

25 years of lifetime history for seven Energinet.dk gas caverns in the LI. Torup Zechstein salt dome in Jutland, Denmark

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Abstract

The LI. Torup Zechstein salt dome belongs to a group of about 25 salt structures that were discovered in the northern part of Jutland by means of geophysics and drilling. 16 of these salt structures can be regarded as genuine salt diapirs whereas the remainder have not reached the diapir stage and have remained salt pillows at a depth of more than 2,000 meters below the surface.

The LI. Torup Zechstein salt dome is oval in form with a maximum north-south diameter of 6,500 meters and a maximum west-east diameter of 4,500 meters. Reflection seismic and gravimetric investigations showed that the diapir is shaped like a mushroom with an overhang in all directions. This overhang has a maximum extent of approximately 500 meters at the eastern flank while it is less distinct towards the north, west and south with approximately 200 to 300 meters.

The base of the salt dome has been ascertained with an accuracy of +/- 200 meters in a depth of about 5,500 meters at the centre and in the southern part of the salt dome, and in a depth of about 6,300 meters in the northern part of the dome.

Rock mechanics require that cavern wells must be located within certain safety limits from the salt dome flanks and overhangs. A safety distance of at least 400 meters is assumed to be necessary for the required minimum separation between cavern wells and salt dome boundary. The same distance was chosen for the well spacing.

Two exploratory oil wells (TO-1 and TO-2) were drilled in the salt dome to a depth of 762 meters in 1951. No oil was found, and the wells were abandoned as being non-productive. The well TO-1 encountered high pressure gas while drilling in the salt at a depth of 500 meters. It was not possible to determine the composition of the gas as no sampling took place within the half hour during which the entire gas escaped.

During the later drillings and investigations it has been found that the cap rock has a thickness of 21 (TO-1) to 99 (TO-2) meters. The cap rock is located in a depth varying from 145 (TO-2) to 325 (TO-7) meters below ground.

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