BENTONITE HOMOGENIZATION

EXPERIMENTAL CONTRIBUTION OF CEA/LECBA

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The CEA/LECBA (Laboratory of concrete and clays) realizes experiments on bentonite engineered barriers in support to Andra’s concepts

- Design and formulation of bentonite materials for plugs and seals, from lab scale to full scale
- Laboratory testing: THM & gas behaviour on unsaturated and saturated material
- In situ implementation: FSS, REM (DOPAS project), SET, ....

Some problems appear when blocks or pellets are used at a large scale
- Heterogeneity at construction, uncomplete filling of submittal zone, technological voids, connected joints...

But, we observe complete filling *in fine*: what is the hydromechanical path during the transitional hydration phase (depending on hydration scenario)?

*Ophelie mock-up, Belgium, 5 years hydration*

*REM mini mock-up, 6 months hydration*
Propositions of experiments

- Qualitative investigation of some specific points, using visual and smart experiments in glass vessels
  - Filling of gaps containing air or water or both: increase of pressure, delay of saturation time…
  - Study of different scenarios, defined with modellers
  - Pressures measurements during the tests
  - Density and water content performed after dismantling

- Influence of a gaz flow on gaps or joints closing, for chosen scenarios (existing equipment).

Some of these tests were reported by Rémi de La Vaissière within EC FORGE project (D3.38-R)
Propositions of experiments

- Saturation test(s) on bentonite cylindrical specimen prepared with composite density along height (or gradient of density)
  - Representative dimensions: 240 mm in diameter, 500 mm in height
  - Radial hydration to get full saturation in acceptable time
  - Swelling pressure measurement axial and radial
  - Density measurements at dismantling to verify vertical homogenisation

- Long term behaviour of saturated heterogeneous material
  - Is the swelling pressure stable along time? Is there significant creep phenomena in saturated bentonite?
  - Tests will be performed using « Phenix bench »

Press « Phenix » pilot operated in axial stress and displacement equipped with 120 mm vessel

240 mm device developed for studying FSS pellets mixture
The CEA/LECBA, involved in a lot of projects leaded by Andra, can bring a large amount of experience in the IGD-TP new project.

The LECBA is also involved in a partnership with the SATIE laboratory for developing a new High Frequency probe (see Jean Talandier presentation).

Previous lab experiments may be set up in a short time with any composition of bentonite material (usually MX80).

Tests will be discussed and performed in a close collaboration with modellers.

Ressources needed: around 30 men/month.

Example of heterogenous bentonite materials: visual mock-up for demonstration of a cut off filling.