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Laboratory Measurement to Confirm Tightness of Rock Salt Against Hydrogen, Nitrogen and Methane

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Abstract

A reliable assessment of the caver's integrity for underground storage is essential by knowing the permeability of salt rocks as well as the integrity of well completion. The tightness of the cement materials behind the casing is important pretty much as the cement bond with salt rocks, and casing. The expected low permeability should be measured using unsteady state method.

The institute owns sophisticated equipment relevant to measuring permeabilities of very tight rocks such as cap and salt rocks (up to 10-22 m²) and proving its tightness under high pressure conditions using unsteady state methods. In addition, new equipment has been designed and operated to evaluate the tight rocks using flammable gases e.g. hydrogen and methane.

In this paper, the experimental procedures to determine the permeability and the additional laboratory measurements will be introduced and discussed. The obtained results using hydrogen, methane, helium and nitrogen are presented and compared. Emphasis will be laid on the influence of the time duration of confining pressure and the type of gas on the permeability. Moreover, results to the tightness of the bonding salt rock and cement, and shear strength between cement and casing are presented as well.

Key words: Caverns for Gas Storage, Tightness of the Caverns against Gas, Hydrogen storage in Caverns, Shear and Bonding Strengths of Cement/Casing

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