SALT FOR OIL
QUANTITATIVE X-RAY DIFFRACTION AND UNDERGROUND PETROLEUM STORAGE

Ralph G. Tissot and Stephen J. Bauer
Sandia National Laboratories
Albuquerque, New Mexico

For the past 40 years petroleum products have been stored deep beneath the earth’s surface in large caverns created in naturally occurring masses of salt. There are about 500 such salt masses found on the U.S Gulf coastal area. These domal geologic structures composed predominantly of halite (NaCl) are about 1-2 miles in diameter, with gently curved tops (a few hundred feet to a few thousand feet below the surface) and extend down many thousands of feet.

The caverns used for storage are created by dissolving (leaching) the salt through now well established engineering practices to produce a cavern geometry that is regularly shaped such that its mechanical response is well understood for its service life (~30 years). The dissolution properties of halite are well understood. The location, distribution and relative amount of impurities (other salts and insolubles) may affect the cavern leaching, its cavern shape, and thus it mechanical response.

Part of the cavern construction process involves sampling the salt dome along the proposed cavern vertical axis by coring the rock. These samples are tested for their mechanical properties and chemistry. Quantitative X-ray diffraction analysis of the rock (salt) cores is used to determine the concentrations of the various mineralogical species in order to determine dissolution behavior and location suitability. This paper will examine the quantitative x-ray diffraction techniques and sampling methods used and a short overview on the formation of these caverns will be presented as well.

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