



## **Accessible Field-Scale wellbore containment breach experiment at a large-scale Underground Research Laboratory**

Harvey Goodman, Tony Espie, and Christian Minnig

Chevron Energy Technology, Reservoir & Production Engineering, United States (hgoodman@chevron.com)

The Mont Terri Underground Research Laboratory provides researchers the means to control boundary conditions for experiments designed to mimic field scale subsurface conditions. Realistically scaled CO<sub>2</sub> injection well designs that can be instrumented to assess near borehole pressure containment loss with temperature cycling, enables development of novel sealants that may restore containment. Novel sealant attributes required by the experimental program include the ability to penetrate narrow micro-annuli apertures of 120 microns and less that often form at the casing – cement sheath boundary. These small apertures are extremely difficult to treat using conventional sealant technology.

The mock well system experiment for CO<sub>2</sub> breach mitigation, designated CS-A, is operational with equipment installation accomplished late 2nd quarter 2015. A six metre length of 100 mm ID casing has been partially cemented into a 14.4 m shallow borehole. Six dual injection / production ports through the casing with flow lines to surface were installed at 1 m intervals over the six metre length enabling the flow properties of individual one metre sections of the cemented region behind casing to be characterised.

After re-saturation of the test site with compatible Opalinus Clay host formation water, experimental protocols commenced late December 2015. Mock well completion system conditioning and hydraulic connectivity mapping between well system compartments has been performed to establish the well system connectivity baseline prior to temperature cycling. The characterisation of induced leakage pathways after temperature cycling was completed 2nd quarter 2017.

Sealant testing commenced late 3rd quarter 2017, expected to continue in to 3rd quarter 2018. A summary of sealant testing protocols and results to date will be presented, as well as a path-forward for field implementation.