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## **BRINE STRING INTEGRITY SURVEY AND MODEL EVALUATION**

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### **Abstract**

Brine strings are essential components of both natural gas and liquid hydrocarbon storage caverns. Both the natural gas and liquid hydrocarbon storage industries are well aware that a limit exists for the fluid velocity in the injection tubulars in their storage caverns. If the brine injection or brine withdrawal velocity is gradually increased, eventually, the hanging tubular will experience flow-induced vibration, resulting in the potential for the hanging tubulars to bend and/or break. Additionally, in both types of hydrocarbon storage, salt falls can impact the brine string integrity.

*The magnitude of the velocity limit for flow-induced vibration of the hanging tubulars in salt caverns is not known.* In the absence of a clearly defined method for determining the maximum allowable fluid velocities in the hanging tubulars, much of industry has attempted to adopt a conservative maximum flow velocity based on “industry experience.” Sometimes this works and sometimes it does not. The objective of this project is to better define the causes of brine string failure and failure mitigation technologies. The project (1) compiled case histories of successful brine string installations as well as brine string failures in solution mining, liquid hydrocarbon storage, and gas cavern dewatering; (2) evaluated case histories with models (proposed in the literature) for brine strings that have not failed as well as brine strings that have experienced failure; and (3) developed recommendations for maximizing brine string integrity.

**Key Words:** Bedded Salt Deposits, Cavern Operation, Caverns for Gas Storage, Caverns for Liquid Storage, Domal Salt