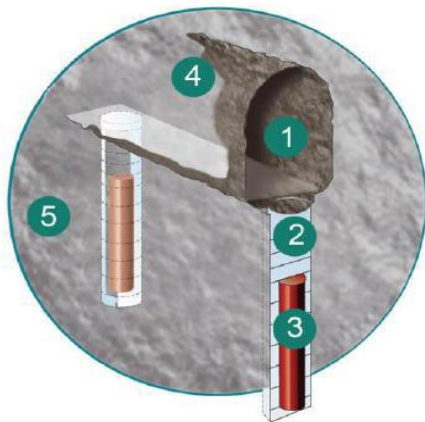




## Examples of Finland's experiments for assessing buffer-backfill-pellet homogenization and performance



IGD-TP Exchange Forum, WG2

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Ville Heino & Pasi Rantamäki (Posiva Oy)

# Large-Scale Experiments Evaluating Bentonite Compatibility and Homogenization

- Multiple on-going test arrangements, multi-scale
- Results of initial-state performance can feed into long-term prediction models for material safety
- Results serve as input to modelling and validation (Posiva et al)
- University degrees
  - 2015 (Ms. Tech.): Rinta-Hiiro, V. “Buffer-Backfill Interaction Test”
  - 2016 (PhD): Pulkkanen, V-M. “Modelling bentonite behaviour in spent nuclear fuel disposal conditions”
  - 2017 (PhD): Vehmas, T. “Cement-Bentonite Interaction in long-term safety”

# Buffer-Backfill Interaction Experiments



## Project Background (2014-2016)

- A new laboratory equipment manufactured 2014
- ~ 1/6 scale dimensions of the deposition area planned within Posiva's spent fuel repository (KBS-3V concept)
- customized test environment (inflow/outflow arrangements, sensor instrumentations, independent pumping system, automatic sampler, sedimentation basin, experienced personnel)

## Project Goals

- behaviour of the water flow & distribution during and immediately after emplacement (cameras, visual observations)
- Possible heaving or uplift of the buffer (pressures, dismantling)
- possible erosion of bentonite materials (sampling during the test)
- support earlier modelling results (uplift, water flow paths, pressures)
- Provide information for future larger scale in-situ EBS demonstration tests and long-term safety.

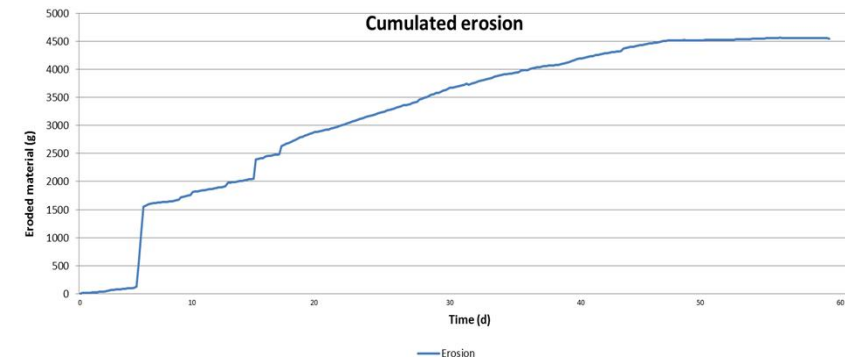
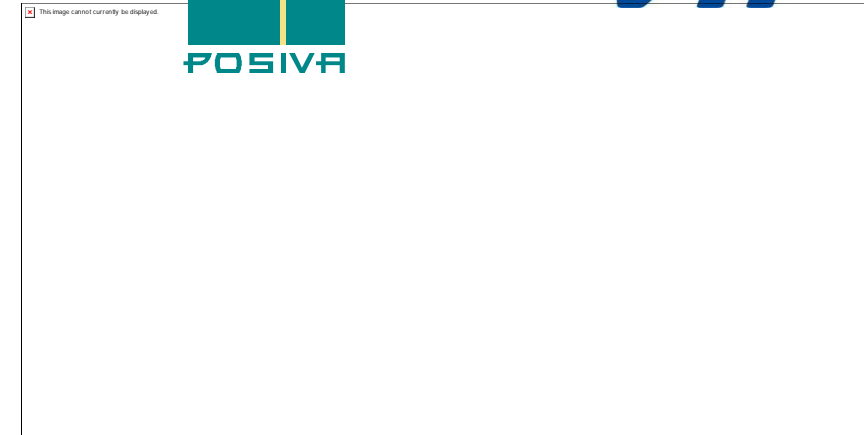
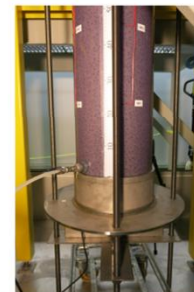
## Example: Test Basic Information

- Duration: 2 months (62 days),
- 4 buffer blocks (MX-80), 6 backfill blocks (Ibeco RWC BF)
- Pellets (pillow shaped MX-80/extruded Cebogel)
- Saline water (1%)

## Dismantling (August 2015)

- 365 water content measurements
- 257 density measurements

27/10/2015



# KBS-3V 40% Scale Buffer Demonstrations

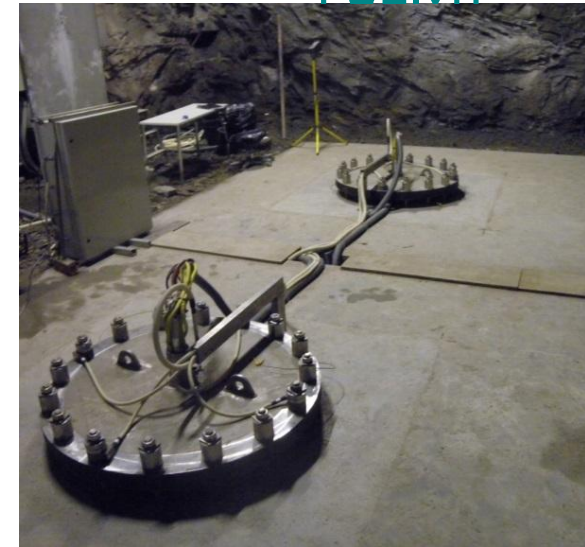


## Project Schedule

- Site selection & Designing 2010
- Site preparation 2011 then Final installation 10/2011
- Monitoring 2011-> on-going
- Partial Dismantling 9/2013

## Project Goals

- To perform medium-scale tests in underground conditions
- Learn how to plan, build and monitor tests at repository environment
- Get information from early phase processes of the bentonite buffer



## Test basic information

- Two test holes: 800 mm diameter, 3000 mm deep and 4 m from each other
- Buffer blocks, gap filling pellets and heating canisters

## Dismantling

- One experimental test hole was opened and sampled after two years of testing
- A total of 361 water content measurements and 203 density measurements were done during the post-sampling laboratory assessments phase

**REFERENCE:** *Posiva Working Report 2015-08 (Kivikoski et al)*

27/10/2015

