SOLUTION MINING RESEARCH INSTITUTE

812 MURIEL STREET
WOODSTOCK, ILLINOIS 60098
815-338-8579

MEETING PAPER

ROCK MECHANICS INVESTIGATIONS FOR GAS STORAGE SALT CAVERNS AT SHALLOW AND INTERMEDIATE DEPTH

Dr. Evan K.S. Passaris

University of Newcastle upon Tyne, U.K.

Abstract

In order to investigate the mechanical response of rocksalt under conditions similar to those predicted around operating gas storage caverns at shallow and intermediate depth, a series of in-situ tests were conducted in an instrumented cavity 140 m below ground at a rocksalt mine in Cheshire, operated by I.C.I. Ltd.

Analysis of the experimental results indicated that the in-situ elastic modulus of salt was more than twice the value of the usually quoted laboratory value and that the Poisson's ratio of salt varied with stress, the most distinct differences being between compressive and tensile stress state. This different constitutive behaviour in tension and compression develops an extrinsic anisotropy resulting in substantial reduction of the tensile tangential stresses acting on the surface of pressurised caverns.

Furthermore, critical assessment of the time-dependent in-situ tests has shown that creep of rocksalt is within the linear viscoelastic region and it was possible to calculate the creep constants of the rheological model representing the in-situ behaviour of rocksalt.

The stability of gas storage salt caverns at shallow and intermediate depth is illustrated with an example by assessing the effect of the tensile stresses resulting from rapid gas withdrawal. The beneficial influence of the extrinsic anisotropy of salt is clearly demonstrated.

Manchester, UK
October 1987