

## **APPLICATION OF WINUBRO SOFTWARE TO MODELLING OF CAVERN DEVELOPMENT IN TRONA DEPOSIT**

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### **Abstract**

Turkish company ETI Soda AS has been constructing a new mine of natural soda ash in trona deposit near Beypazari (130 km NW from Ankara) since 2005. Drilling and completion works are conducted by Chinese company CMEC and consultation/supervising is provided by CHEMKOP Poland.

The deposit consists of several thin trona layers with thickness of few meters each. A special solution mining technology is needed in such geological conditions. A basic solution mining unit consists of two wells – one vertical and one horizontal.

First, after drilling the vertical well, an initial cavern is leached in the deepest trona seam, and then few hundred meters long horizontal well is directed to be connected with this cavern through bottom of the trona layer.

So, vertical caverns are developed not directly for trona exploitation purposes. They are a target to be reached by horizontal wells, and they are supplying the volume inside trona layer for easy intake and output of the production soda brine, coming from horizontal well. For proper leaching design of the initial cavern, the modeling software was needed.

The WinUbro model authors, working as leaching consultants for ETI Soda in 2005 - 2007, adapted their WinUbro software for trona specificity and used this software for prognoses and designs of vertical caverns development.

The fact, that soda brine is two component solution, containing sodium carbonate and sodium bicarbonate, was a feature needed to take into account during adapting the software for trona leaching modeling. The alkalinity of soda solutions in different temperatures and their densities which were measured in ETI Soda laboratory, were used to find the polynomial approximation of this dependence, which was afterwards used in the adapted model.

Also the formula describing the total alkalinity of saturated soda solutions in different temperatures were derived from laboratory measurements and introduced into the model. Leaching rate formula used in the WinUbro model was compared with the leaching laboratory tests results made in ETI Soda on trona core samples, and the proper for trona case coefficients for this formula were chosen – especially the coefficient responsible for leaching rate dependency on temperature of the leaching solvent.

As a result of these work, a unique software – WinUbroTrona was constructed and afterwards used for modeling vertical caverns development. Due to extensive applying of this model to the trona cavern leaching, many conclusions and hints to the trona leaching technology were derived – some of them will be presented in the paper.

**Key words:** Trona, Turkey, Computer Modeling, Cavern Design, Cavern Dissolution Modeling.