SOLUTION MINING RESEARCH INSTITUTE

1745 Chris Court
Deerfield, Illinois 60015-2079
USA
Telephone: 847-374-0490 Fax: 847-374-0491
E-mail: bdiamond@mcs.com

Meeting Paper

Geologic Evaluation for Domal Salt Storage Projects— An Overview

by

Karl M. Loof [1]
Kurt M.Loof [2]

[1]**Geologic Consultant**
Lovelady, Texas, USA

[2]**SofregazUS Inc.**
Houston, Texas, USA

Spring 1998 Meeting
New Orleans, Louisiana, USA
April 19-22, 1998

Geologic Evaluation for Domal Salt Storage Projects - An Overview

Karl M. Looff [1] and Kurt M. Looff [2]

ABSTRACT

Salt storage projects in domal salt are concerned with the position of the salt and the nature of the adjacent strata generally to a depth of about 4,000 - 5,000 feet. Salt diapirs which have reached this depth range are geologically dynamic and the position of the salt is controlled by the interplay of three different processes (upward salt movement, salt dissolution by ground water, and subsidence of the base of the salt). The interaction of these processes determines whether the salt stock (or its various components) is in an active, passive, or dormant stage. Each stage is related to geologic processes associated with salt movement and dissolution, cap rock formation and alteration, and the deposition and deformation of surrounding sediments. While these processes are commonly thought of at rates measured in geologic time (i.e., 1000 years or more), they may have a significant impact on storage projects (i.e., cavern closure and casing failure) over a period of 10 - 20 years or less.

Geologic evaluation for domal salt storage projects consists of two aspects: physical delineation and process definition. Historically only the physical delineation has been attempted. Physical delineation addresses through various types of maps 1) depth and geometry of the salt mass, 2) thickness and lithologic variation of the cap rock, 3) thickness variations in the strata adjacent to the salt mass, 4) structure of the adjacent strata, and 5) the surrounding porous and permeable units (especially those containing fresh water). The process definition aspect addresses the geologic processes responsible for the physical aspects, their rates and current status. Process definition is arrived at through the combination of two or more of the physical aspect maps along with geologic rationale. This provides the means not only for determining the present stage of salt diapir evolution but also for interpreting many of the features exhibited by the maps. Of particular interest for on-going storage operations are the lateral variations in both upward salt movement and salt dissolution which can produce forces leading to continual deformation of the cap rock and overlying sediments, as well as lateral salt flowage at the cap rock/salt interface. Such processes can affect storage operations through cavern closure, slabbing during cavern construction and operation, as well as casing failure resulting from faulting or lateral flow of salt or gypsum.

A geologic evaluation which combines the physical and process related aspects provides the best means for delineating and understanding the geologic influence on a storage project. This information can aid in developing a more cost efficient program through better project siting or cavern design and construction, as well as providing an understanding of the impact of long term operations including project induced subsidence. All salt domes are unique and because of variations of geologic complexity and available data, they cannot be evaluated to the same degree of detail. However, there are usually sufficient data available to provide a basis on which a business decision can be made as concerns the storage project or the acquisition of additional data.

[1] Geologic Consultant, PO Box 546, Lovelady, TX 75851, (409) 624 -9008 voice & fax.

[2] Sofregaz U.S. Inc.