

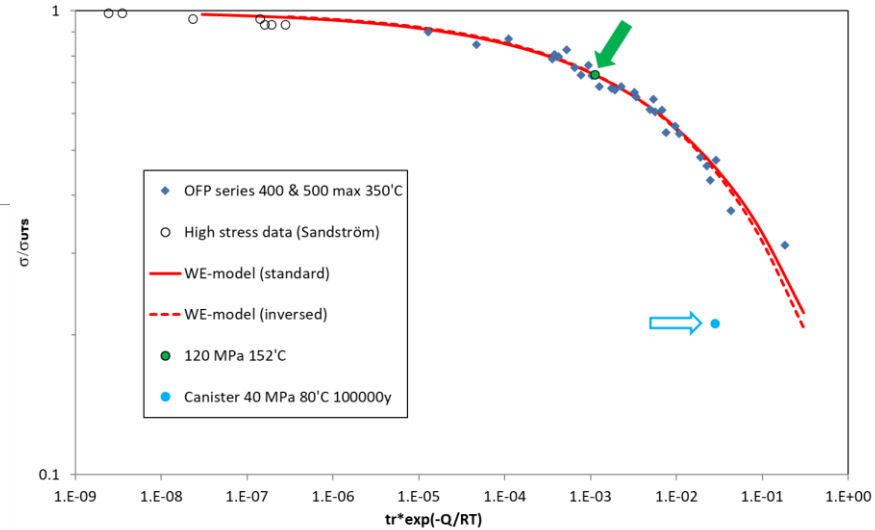
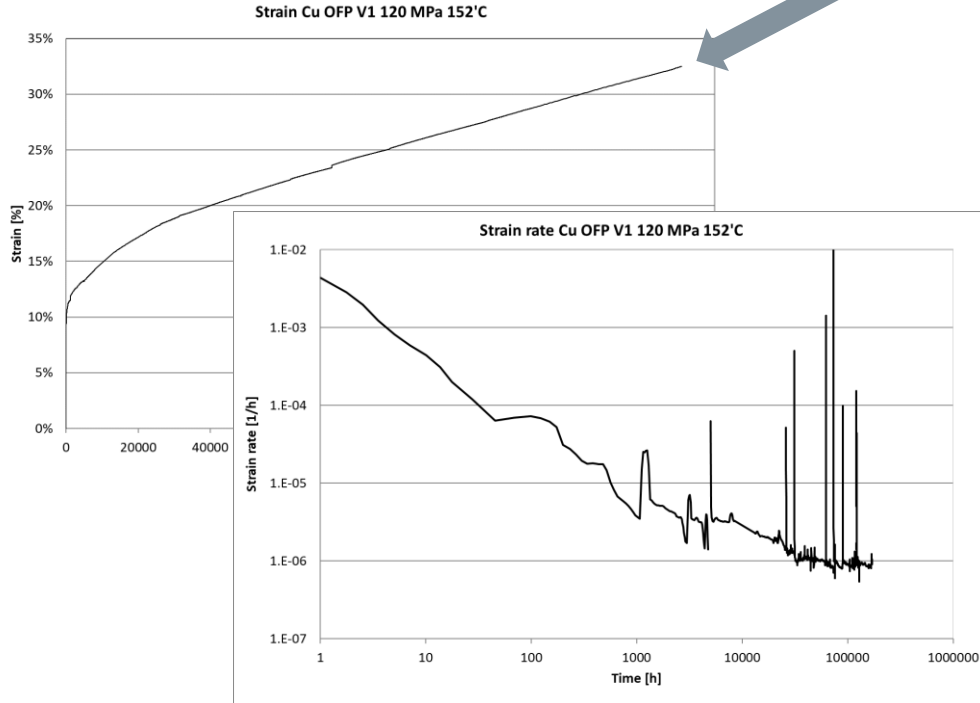


VTT

**BECOLT project
KYT Final seminar 23-
24.1.2023
Juhani Rantala, VTT**

26/01/2023 VTT – beyond the obvious

Long-term creep testing: longest test 19.5 years (interrupted for inspection) - no drop of ductility, now at >32% strain



Test at 70MPa 200°C interrupted after 13.4 years at 10% strain

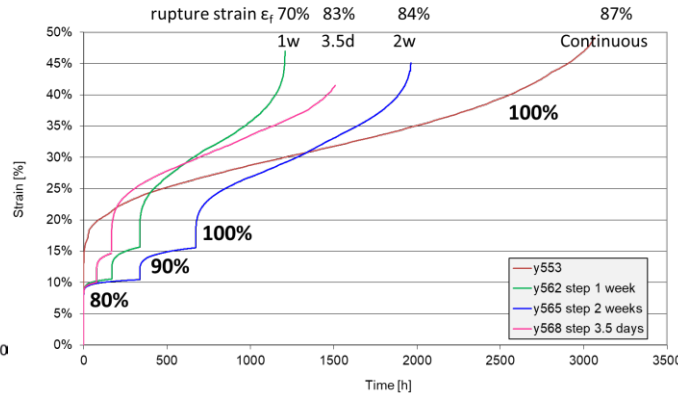
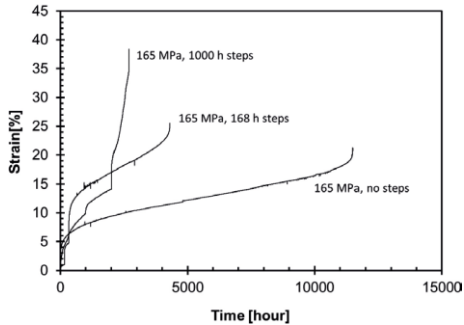
Stress history dependence in stepped loading tests in Cu-OFP

Strong life shortening at 75°C, 11500h continuous test, SKB report R-14-31

Strong life shortening at 175°C, testing by VTT

Hardly any influence on strain rate at 90°C !

Load 80% for 1 week
Load 90% for 1 week
Load 100% to rupture

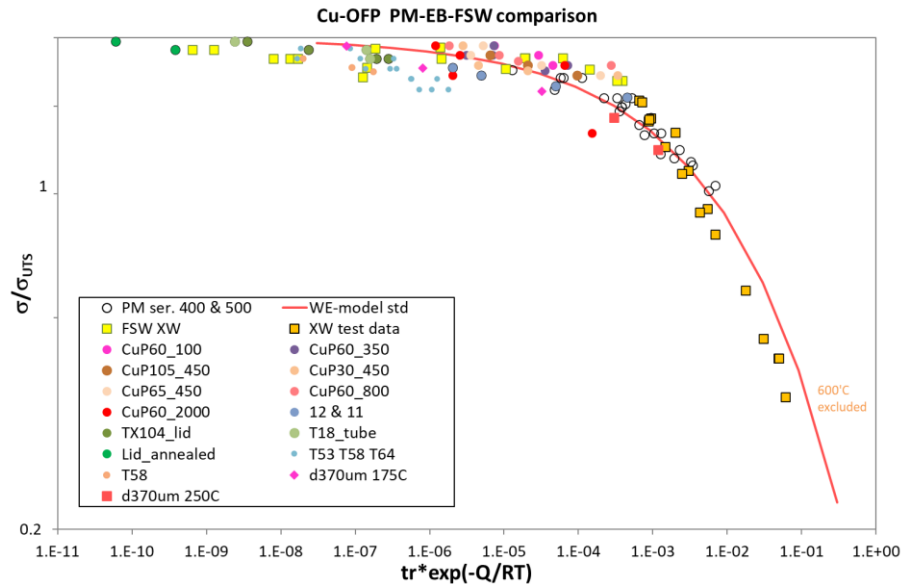


Modelling of creep of Cu-OFP

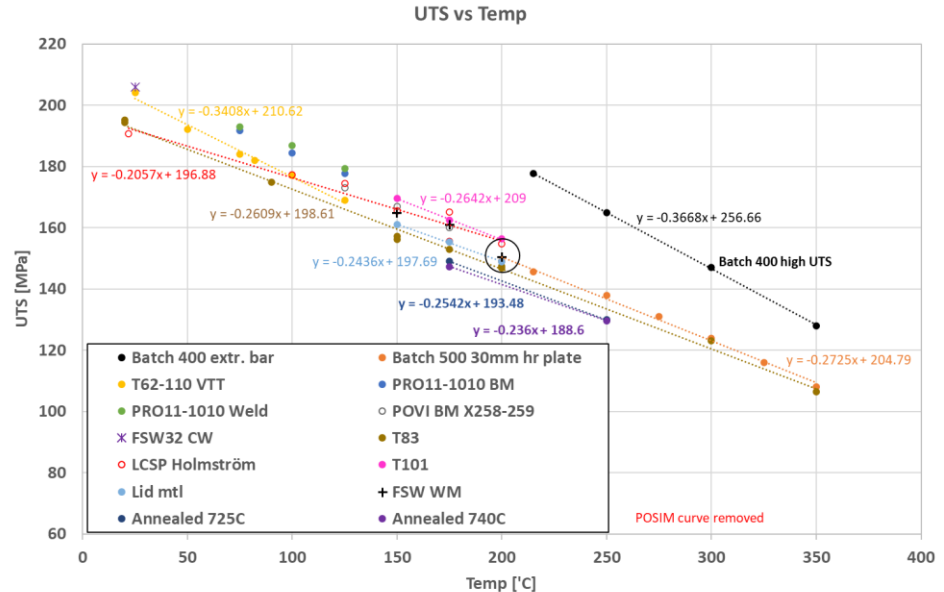
Differences between batches in rupture times!

Define creep models separately for:

- Extruded pipe
- Forged pipe
- Lid
- Weld metal



Differences between batches also in tensile strength!

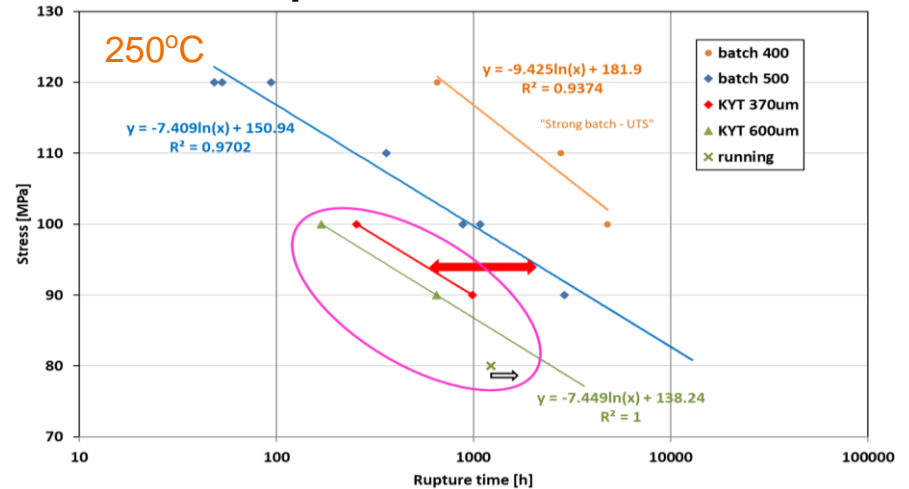
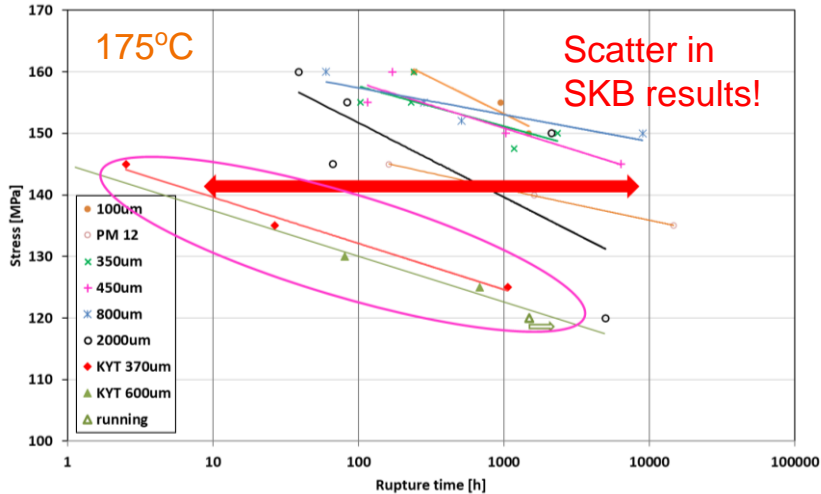


Modelling of creep of Cu-OFP

Influence of grain size:

Producing a certain grain size by heat treatment does not guarantee the same **dislocation structure** as via the normal fabrication route!

Creep rupture times of the heat treated copper are reduced strongly, *grain sizes 370 μm and 600 μm tested*



Master's thesis by Jani Vihko on optical image analysis of long-term tested Cu-OFP cross-weld samples tested for Posiva Oy

A KYT seminar dedicated to mechanical behaviour of copper and hydrogen effects in Nov 2021

Novel methods: Small Punch tensile testing: $\phi 8 \times 0.5 \text{ mm}$

