Solution Mining Research Institute; Fall 2004 Technical Meeting
Berlin, Germany, October 3 - 6, 2004

PRESSURE AND TEMPERATURE CHANGES AT THE WELLHEAD OF NATURAL GAS STORAGE CAVERN - LONG-TERM COMPUTER SIMULATION COMPARED WITH FIELD DATA

Andrzej S. Kunstman, Kazimierz M. Urbańczyk - CHEMKOP, Krakow, Poland

Kazimierz Gąska - INVESTGAS - KPMG Mogilno, Poland

Abstract:

The first Polish natural gas storage plant in salt caverns KPMG Mogilno owned by Polish Oil and Gas Company PGNiG , and operated by INVESTGAS is located in salt dome in northern Poland and now 8 gas caverns are in operation. The oldest cavern was filled with gas already 7 years ago. CHEMKOP was the main designer for underground part of the project - e.g. for drilling designs, geomechanics, leaching technology and sonar measurements. When the first cavern was filled with gas, CHEMKOP delivered the specialised computer code KAGA for simulation of thermodynamical behaviour of gas cavern.

KAGA is the software package to simulate thermo-hydrodynamical processes occurring during the operation of an underground natural gas storage cavern. It can simulate different kinds of operations modelling single stages of injection, withdrawal or idling, as well as scenarios consisting of several operation stages.

During simulation, the computer can provide information about the amount of gas in the cavern, its density, temperature and pressure, its parameters at the wellhead, temperature distribution along the exploitation tubing and in the rock salt formation, etc.

Using KAGA Package for controlling natural gas cavern operation one can trace the past cavern operations and find the current status of gas inside the cavern and surrounding rock salt formation. Being supplied with these data one can optimize further cavern operations also with help of the KAGA package.

Results of application of the KAGA package for the KPMG Mogilno caverns are presented in the paper. Several parameters were adjusted at the beginning of modelling, e.g. temperature distribution in the rock salt massif around the modelled cavern, heat exchange coefficients. They were verified and fitted basing on the field data from the initial period of the gas cavern exploitation. After the proper fitting, the model can be considered as a true model and the results of simulation will match satisfactorily the field measurements for the next many-years period. Two oldest caverns are used as an example to discuss and present effects of proper adjustment of the KAGA model parameters and obtaining the true models of these gas caverns.

Key words: Poland, Caverns for Gas Storage, Thermodynamics in Gas and Rock-Salt, Cavern Operation, Computer Simulation of Gas Cavern.