

Reduction of cavity wall thickness around weld locations

Norbert Kuder and Carlo Zanoni EN/MME

05/10/2015



ENGINEERING
DEPARTMENT

Preliminary calculations

- No helium tank (not conservative, but saves lot of time)
- Shell elements around welds
- Cavity constrained at interface with NbTi rings
- Load:
 - 1.8 bara pressure
 - pretuning ± 0.13 mm

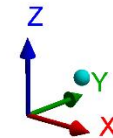
Preliminary calculations

Figure
01/10/2015 08:45

-  Nb-Ti
-  Niobium
-  Titanium



0.00 150.00 300.00 (mm)
75.00 225.00



Full cavity (pretuning pushing)

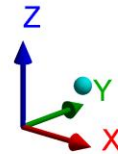
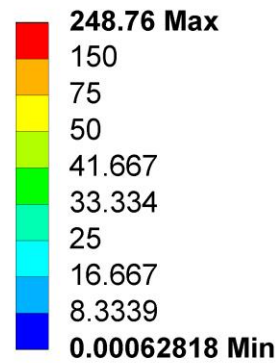
Figure

Type: Stress Intensity

Unit: MPa

Time: 1

30/09/2015 15:11



Reduced cavity (pretuning pushing)

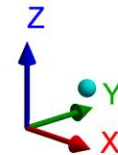
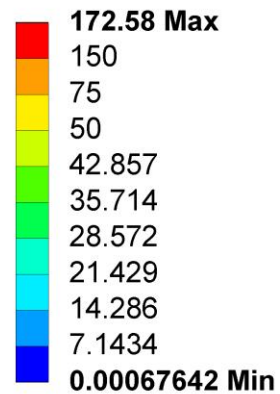
Figure

Type: Stress Intensity - Top/Bottom

Unit: MPa

Time: 1

30/09/2015 14:59



Full cavity (pretuning pulling)

B: Pulling

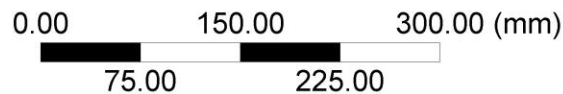
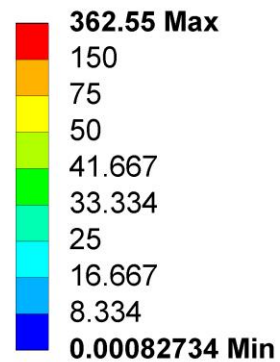
Figure

Type: Stress Intensity

Unit: MPa

Time: 1

30/09/2015 13:45



Reduced cavity (pretuning pulling)

A: Pulling

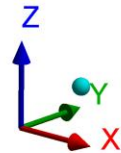
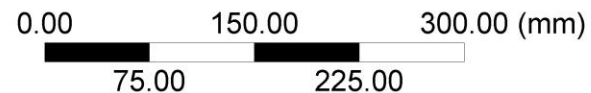
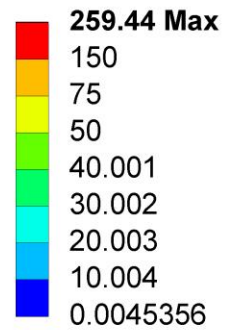
Figure

Type: Stress Intensity - Top/Bottom

Unit: MPa

Time: 1

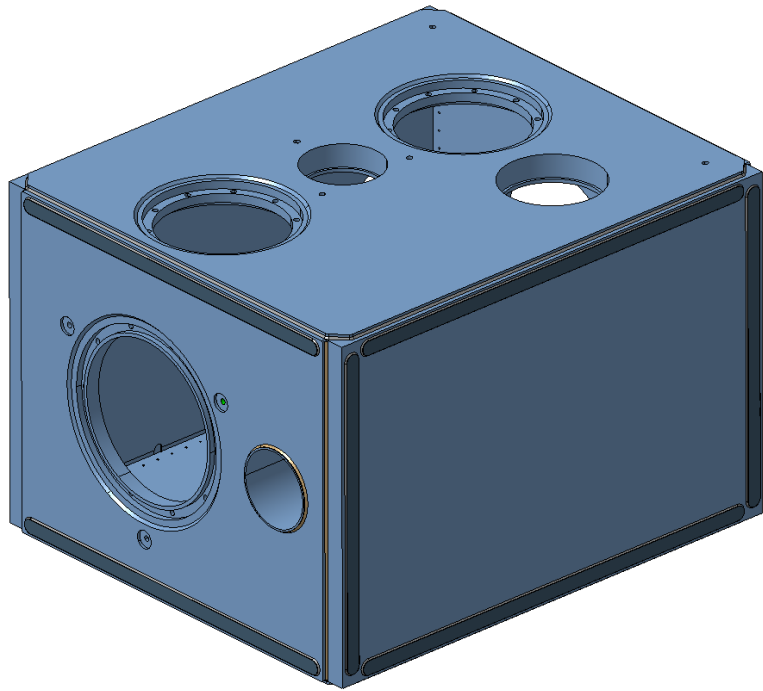
30/09/2015 11:59



Notes and preliminary conclusion

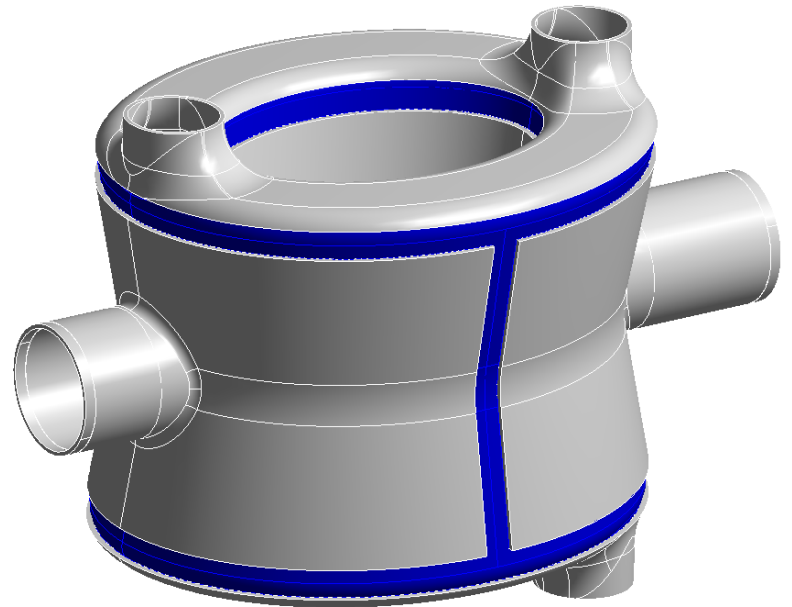
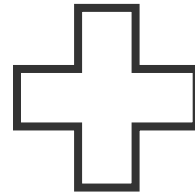
- Peak stress values not indicative between full and reduced (different mesh)
- The advantages of reducing the thickness cannot be ruled out
- Analysis with helium tank required
- Concentration of stresses to be carefully considered (FE not always helpful on this)

Cavity submodel



Helium vessel

■ 2.8 mm

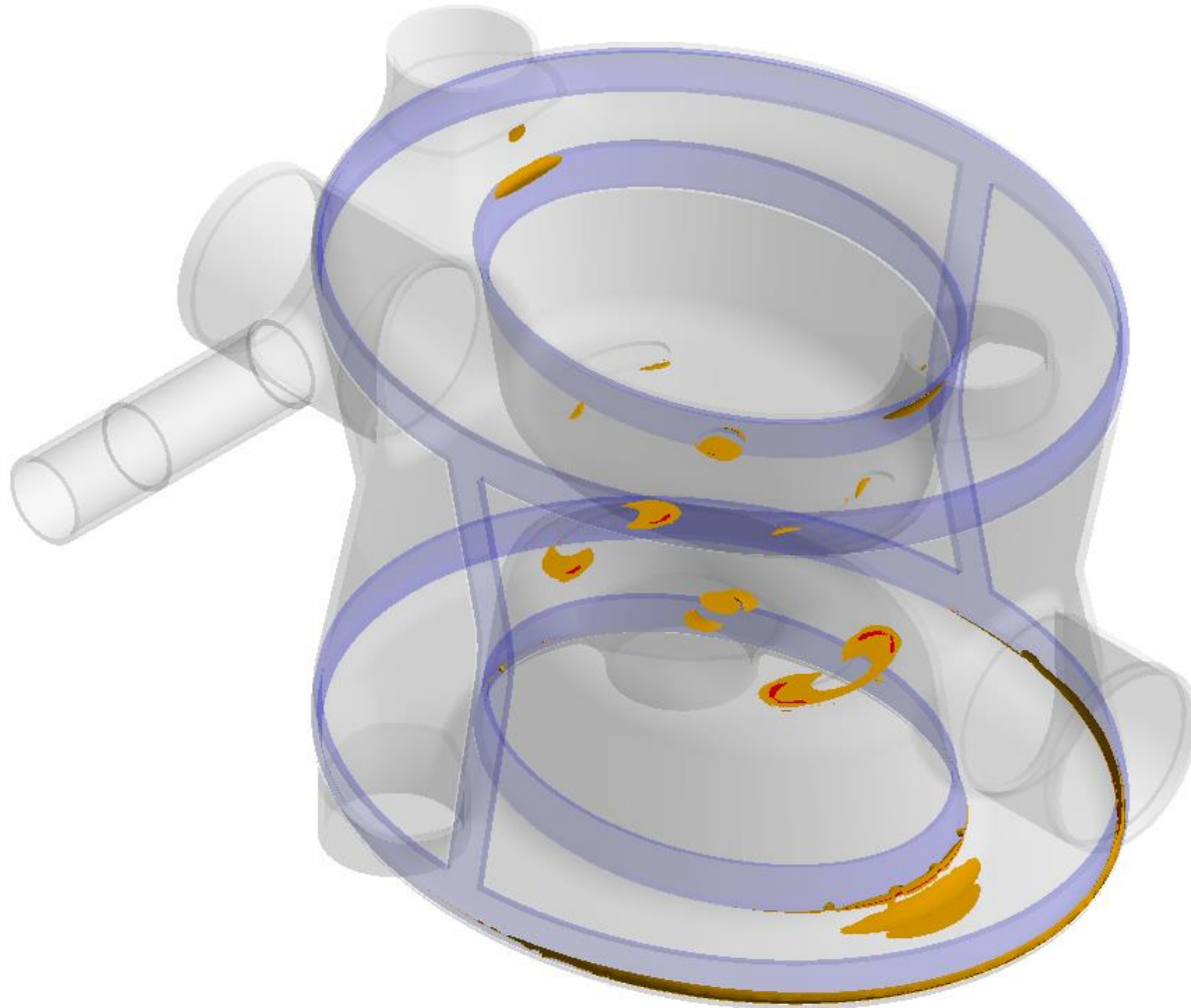
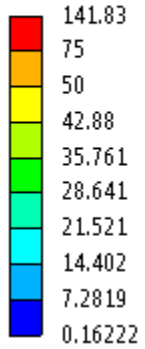


Crab cavity
(submodel)

Cavity 2.8 mm + pressure

Stress Intensity

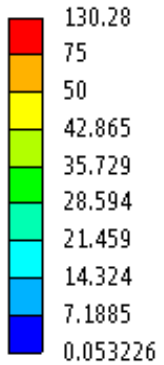
Unit: MPa



Cavity original + pressure

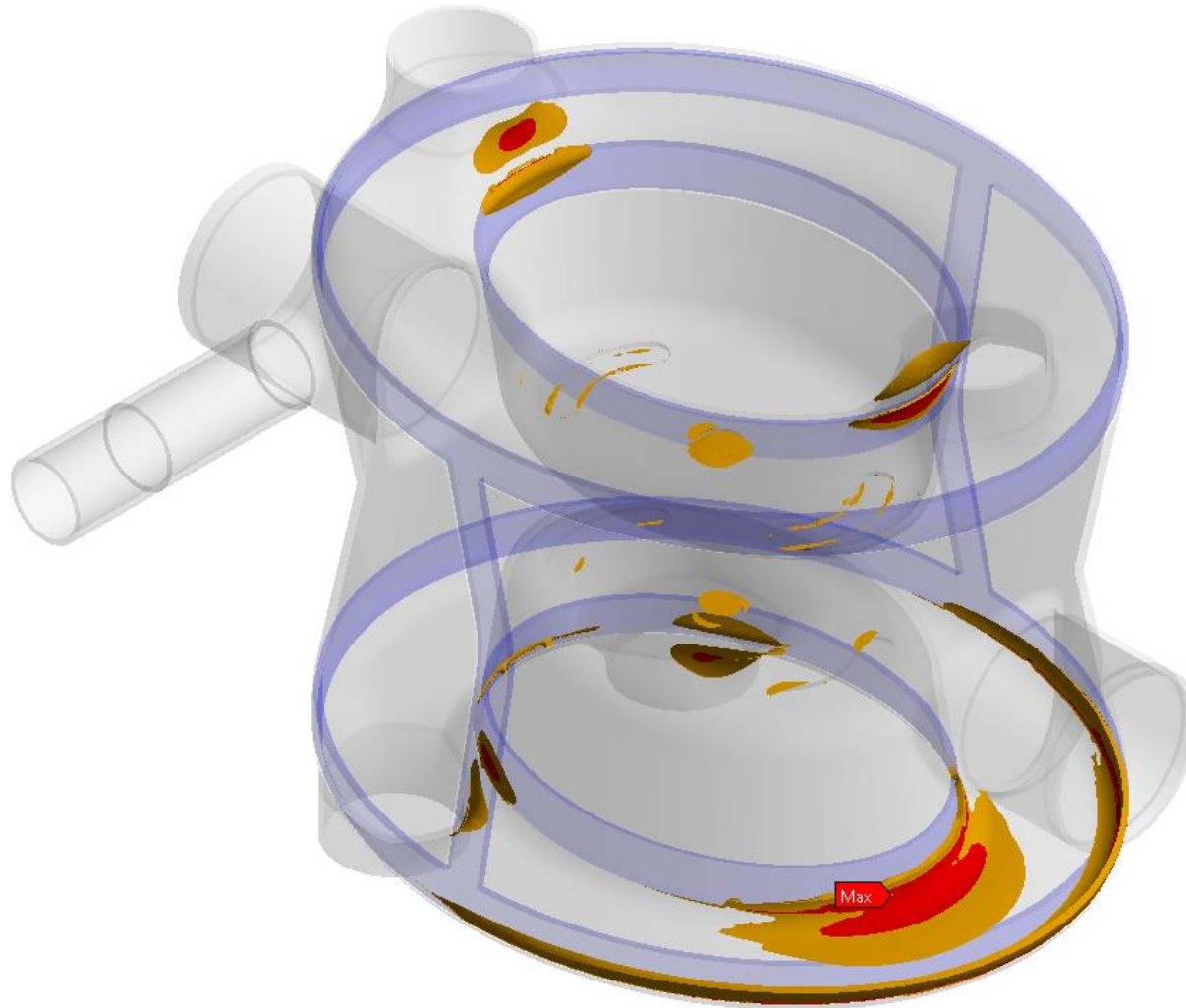
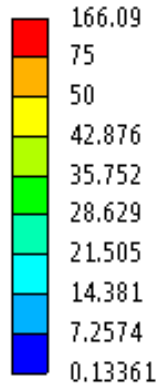
Stress Intensity

Unit: MPa



Cavity 2.8 mm + pretuning (0.15 mm)

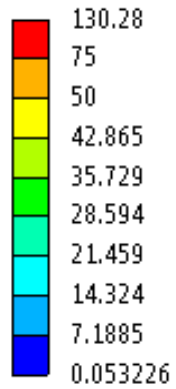
Stress Intensity
Unit: MPa



Cavity original + pretuning (0.2 mm)

Stress Intensity

Unit: MPa





ENGINEERING
DEPARTMENT