

## **Aspects of the Thermodynamic Behavior of Salt Caverns**

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### **Abstract**

Several aspects of the thermodynamic behavior of salt caverns containing liquids or gases are discussed. Natural convection always occurs in a liquid-filled cavern. In most gas caverns, natural convection stirs gas and water vapor in the upper part of the cavern; however, gas temperature is lower at the cavern bottom because sump brine is cold, hindering natural convection. Sump brine remains cold during cavern operation because each pressure cycle leads to condensation in the entire cavern and evaporation at the brine-gas interface. This might explain why, in some cases, gas is not fully saturated with vapor, an important factor when hydrate formation in the wellbore is considered.

**Key words:** Gas storage caverns; Hydrates; Natural convection; Thermodynamics of salt caverns; Water vapor.