Target Seam Selection and Reservoir Modeling in Solution Mining – Field Applications from Beypazarı, Türkiye

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Abstract

This study aims to evaluate the cavern planning strategy (one horizontal and two vertical wells) applied in solution mining operations at the Beypazarı, Türkiye natural soda ash (trona) deposit, focusing on target seam selection and reservoir management. Key factors considered in seam selection include dissolution performance, mineral content within trona, inter-seam fracture networks, and solution flow behavior. The upward migration of the solvent into overlying seams was observed on site and incorporated into the cavern and reservoir model to conduct reserve estimations. The cavern and reservoir model are both presented in this study to provide an overview of the solution mining methods applied at the trona deposit in Beypazarı, Türkiye.

The reservoir model was constructed based on the coalescence of previously mined caverns. Based on the developed reservoir model, the production (AK) well concept was designed to produce saturated solution from the reservoir while controlling solution flow within the reservoir. The drilling plans for AK wells were optimized and fully integrated into reservoir calculations. The study also addresses the determination of cavern direction and inter-well spacing, design modifications in response to operational challenges during drilling, and the impact of trona ore characteristics on cavern behavior. All findings are derived from over 20 years of field-based experience and operational data. Accordingly, the study presents field-tested engineering insights and practical approaches to enhance solution mining performance, offering transferable strategies for solution mining performance in similar deposits.

Key words: Solution mining, Trona, Cavern planning, Target seam selection, Reservoir modeling, Production wells, Field experience, Drilling engineering, Mineral composition