

SOLUTION MINING RESEARCH INSTITUTE

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

MEETING
PAPER



Fracture Predictions for Over-Pressurization of Sealed Wellbores

by

C.T. Gniady and B.L. Ehgartner
Sandia National Laboratories, Albuquerque, NM

1993 Fall Meeting
October 24-28
Lafayette, Louisiana

ABSTRACT

The finite element method is used to evaluate the mechanical response of a **wellbore** that is internally pressurized above lithostatic pressure. The **uncased wellbore** is emplaced in salt, a rheologic media. Salt creep tends to relax the stress state in the salt around the **wellbore** making it possible to expand the size of the **wellbore** without fracturing the surrounding salt. This is a very desirable sealing feature as plugging and abandoning a cavern typically results in **wellbore** pressures that exceed lithostatic pressure. The analyses show that the rate of pressurization determines the hoop stress in the salt surrounding the wellbore. Pressurizing the **wellbore** above the surrounding lithostatic pressure reduces the hoop stress and, for very quick pressurization rates, the hoop stress can become tensile and fracture the salt. For most cavern fields, the pressurization rates after sealing and abandonment should be well below that required to mechanically fracture the salt surrounding a plugged wellbore. In the long-term, however, other mechanisms may contribute to fracture, or to increase the permeability in the salt.

This work was performed at Sandia National Laboratories and supported by the U.S. Department of Energy under Contract DE ACO-76DP00789.