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## **A Case Study of Salt Cavern Leaching Simulation Using Cartesian Grids and Multiple Wells**

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## A Case Study of Salt Cavern Leaching Simulation Using Cartesian Grids and Multiple Wells

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### Abstract

Salt cavern leaching is a critical process in the development of underground storage facilities for natural gas. The process involves the injection of water into salt formations, which dissolves the salt and creates cavities or caverns. These caverns are then used for gas storage. The simulation of this process requires accurate modeling of fluid flow and salt dissolution dynamics. This study employs Cartesian grids for discretizing the domain and simulates the leaching process through multiple wells.

The simulation of complex processes is a critical tool for effective planning and monitoring. In intricate operations such as solution mining, simulations provide valuable insights into the effects of various geological, physical, and chemical parameters on outcomes. For the specific case of salt cavern leaching, two well-established software programs are commonly employed. These programs, however, are based on radial symmetry for their simulation grids, limiting their capability to simulate caverns with multiple wells. Additionally, integrating results from geological modeling tools into these programs is not straightforward.

This article outlines the fundamental principles of salt cavern leaching and introduces a newly developed simulation program designed to address these limitations. This program enables the simulation of leaching processes involving multiple wells and facilitates the incorporation of geological models. It builds upon methodologies derived from software used in the oil and gas industry for simulating fluid flow in complex reservoirs. The article also presents examples, including a history-matching case for cavern leaching, as well as scenarios involving heterogeneous geology and leaching operations with two and three wells.

**Key words:** leaching simulation, salt caverns, gas storage