Mechanisms of Product Leakage from Solution Caverns

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ABSTRACT

The manner in which solution caverns fail and the way in which migration of stored products occur in the event of such failure is generally misunderstood. It is necessary that the stresses imposed on a solution cavern as a result of storage operations be thoroughly understood and put in context with the various mechanisms of cavern failure before adequate precautions can be made to prevent failure. Eleven potential failure modes are discussed herein. The manner in which crude oil could migrate from the cavern in the event of failure, the degree to which such migration might progress, and the eventual accumulation of stored crude oil in natural occurring traps is also discussed. The migration of crude oil is used as an example because of the major emphasis now being placed on the Strategic Petroleum Reserve Program and the general body of knowledge relating to the characteristics of oil trapping phenomena on or adjacent to domal salt formations. The migration of gaseous phase stored products and those having a low specific gravity or high vapor pressure could be quite different from crude oil. One scheme for storage cavern wellhead instrumentation and controls sufficient to restrain operating conditions within safe limits is covered.