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NATURAL GAS CAVERN INVENTORY ASSESSMENT: A NEW APPROACH

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Abstract

Storing natural gas in underground salt caverns is cost effective and provides high deliverability rates, something that is valued in the natural gas storage industry. Salt is an ideal medium for hydrocarbon storage since it is virtually impermeable and hydrocarbons do not dissolve salt. Cavern creation is straightforward and economical because salt dissolves in water and the underground cavity is created by injecting fresh water and withdrawing brine from a salt body. Salt formations suitable for natural gas storage are plentiful in several regions of the United States and in other parts of the world, making it an attractive option for natural gas storage.

Inventory assessment is a challenge for salt gas storage caverns. Metering errors are cumulative and cause uncertainty in the gas inventory based only on measurements of injection and withdrawal. The gas inventory can be calculated from in situ measurements of gas pressure and temperature combined with the dewatered cavern volume. However, the viscoplastic nature of salt makes it difficult to maintain an accurate cavern volume estimate since creep closure continuously reduces the cavern volume over time.

A new approach for assessment of cavern volume and gas inventory is described in this paper. The method incorporates a cavern shape factor into the conventional single-depth cavern volume determination. In the conventional method, the cavern volume and gas inventory are calculated from a measured change in gas pressure and temperature at a single depth produced by a change in gas inventory. This approach alleviates some of the problems related to temperature stabilization issues, cavern convection cells, and atypical cavern temperature profiles from other factors.

Key Words: gas storage caverns, inventory calculation, cavern volume estimate