SOLUTION MINING RESEARCH INSTITUTE
679 Plank Road
Clifton Park, NY 12065, USA

Telephone: +1 518-579-6587
www.solutionmining.org

Technical Conference Paper

Origin of Two Kinds of Thermogenic Natural Gas Released When a Salt Solution Mining Cavern Failed Near Bayou Corne, Louisiana

Alan S. Kornacki, Stratum Reservoir, Houston, TX USA

SMRI Fall 2024 Technical Conference
22-25 September 2024
Edmonton, Alberta, Canada

Solution Mining Research Institute Fall 2024 Technical Conference

Edmonton, Alberta, Canada 22-25 September 2024

ORIGIN OF TWO KINDS OF THERMOGENIC NATURAL GAS RELEASED WHEN A SALT SOLUTION MINING CAVERN FAILED NEAR BAYOU CORNE, LOUISIANA

Alan S. Kornacki

Stratum Reservoir, Houston, TX USA

Abstract

During early August 2012, a large sinkhole suddenly appeared southeast of the Bayou Corne community in southern Louisiana following the collapse of the Oxy Geismar #3 salt solution mining cavern in the nearby Napoleonville salt dome. Many “bubble sites” venting gas and water also appeared. The molecular and carbon (C) isotopic composition of gas samples collected from bubble sites, wells drilled into a shallow aquifer and overlying aquitard, salt dome caprock, and two salt solution mining caverns were measured to identify what kind of natural gas is present at these locations.

Geochemical data demonstrate most gas samples are mixtures of microbial methane and one of two kinds of thermogenic natural gas. The microbial methane formed in the aquifer; different source rocks generated each kind of thermogenic gas at a different level of thermal maturity. Salt-dome type thermogenic gas – which was occluded in salt crystals within the salt dome – probably was generated by deeply-buried Jurassic source rocks that later were penetrated by the incipient salt diapir. This kind of natural gas exsolved from brine migrating vertically through a disturbed rock volume (DRV) that formed adjacent to the salt diapir. The other kind of thermogenic natural gas (“Big Hum”) – which probably was generated by younger source rocks – was released from one or more sandstone reservoirs located outside the salt diapir when their seals were breached. Big Hum-type natural gas also migrated to the aquifer through the DRV.

Thermogenic natural gas is present in salt diapirs is a recognized hazard during salt mining operations because it can cause rock salt to spall from mine ceilings and walls. However, the risk posed by the presence of natural gas in active or abandoned salt solution mining caverns is not well understood. Samples of gas that exsolve from brine when it is produced from a salt mining solution cavern should be collected and analyzed to determine its molecular and C isotopic composition -- baseline data required to determine the origin of stray gas present in an aquifer located near the salt diapir where the cavern is located. In addition, residual salt dome-type natural gas present in a cavern converted into a storage facility that partitions or percolates into crude oil, natural gas, or refined petroleum products can change their physical properties or composition.

Key words: Natural gas geochemistry**,** Monitoring, Salt dome, Sinkholes, U.S. Gulf Coast

Introduction

During early August 2012, a large sinkhole suddenly appeared ≈1,500 ft (≈455 m) SE of the small community of Bayou Corne in Assumption Parish, southern Louisiana. The size of the sinkhole continued to grow as trees, shrubs, and the surrounding marshland fell into it, eventually reaching a surface area of ≈37 acres (≈15 ha) (Figure 1).