Main principles for establishing underground mine openings by geotechnological method and their secondary use for industrial waste management

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Introduction

When mining rock salt underground there are established mine openings, essentially cylindrical in their shape and enormous in volume (up to millions cubic metres).

Until recently the process of extracting saline solutions finalized the mining of saline deposits, and underground cavities formed hereby had to be liquidated along with brines left therein. However, inasmuch as the brine producing operations are related to chemical works, on the earth surface in huge amounts were being storaged the waste materials left after brine processing (both solid and liquid, including toxic ones) and contaminating the environment. Specific features of rock salt formations are characterized, on the one hand, as good solubility in aqueous medium, and on the other hand, as chemical inertness to aggressive mediums, high density, impenetrability, sufficient [adequate] long-term stability of structures created in salt; all that has predestined the use of underground mine openings [cavities] formed under salt mining by geotechnological method as tanks for disposal and storage of chemical products.

The idea of utilizing production waste into the mined-out underground solution cavities with parallel reextraction of previously "buried" brines quickly found its partisans and became hardly the foremost **goal** for recent research developments in the global practice of salt mining by means of geotechnological wells.

Wide implementation of this idea had been promoted by the fact that a number of countries introduced a special legislative base on inflicting penalties [fines] for placing waste on the surface and contaminating natural environment.

Another use, of no less importance, for the mined-out underground solution cavities is their employment as storages for crude oil and natural gas.

When realizing tasks related to disposing and storaging of chemical products we face the problems of geotechnological and geomechanical nature:

- providing long-term stability for structural elements of underground mine opening (cavity roof safety pillars, airtightness of casing plugging tube strings);
- optimization of a well-drilling network [arrangement pattern] for maximum extraction from subsoil;
- minimization of underground mining effects on deformations of the earth surface and objects [structures] being undermined;
- choosing of brine producing process with guaranteed performances, including a set cavern shapeforming and ability to control their development and solve optimization problems in accordance with requirements of maximum extraction and periods of operation, etc.

The paper considers the ways to solve these tasks for the conditions of Novomoskovsk rock salt deposit.