

# The Results of the Numerical Simulation of the Etzel Test

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## Abstract

The Etzel test is a unique field test on high pressure conditions in caverns and its results give valuable information on the behavior of an abandoned cavern.

The objective of the field test was to quantify the internal pressure in a brine filled cavern at the point of losing tightness by the formation of a macroscopic fracture. However the new and unexpected occurrence of high infiltration volumes at internal pressures in the range of the lithostatic pressure gave new knowledge about the behavior under abandonment conditions. In the paper the results of the numerical calculations of the Etzel test will be presented and discussed.

## 1 Introduction

The pressure build up test of Etzel took place from September 1990 to August 1993. The boundary conditions were set to allow pressure increase rates with an acceptable time-cost ratio which could be extrapolated to longer time periods. The test equipment was designed to create a brine pressure gradient of  $G = 0.320 \text{ bar/m}$  with respect to the casing shoe at a depth of  $827.7 \text{ m}$ . The hope was to get basic figures for the approval procedure, which could allow an economically viable and technically prudent abandonment of a high percentage of the German salt caverns.

The detailed final report of the test was submitted in 1994 (main report /1/, addendum /2/). In 1998 the Solution Mining Research Institute obtained the permission to publish the report and carried out a translation in English /3/. At the SMRI Fall Meeting 2000 in San Antonio a paper described the testing procedure and the results in detail /4/.