

ROCK MECHANICAL BEHAVIOUR AND SEALING ASPECTS OF A CLOSED-IN SALT CAVITY FILLED WITH BRINE

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ABSTRACT

Magnesium and potassium salts are being solution-mined from carnallite/bischofite layers in the north-east of The Netherlands, near Veendam. It is planned that, at the end of the mining process, the brine-filled cavities will be abandoned.

The paper presents some rock mechanical considerations with respect to cavity behaviour after abandonment, assuming perfect cavity sealing. A finite element analysis of the cavity response after shut-in, and the design requirements for a suitable sealing plug for the borehole, are discussed.

The finite element calculations indicate a rise in brine pressure after shut-in, followed by a gradual pressure increase towards an asymptotic value. This change in pressure is accompanied by adjustments in the cavity roof, wall and floor stresses.

Different sealing principles and plug designs are considered. Cavity response after abandonment, long-term reliability, and general compatibility with in-situ conditions are the major criteria in the selection of a suitable sealing plug material.