

FROM RESEARCH TO INDUSTRY

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BENTONITE HOMOGENIZATION

EXPERIMENTAL CONTRIBUTION OF CEA/LECBA

IGD-TP Exchange Forum n°6 – WP2, London, UK

| Claude Gatabin

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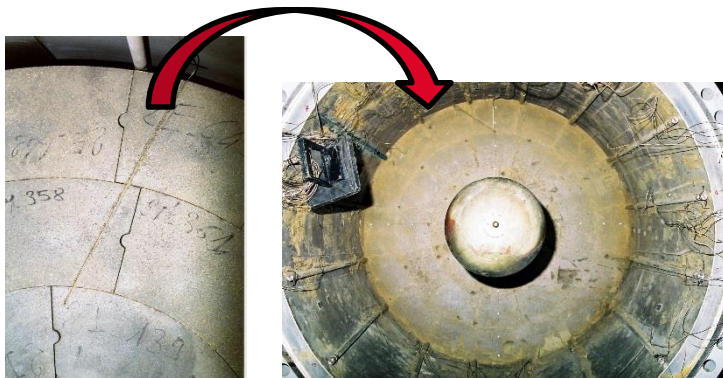
The CEA/LECBA (Laboratory of concrete and clays) realizes experiments on bentonite engineered barriers in support to Andra's concepts

- 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,

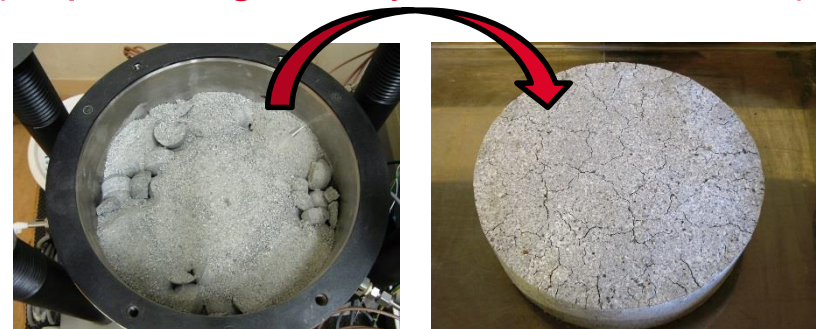
Some problems appear when blocks or pellets are used at a large scale

- 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



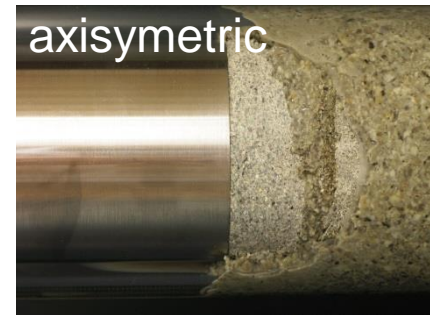
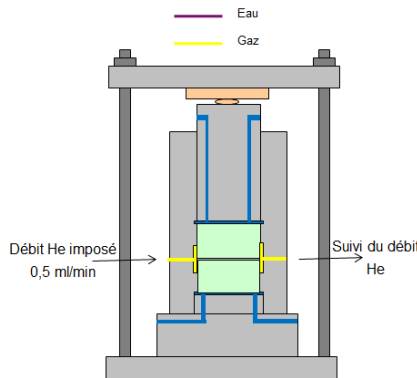
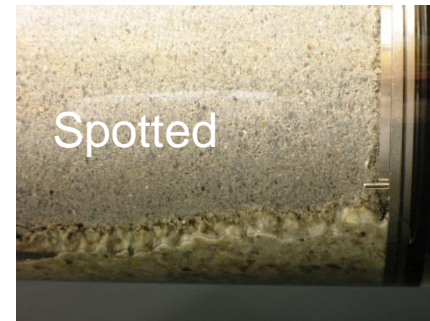
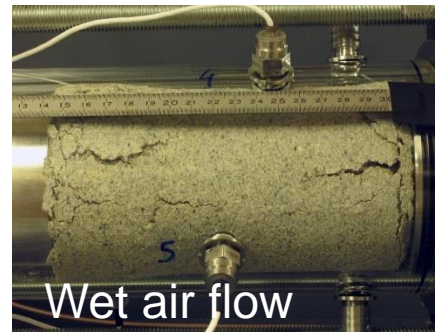
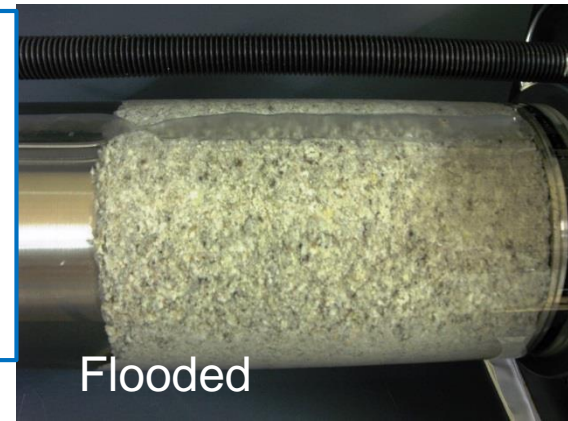
REM mini mock-up, 6 months hydration

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 choosen 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 »



φ 240 mm device developed for studying FSS pellets mixture

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



SUMMARY

- 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 developping 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