Solution Mining Research Institute Fall 2011 Technical Conference

York, United Kingdom, 3–4 October 2011

MULTI–CYCLE GAS STORAGE IN SALT CAVERNS

M. Karimi–Jafari, N. Gatelier, B. Brouard, P. Bérest, H. Djizanne

Abstract

Today there is a growing demand from the operators of gas storage in salt cavern for quick cycling operation mode. Gas price fluctuation and trading issues make gas operators more interested in daily micro–cycle service than purely seasonal storage. Thus the main question is to what extent such a quick cycling operation is permitted from a thermo–mechanical point of view to ensure the cavern stability and integrity.

In this paper, some thermo–mechanical simulations of the salt cavern behaviour under different gas operation scenarios are discussed. Two main scenarios are compared: a purely seasonal storage versus a combined seasonal micro–cycling operation. The studied seasonal micro–cycling operation mode consists in weekly/daily pressure variation super–imposed on the purely seasonal storage.

The gas thermodynamic simulations are performed to optimize envelope of the seasonal micro–cycling operation taking into account the geotechnical and operational constraints.

Thermo–mechanical computations are performed to predict the stress and strain state in the rock salt. The cavern stability is verified applying the conventional criteria: no–tension and limited dilation in the rock salt.

Numerical simulations show that the seasonal micro–cycling scenario gives more favourable results than the purely seasonal one. The seasonal micro–cycling, fulfilling mechanical stability issues, provides higher cavern performance and larger working gas.

Key words: Gas Storage Caverns, Multi–cycling, Computer Modeling, Rock Mechanics, Gas Operation Performance