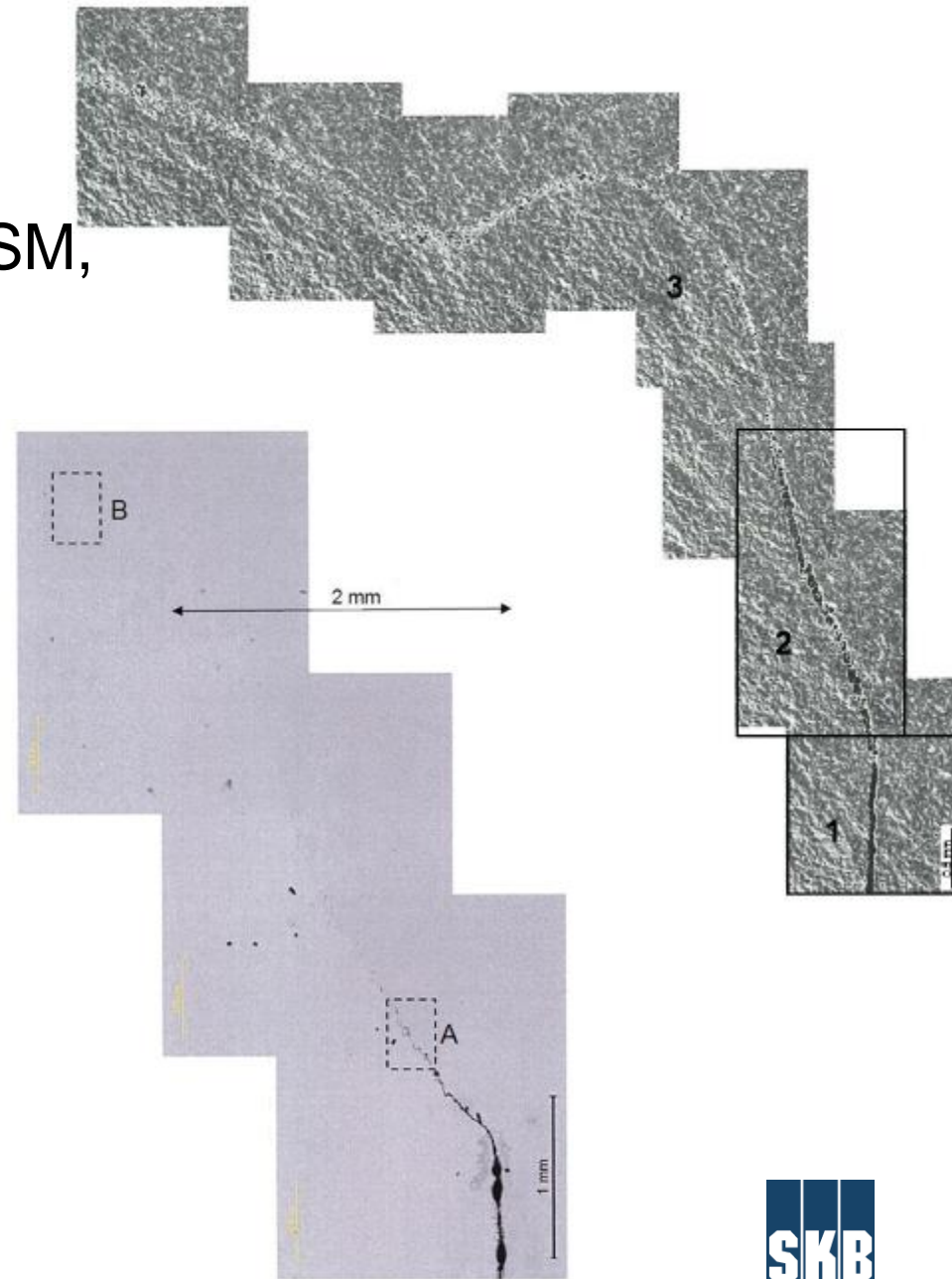




New argon shielding gas chamber at SKB

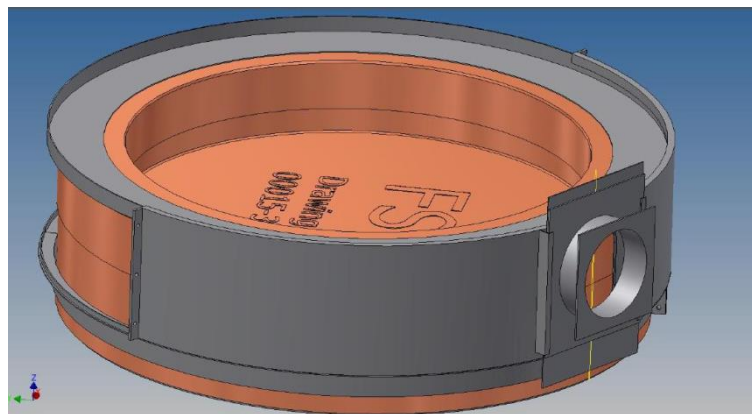
Oxides in the weld

- Remaining question from SSM, see SSM2011-1137-64
- Elongation at rupture OK
- Corrosion properties OK
- Plan of attack
 - Gas shielding

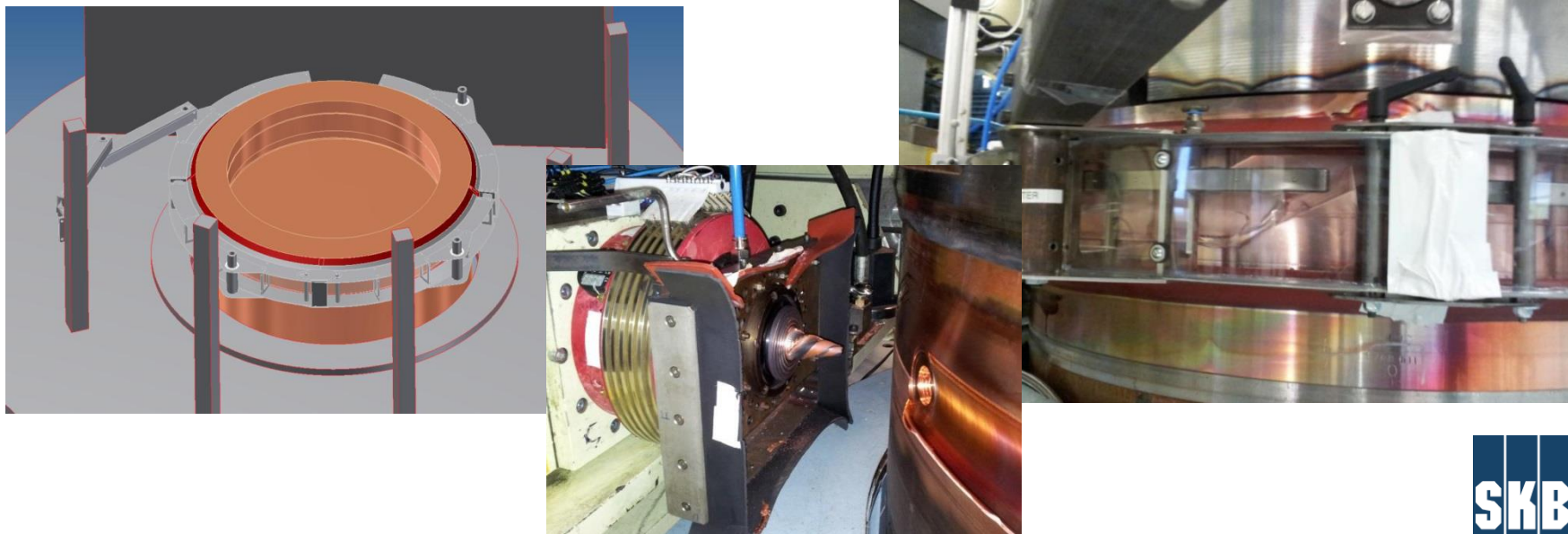


Previous gas shields

First version

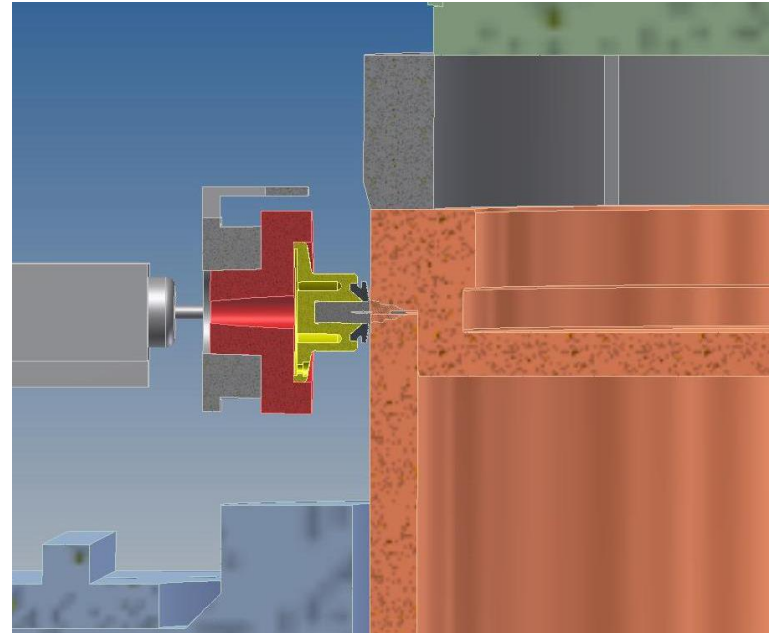


Second version



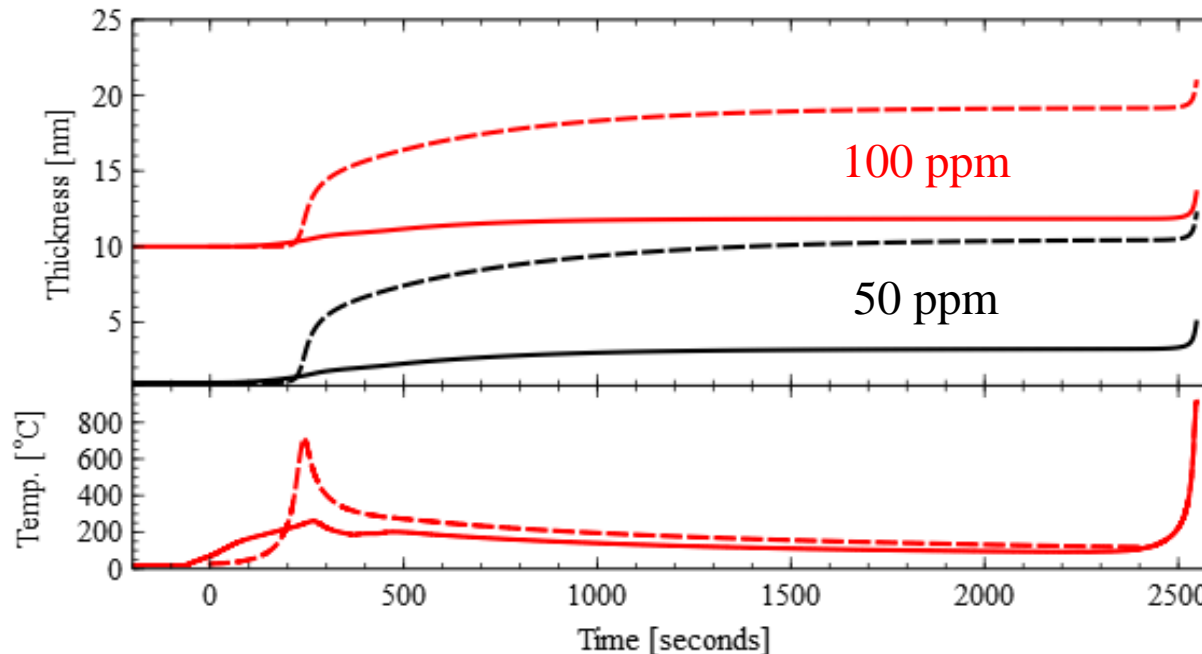
Design Considerations

- Hot surfaces – sealing material.
- Material movement – clamping.



Oxygen level in the shielding gas

- Calculations of the expected oxide thicknesses from a previously determined model.
- An oxygen level in the shielding gas lower than 50-100 ppm should not yield a significant improvement.



$$\frac{x}{k_l} + \frac{x^2}{k_p} = t$$

$$k_p(p_{O_2}, T) = F_p \left(\frac{p_{O_2}}{p_{ref,p}} \right)^{n_p} \left(A_{p,1} e^{-\frac{E_{p,1}}{RT}} + A_{p,2} e^{-\frac{E_{p,2}}{RT}} \right)$$

$$k_l(p_{O_2}, T) = A_l \left(\frac{p_{O_2}}{p_{ref,l}} \right)^{n_l} e^{-\frac{E_l}{R} \left(\frac{1}{T} - \frac{1}{T_{ref}} \right)}$$

Rebuilding

Feb 2015

Sep 2015

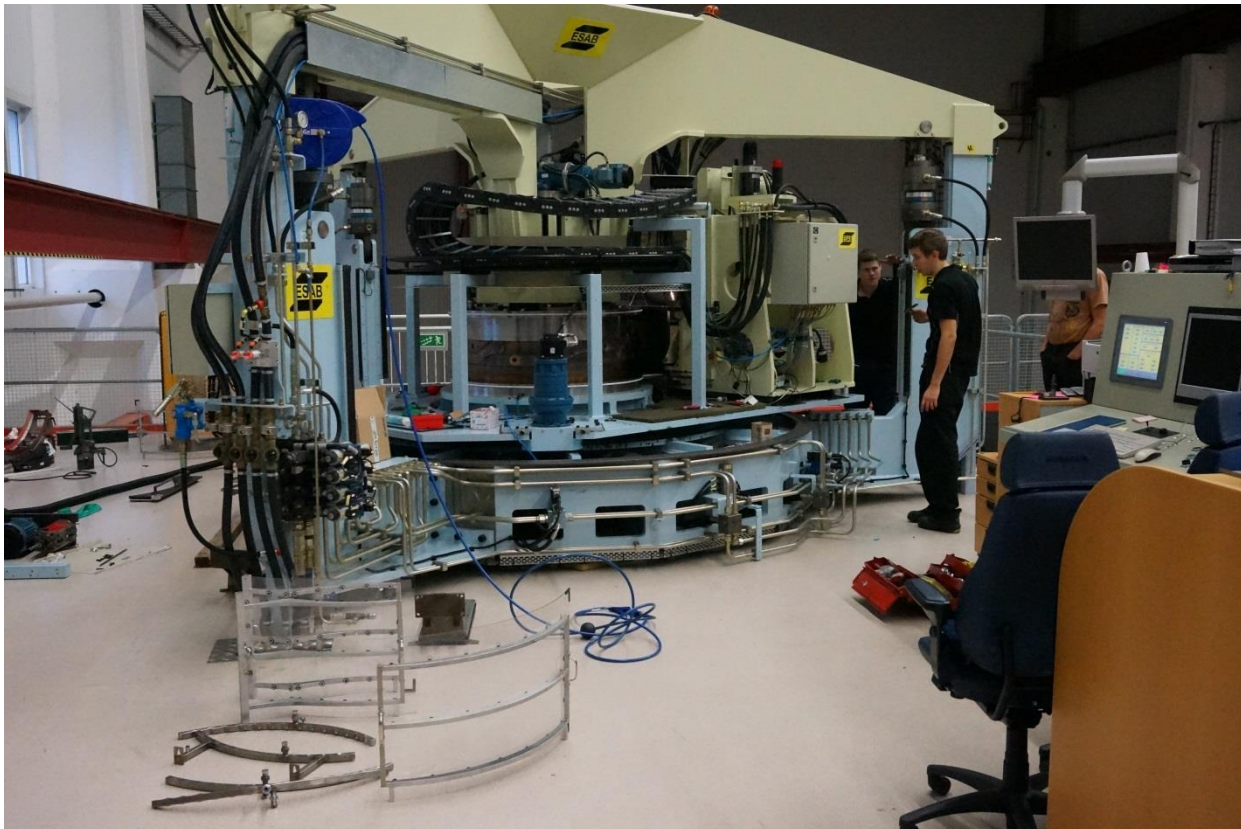
New gas shield

- Construction
- Commission

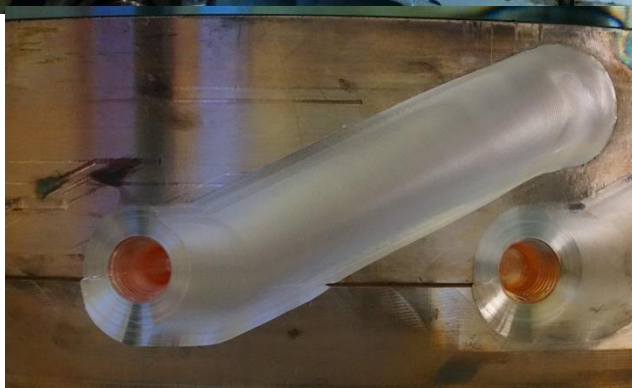
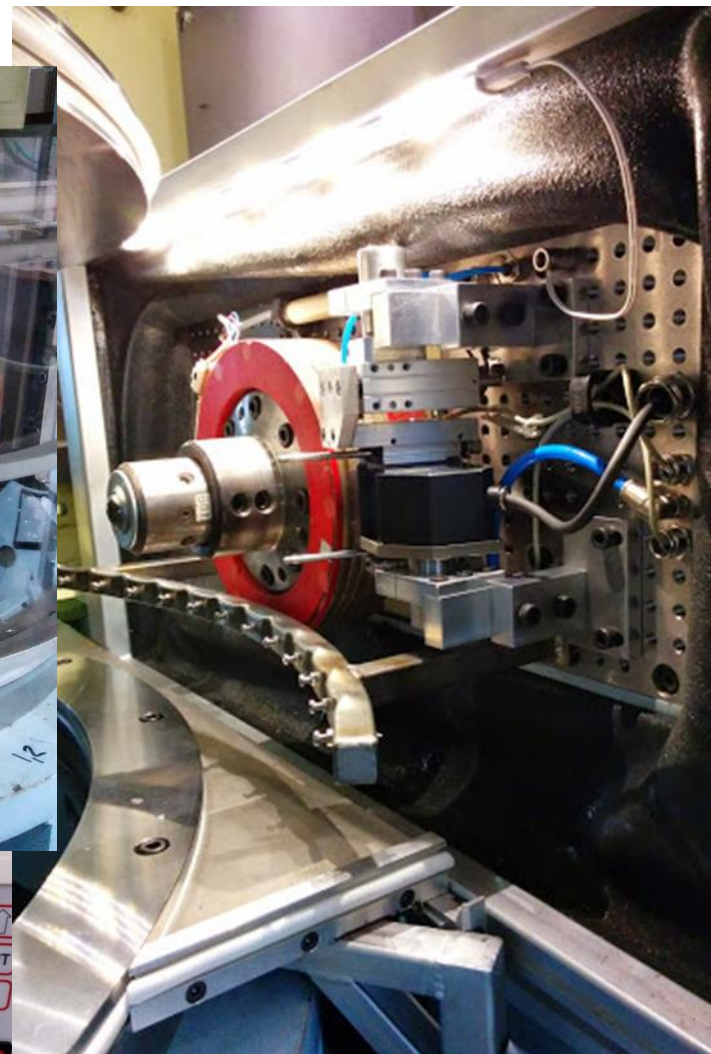


Fullvarvssvetsar

- External
- External + internal



The new gas shield

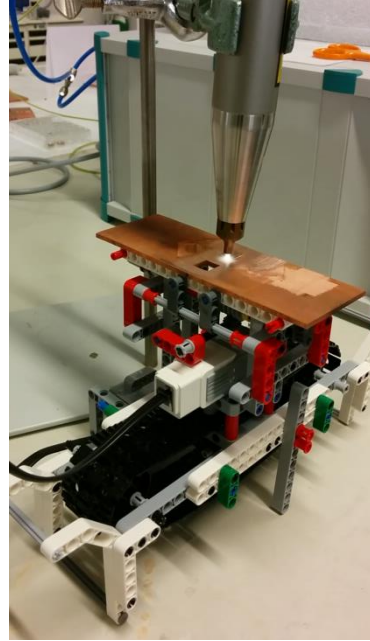


Cleaning

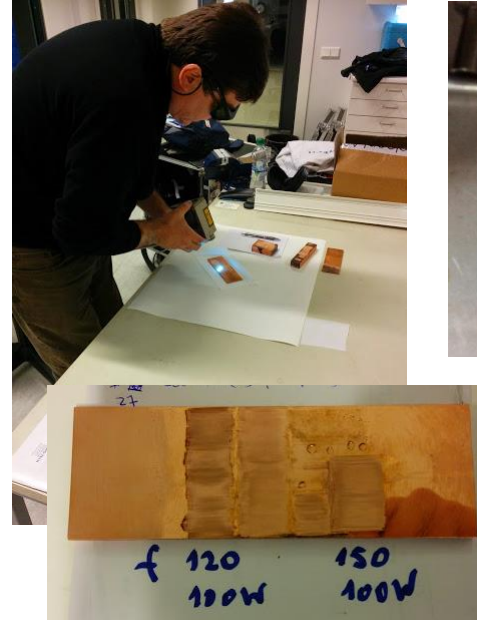
Carbon ice blasting



Plasma cleaning



Laser cleaning



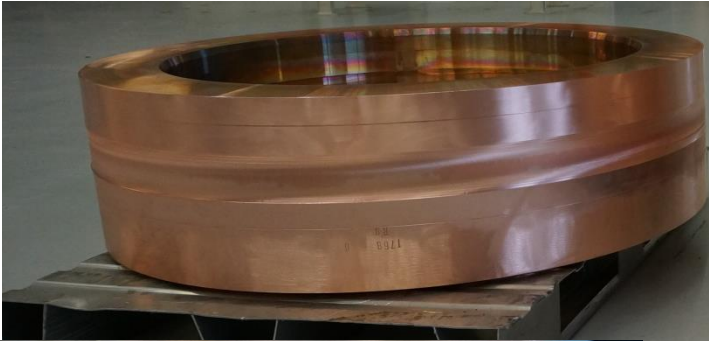
Mechanical cleaning



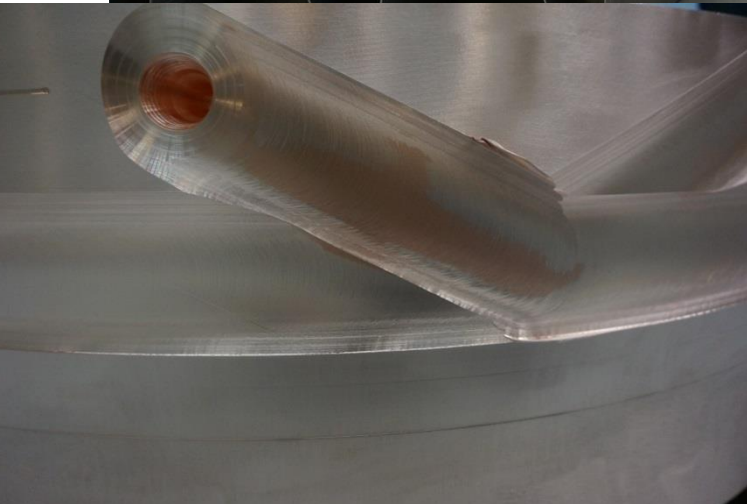
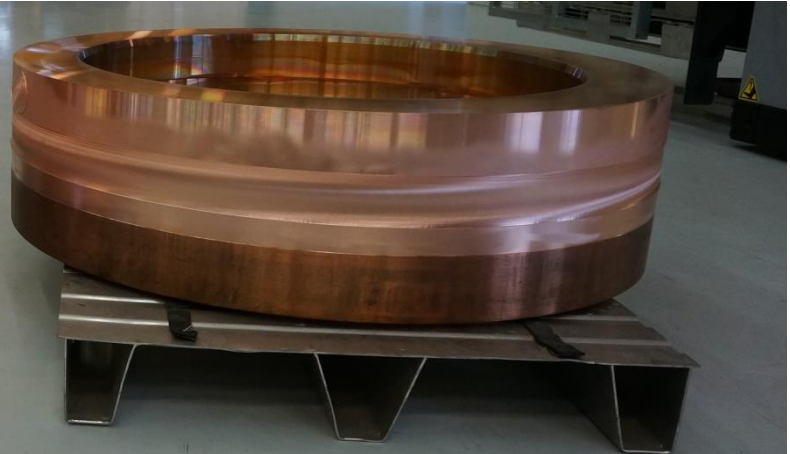
Best methods

Experiments

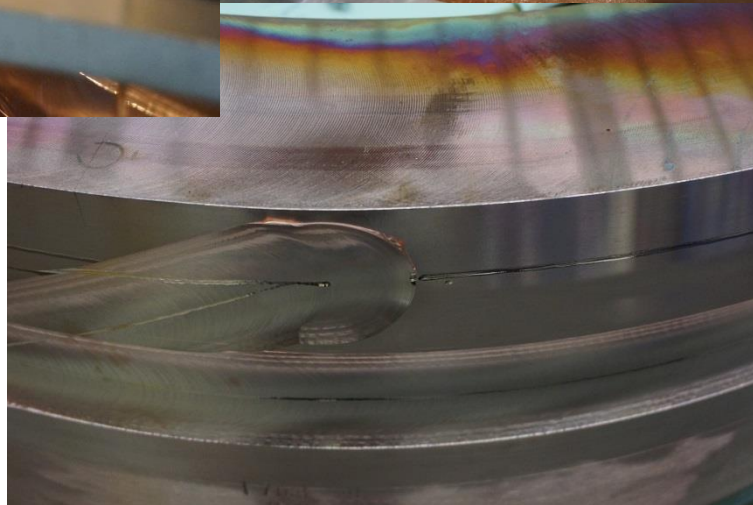
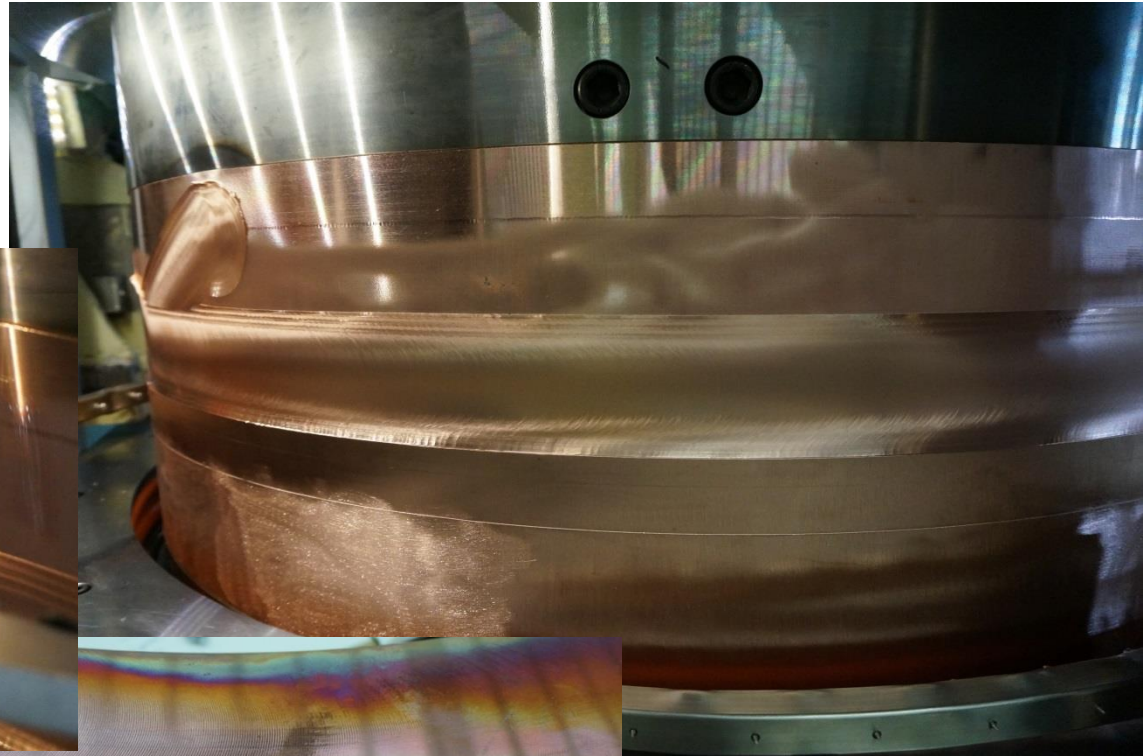
Internal + External
gas shield



External
gas shield

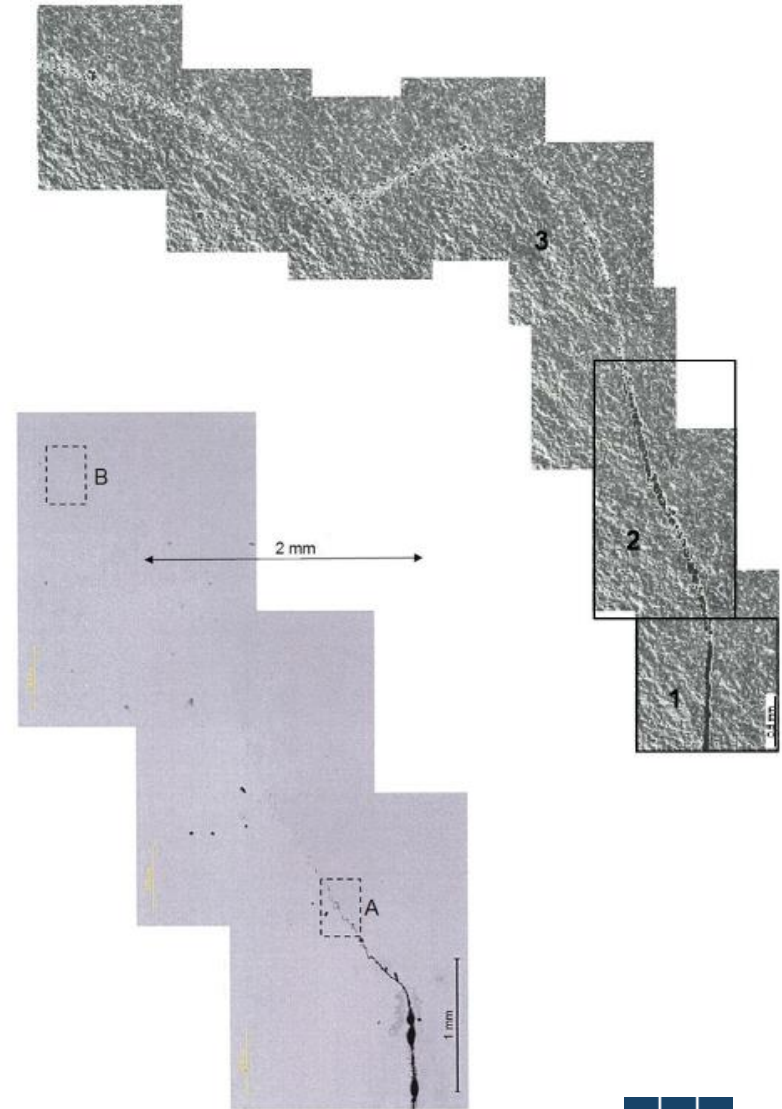


Reducing atmosphere (2 % Hydrogen)



Outlook

- Metallographic inspections (oxide streaks)
- Oxygen content measurements
- Hydrogen annealing + metallography.



Future work

- Process window for oxides
 - Pre oxidised surfaces
 - Creep testing
 - Corrosion testing
- Process control, cleaning/oxidation
 - Optical reflectometry

