

HOT-CELL ACTIVITIES AT VTT

524.

HOT-CELLS

- constructed ca 1977-1979
- gamma cells (no fuel studies)
- shielding: 250 mm, 100 mm and 50 mm lead chambers and local shielding

STANDARD TESTING FACILITIES

1. INSTRUMENTED IMPACT TESTING

- standard Charpy-V hammer, both ISO and ASTM-tup geometries, 300 J / 5.4 m/s, low blow option
- subsize Charpy-hammer, 15 J / 3.8 m/s

test temperatures from -150 °C to 250 °C, liquid bath mostly used, pneumatic specimen transfer system



MANUFACTURING TECHNOLOGY

2. FRACTURE TOUGHNESS TESTING

- two servohydraulic testing systems
- fracture resistance curve and brittle fracture initiation K_{JC} measurements
- partial unloading compliance used (CMOD/LOAD)
- test temperatures: from -150 °C to 250 °C (+300°C), liquid bath mostly used
- specimen size: 25 mm-CT down to miniature specimens
- specimen geometries: 3PB, CT and RCT

3. TENSION TESTS

- servohydraulic testing system
- standard and custom tailored specimen geometries
- test temperatures: from -100 °C to +300 °C



MANUFACTURING TECHNOLOGY

4. HARDNESS MEASUREMENTS

- standard Vickers microhardness measurements,
- sub 1 g microhardness measurements if activity reasonable

5. SEM

- SEM for fracture surface characterisation

6. METALLOGRAPHY

- standard cutting, grinding and polishing facilities

7. PREFATIGUING OF ACTIVE SPECIMENS

- ISO Charpy-size and smaller specimens in 3PB-geometry



MANUFACTURING TECHNOLOGY

8. RISING LOAD TESTS IN REACTOR WATER

- J- Δa cure in reactor water, crack length with PD-measurement



MANUFACTURING TECHNOLOGY

RECONSTITUTION WELDING TECHNIQUE

- stud arch welding
- parameters app. 1.8 kJ, 100 ms, 800 A
- 10mm x 10 mm and 3mm x 4 mm cross-sectional specimens
- validated for:
 - 16 mm inserts / 10mm x 10 mm Charpy-V
 - 10 mm inserts / 3mm x 4mm KLST
 - 10 mm inserts / 10mm x 10 mm Fracture resistance curves
- used for pressure vessel and stainless steels



MANUFACTURING TECHNOLOGY

ELECTRIC DISCHARGE MACHINING CAPABILITY

- numerically coded electric wire discharge machine
- maximum specimen height app. 150 mm
- maximum lateral specimen dimensions app. 200mm x 350mm
- closed water circuit, filtration of active particles
- accurate contact measuring functions (specimen alignment angles set in the programme)



MANUFACTURING TECHNOLOGY

APPLICATIONS

1. NUCLEAR SURVEILLANCE TESTING FOR FINNISH POWER PLANTS

- dummy elements installed in Loviisa

1. STUDIES FOR LOVIISA MATERIALS ANNEALING AND REIRRADIATION

- creation of material data base for Loviisa vessel annealing, Charpy-V and fracture toughness
- reconstitution technique required

1. CHARACTERISATION OF REPLACED IN- CORE COMPONENTS

- austenitic stainless steel riser tube, base and weld
- martensitic stainless steel control rod bayonets



MANUFACTURING TECHNOLOGY

1.SUPPLEMENTARY SURVEILLANCE

- Halden research reactor

2.CHARACTERISATION OF OLD PRESSURE VESSEL MATERIALS

- Identification of Loviisa vessel forgings
- Surface samples of Greifswald 1 and 2
- Through wall trepan from Novovoronesh 1
- Studsvik research reactor



MANUFACTURING TECHNOLOGY