuming a plane strain state using a die velocity of 1 mm/s.
- Coulomb friction with a friction coefficient of $\mu = 0.5$ was assumed after discussion with the customer.
- The components have only be stacked together. Weld seams have not be considered between the two components.
- The main focus of the post processing are the evolution of the forces over the stroke as well as the distribution of the equivalent v. Mises stress.

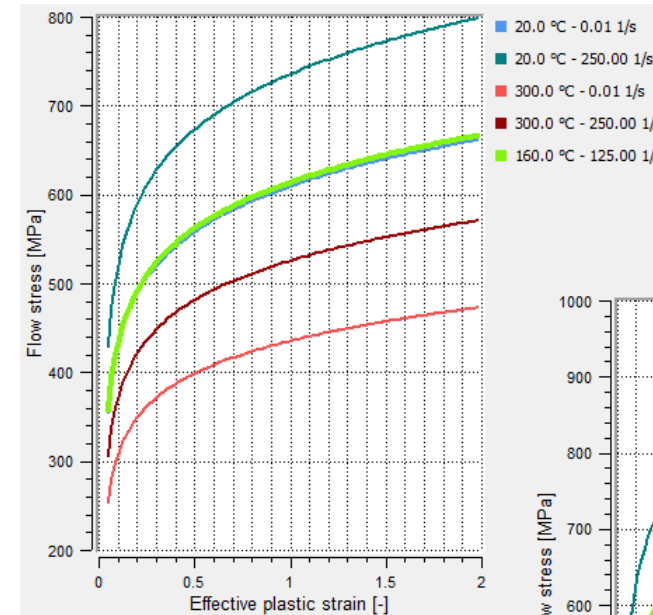
MDF = DF + 2x MF140

Material data

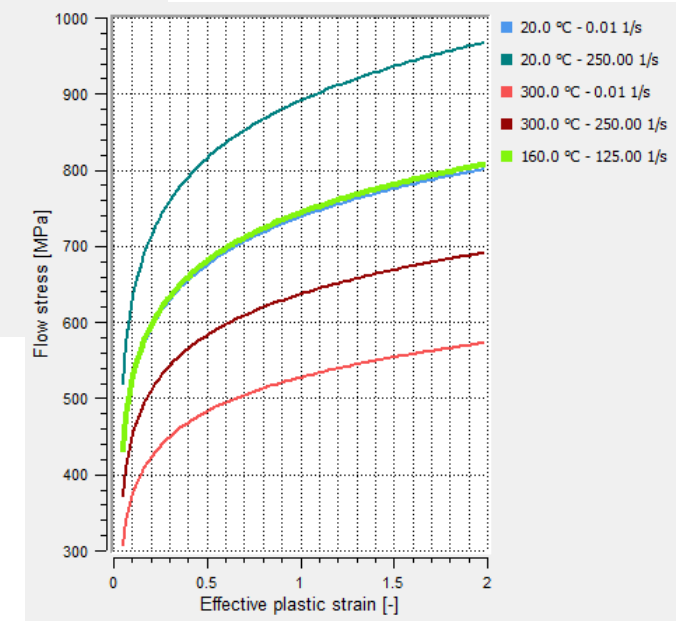
- Sheet piles are made of S355J2.
- Assumed / researched characteristics:

| Mechanical properties | | | Chemical Distribution | | | | |
|-----------------------|-------------------|-----------------------|-----------------------|-----|-----|-------|-------|
| Material | Min. yield stress | Min. tensile strength | C | Si | Mn | P | S |
| | MPa | MPa | % | % | % | % | % |
| S355J2 | 355 | 480 | 0,27 | 0,6 | 1,7 | 0,055 | 0,055 |
| S430GP | 430 | 510 | 0,27 | 0,6 | 1,7 | 0,055 | 0,055 |

- The material data for S355MC, normalized, from the Simufact Forming material database was used and scaled according to the minimum yield stress



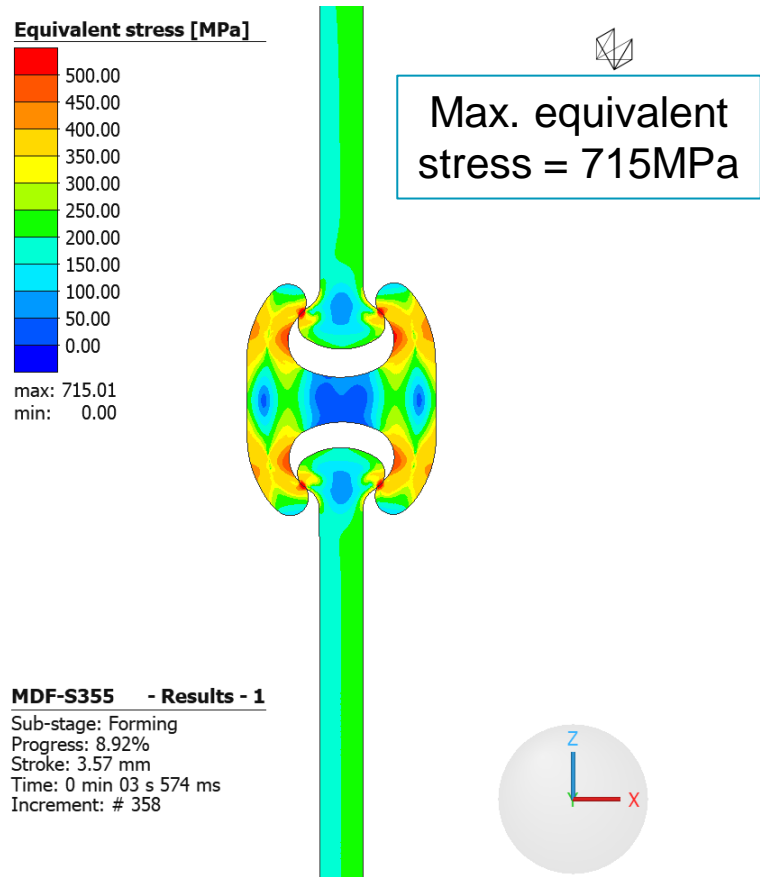
S355J2



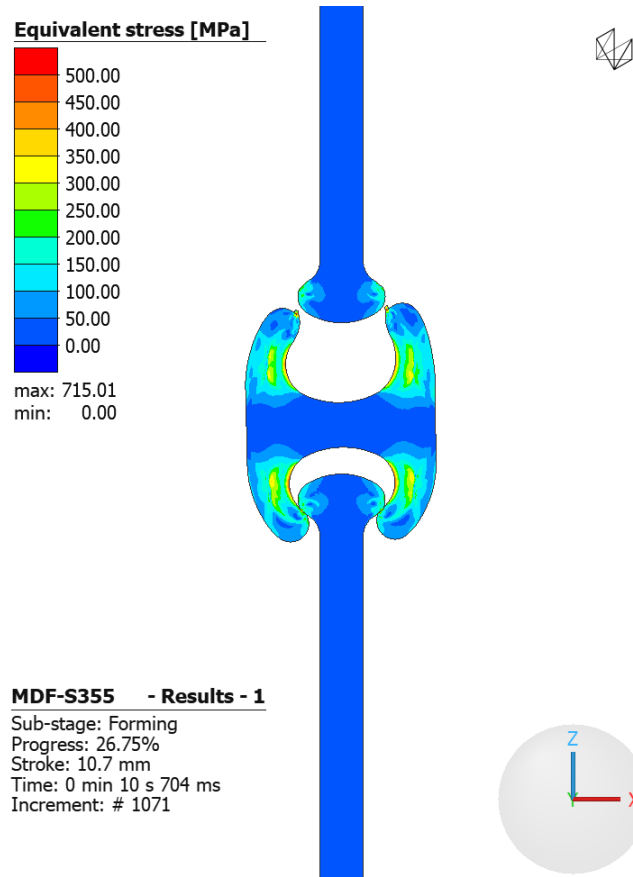
S430GP

MDF = DF + 2x MF140 – S355J2

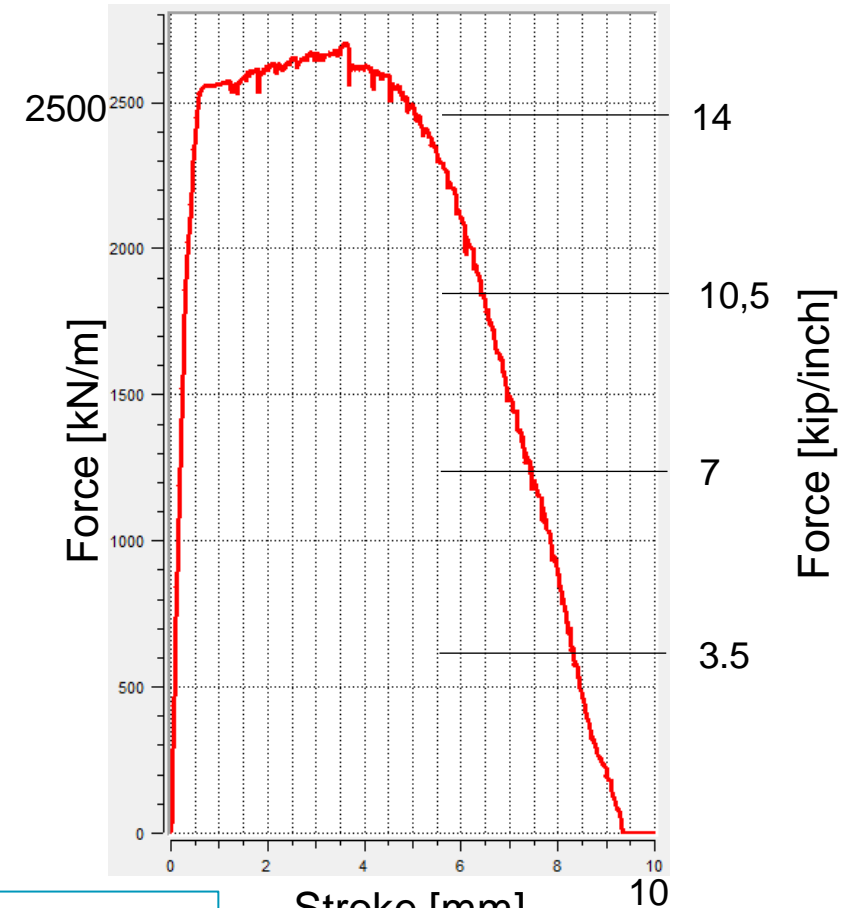
Simulation results



Equivalent stress at maximum force



Equivalent stress after release



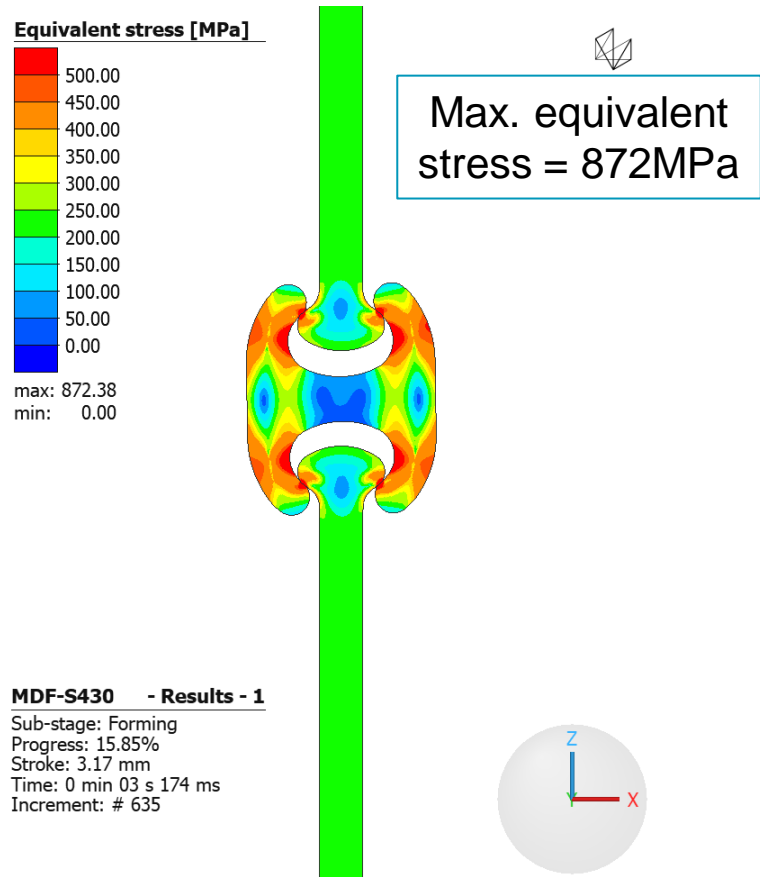
Max. force =
2700 kN/m =
15.42 kip/inch

Stroke [mm]
each leg

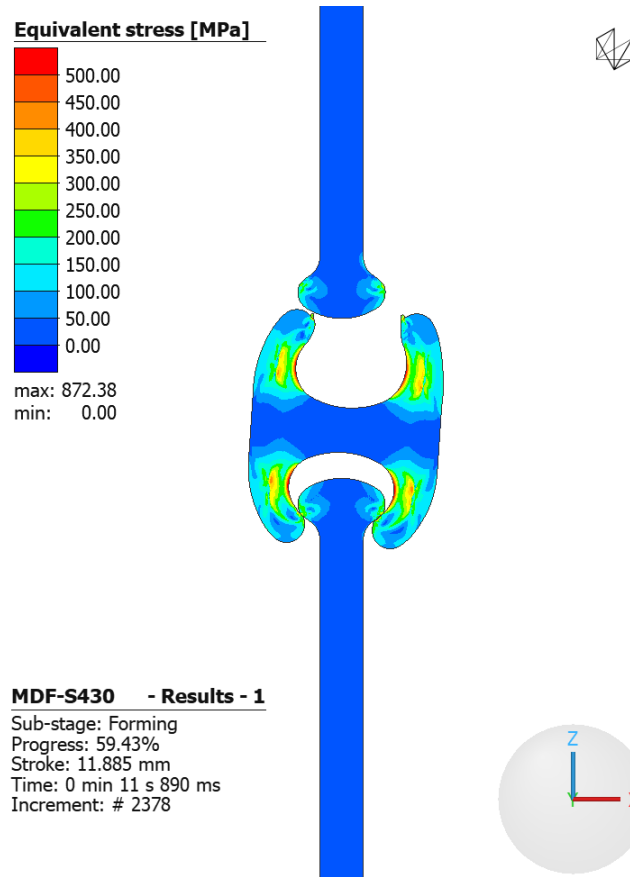


MDF = DF + 2x MF140 – S430GP

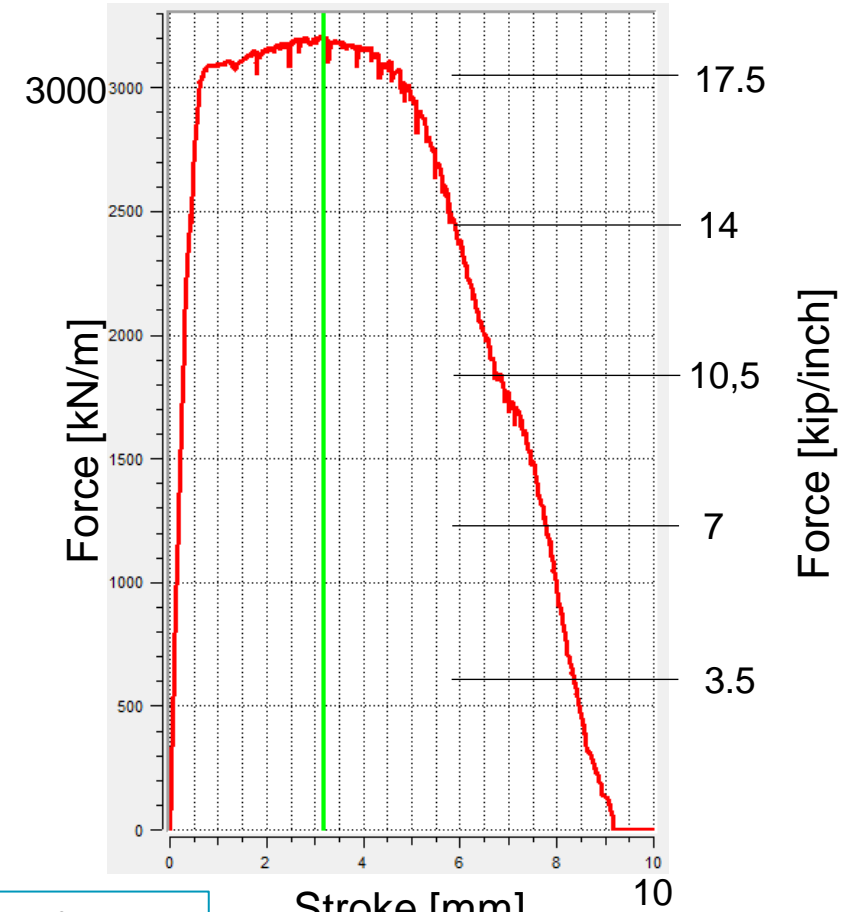
Simulation results



Equivalent stress at maximum force



Equivalent stress after release



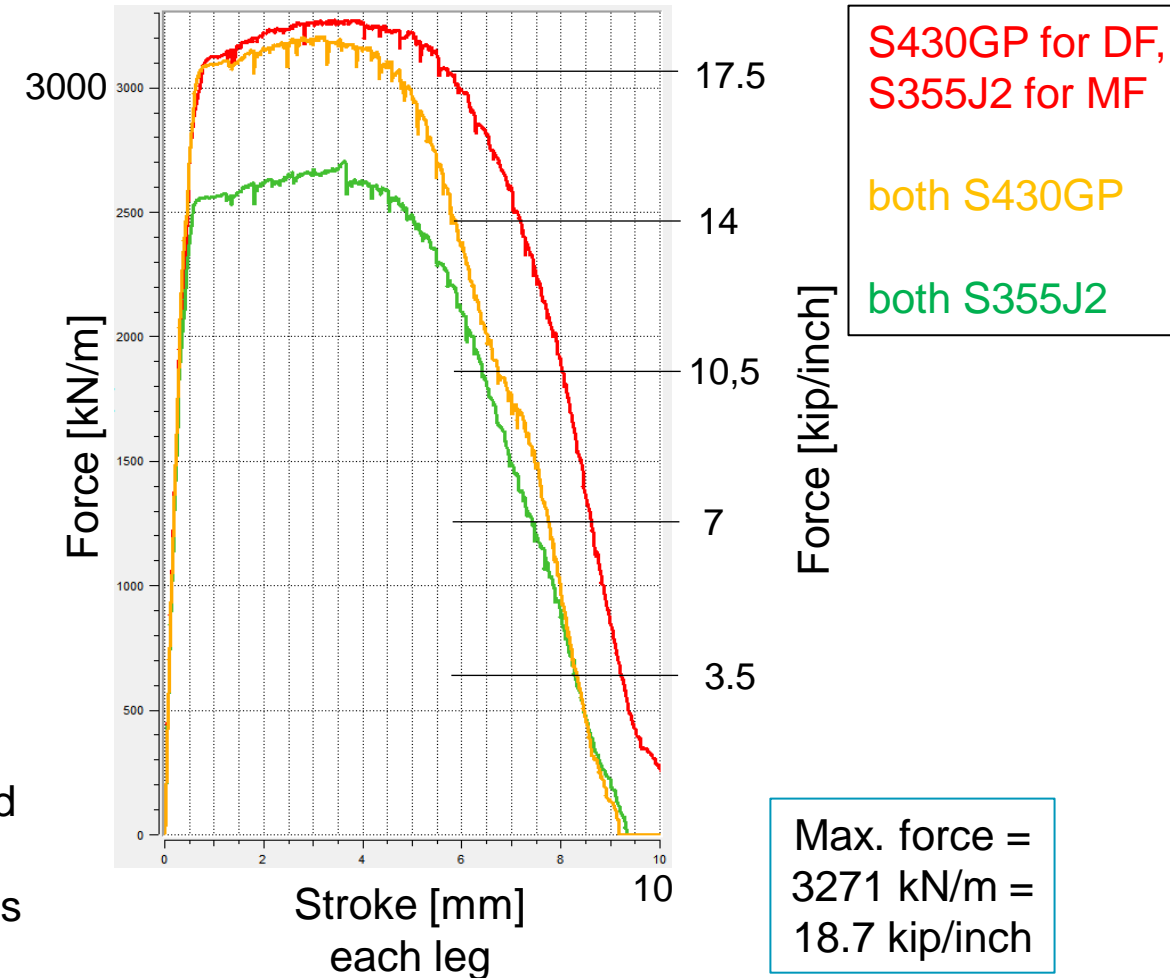
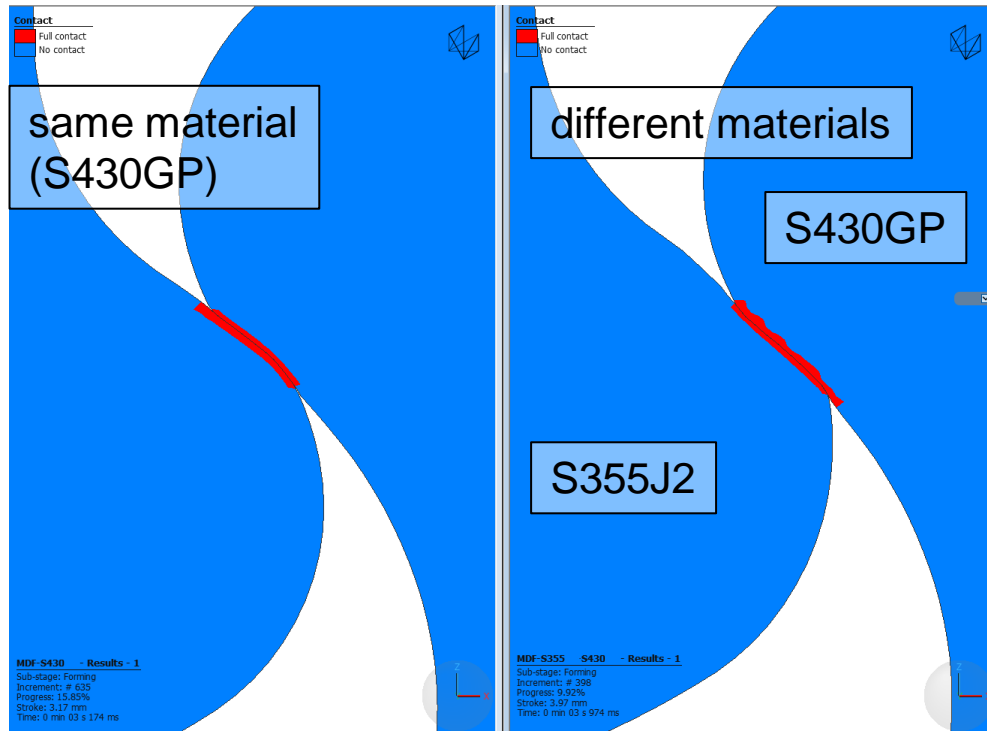
Max. force =
3204 kN/m =
18.3 kip/inch

Stroke [mm]
each leg



MDF = DF + 2x MF140 with DF made of S430GP and MF made of S355J2

Simulation results



- If MF and DF use the same material the local deformation and the contact area is the same for S355J2 and S430GP
- If the MF is softer as the DF, the local deformation of the MF is bigger leading to a longer contact length.
 - This leads to little higher acceptable forces.