Laboratory Tests within the Scope of Rock Mechanical Investigations for the Design of Solution Mined Caverns in Rock Salt

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ABSTRACT

Within the layout of caverns in rock salt mass for the storage of hydrocarbons the rock mechanical investigations have to lead to recommendations for a safe operation of the underground openings. The results of laboratory tests give the basis to determine the time- and temperature- dependent deformation and strength properties of the site-specific rock salt.

Two sets of parameters have to be determined within the procedure for the design of the cavern. The investigation of the deformation characteristics is prerequisite for the determination of the parameters for the applied material law, which is used to calculate the state variables in the rock salt mass surrounding the cavern. The strength characteristics are part of the design parameters for the assessment of the calculated results.

The paper describes for a typical example the procedure of laboratory investigations for a gas cavern project. The demand for optimisation with respect to working gas volume requires a very precise knowledge of the material behaviour. The development of new testing machines, computer controlled test procedures and data acquisition in connection with the experience and research results of the last decade has improved the understanding of the response of rock mass on different loading conditions.

The different test conditions for short term and long term tests, the necessary amount of tests and the evaluation of the results are discussed. Finally the application of the results for predicting the behaviour of the rock salt mass in the vicinity of a cavern is shown.