

# Tunnel type underground reservoir construction project

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## Abstract.

The tunnel-type underground natural gas reservoir in rock salt is designed to equalize the unevenness of gas consumption in a large industrial region. An engineering-geological and a geomechanical models of a stratum were developed in designing with account for the features of its geologic-lythological structure. The stable shapes and dimensions of an underground reservoir with a geometrical volume of 350 thousand m<sup>3</sup> were calculated on the basis of the models.

The project implies:

- drilling of a horizontal well and a vertical well;
- construction of a small-size cavern in the vertical well;
- connection of the two wells;
- cavern construction technology.

The construction technology provides that the cavern shall be formed on the horizontal section of the well in several steps. The technology developed allows the construction of the reservoir with equal transverse cross-sections along the entire length of the horizontal section of the well.

The basic characteristics are:

- depth range of 1063 - 1103 m
- maximum span of 44 m
- length of 300 m
- transverse cross-section area of 1190 m<sup>2</sup>.

## 1. Geological structure of rock salt bed and hydrogeological conditions on the underground reservoir construction site

Four exploration wells were drilled to study the feasibility of the construction of the tunnel type underground reservoir as well as to collect the initial data for its design. The salt massive was investigated in the two of the wells. The other two were used to examine the hydrogeological conditions of water intake and brine injection horizons.

The drilling of the wells was accompanied with geophysical logging and coring as well as laboratory tests of physical, physico-mechanical and physico-chemical properties of rocks. The working salt bed dates back to the Kungur stage of lower Permian. Within the UGS site its roof lies at a depth of 1145 to 1163 m, its thickness varying from 62 to 69 m. The bed is gently dipping, with angles of dip no more than one degree. The bed is composed mainly of halite (with a weight average NaCl content of 92%). Anhydrite