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**Technical
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Paper**



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A COMPUTATIONAL MODEL FOR REAL-TIME BLANKET LEVEL TRACKING DURING SOLUTION MINING

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Abstract

During the salt cavern solution mining process, accurately monitoring the blanket-brine interface is essential for maintaining mechanical stability and ensuring that the cavern roof shape develops as designed. Although downhole density logging tools are commonly used to verify the interface location, they can be time-consuming, costly, interrupt solution mining operations, and create windows of uncertainty while waiting for logging to be completed.

To address these challenges, this paper introduces a robust computational methodology, implemented in Python, that combines advanced hydraulic calculations with machine learning algorithms to track gas and liquid blanket levels in real time. By using readily available surface data, such as pressure, density, and viscosity of leaching water and the blanket medium (e.g., nitrogen, diesel), the approach estimates downhole conditions and identifies the blanket-brine interface level with high accuracy.

Extensive validation with operational data from multiple salt cavern mining operations consistently demonstrates that this model maintains prediction errors of less than 1% in determining blanket levels. This high degree of accuracy enables operators to exercise tighter control over the leaching process and reduce the risk of unintentional upper-cavern dissolution.

In addition to providing continuous interface tracking, the proposed method can also be employed as a secondary verification tool that complements existing interface-logging techniques. Its smooth integration into current operational frameworks provides greater confidence in blanket-level measurements, promoting both safety and efficiency in salt cavern solution mining operations.

Key words: blanket-brine interface, nitrogen blanket, hydraulic calculations, machine learning.