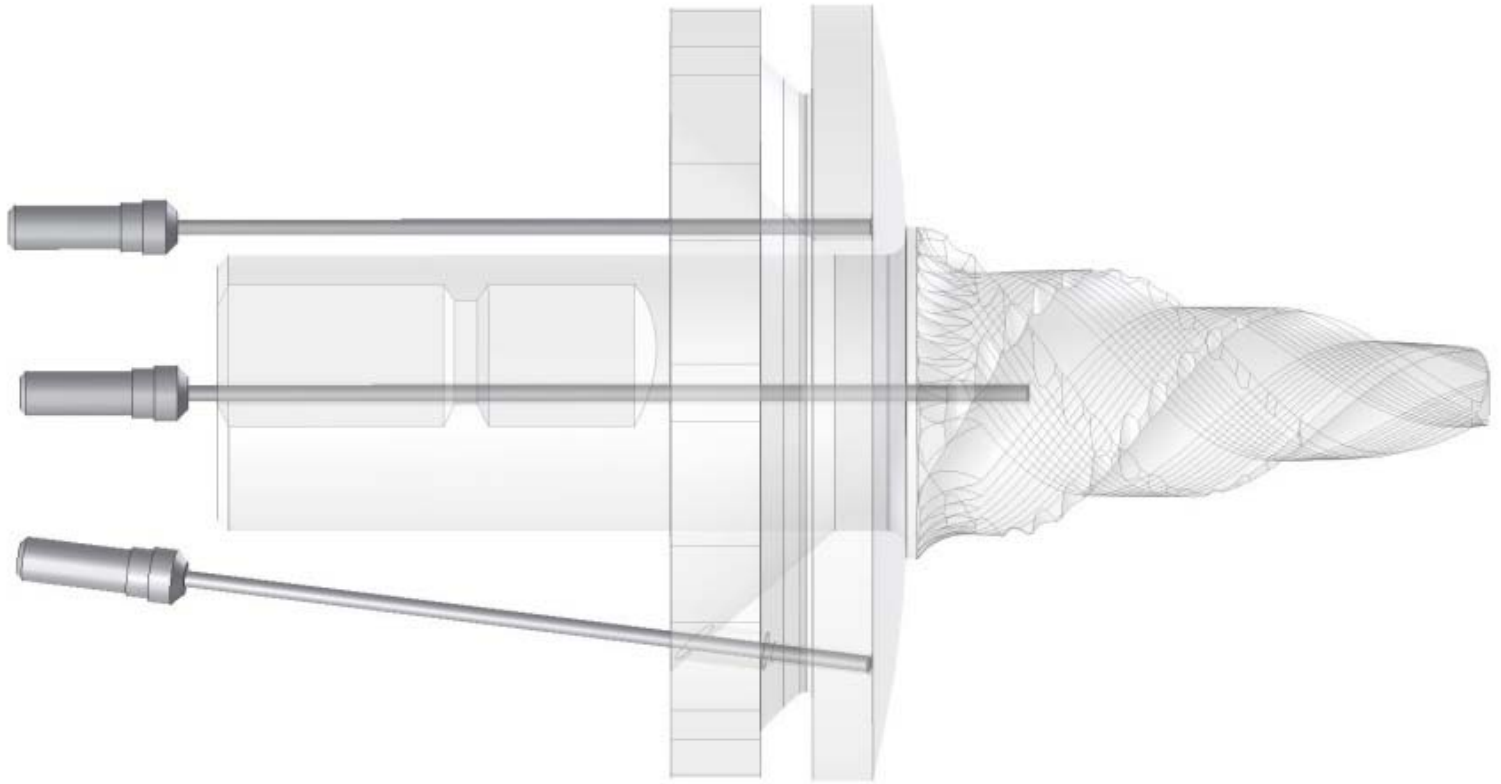


# R&D at SKB: Tool geometry, material and surface treatment



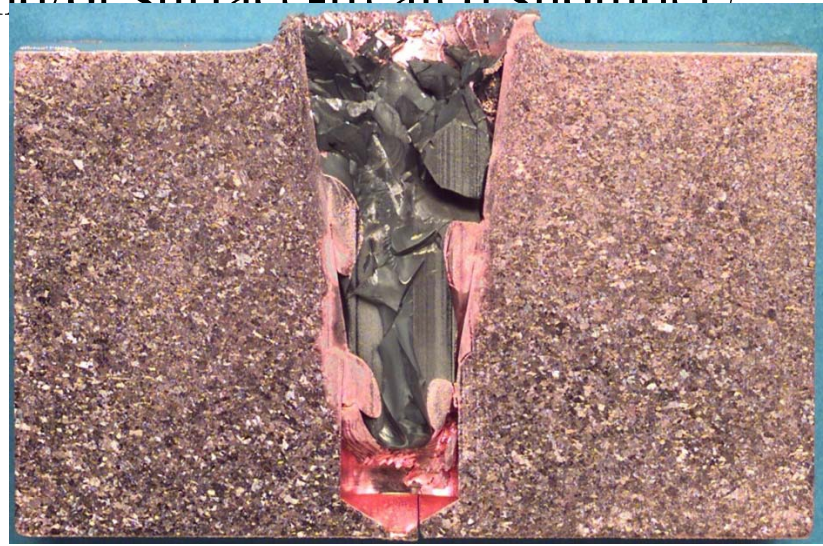
# Background: The weldcycle

- Five sequences: Plunge/heat, acceleration/start, downward, jointline, upward/parking
- If error in plunge/heat or acceleration/start, possible to abort without rejecting canister



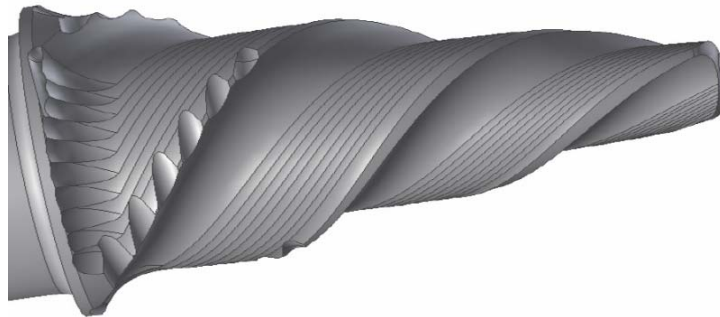
# Remaining issues for tool

1. Eliminate risk of probe fracture during sealing welds
2. Excessive flash during 2<sup>nd</sup> half of 3/4 hr long weld cycle
  - Due to shoulder (scroll) wear and/or heated canister ?
  - Solved by less FZ, Ar and/or surface-treated shoulder?



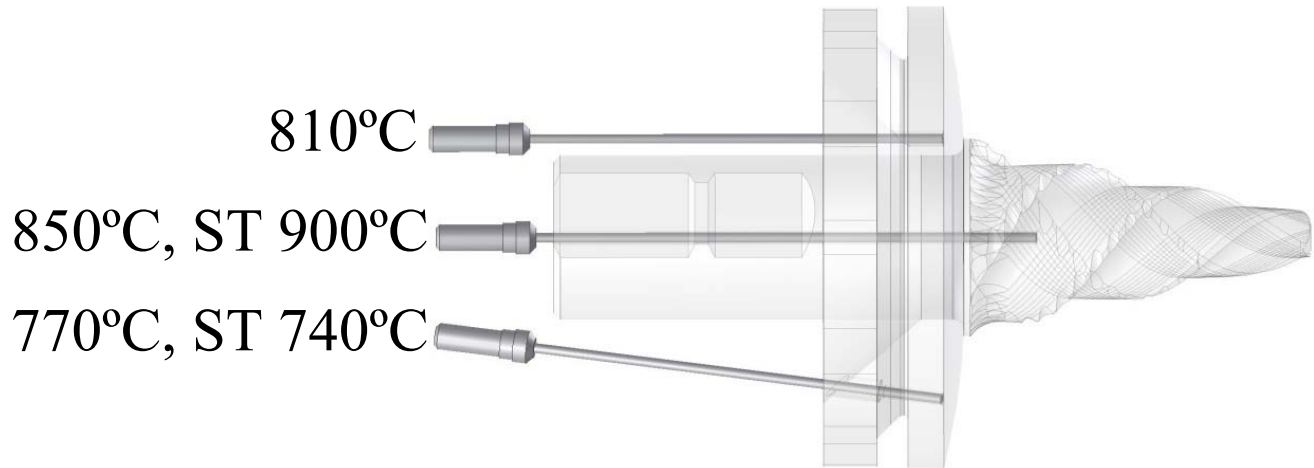
# Ongoing work, Probe

- Various surface-treatments tested
  - Result: Surface-treatment reduces cracks
- Cracks starts mostly in MX feature – eliminate MX
  - Result: worm hole defects (smaller process window)
- Most cracks and failures occur 22-25 mm down, test probe with MX only 17 mm down.



# Ongoing work, Shoulder

- New convex shoulder geometry for process stability
  - Developed with Brigham Young University
- Surface treatment resulted in even flash throughout weld cycle, BUT less shoulder friction caused colder shoulder and hotter probe  $\approx$  probe failure, BACK TO SQUARE 1



# Summary/Future work

- Find more wear-resistant Densimet alloy or similar, or find surface-treatment (carburized surface?) that doesn't reduce friction coefficient
- Test Nimonic 105 vs. "big brother" Nimonic 115;
  1. with 17 mm MX, 2. with full MX, 3. without MX
    - Maximum temperature before failure, to find upper limit for process window
    - # of cycles in the middle of temp process window, to find safety factor for probe life