

Thermodynamic studies of hydrogen storage in salt caverns

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Abstract

To date, few hydrogen storages in salt caverns exist in the world and all are designed for industrial applications needs, not for power generation or energy storage purposes. That explains why the related literature is rather scarce.

This paper is a contribution to bridge this gap and first presents a comparison between hydrogen and natural gas storages from thermodynamic point of view. Nevertheless hydrogen and natural gas economy are hardly comparable regarding their production and use. Then, a comparative study of hydrogen storage modeling was performed based on three real caverns cases (with respectively the geometrical volume of 7 000 m³, 300 000 m³ and 570 000 m³ at different depths). In each case, performances were evaluated in terms of energy, capacity and rates. The three cases are quite different in terms of working gas volume and deliverability capacity.

These caverns were modelled using DEMETHER, a Storengy in-house software co-developed with Mines Paris Tech school. Storengy extensively validated DEMETHER using downhole measurements in natural gas caverns storage. More recently Storengy adapted DEMETHER to handle hydrogen storage in salt caverns.

Key words: gas storage, salt caverns