Compilation of geological and geotechnical data of worldwide domal salt deposits and domal salt cavern fields

for:

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1 Summary

Diapiric salt formations occur in almost half of the known major salt basins around the world. The main salt dome provinces, including those with more than one hundred localised diapirs, are mainly found offshore and onshore of the US Gulf Coast Basin, in the Central European Basin System (Southern Permian Basin extending from the North Sea through the Netherlands and Germany into Poland), and in numerous salt basins in the Near East and in Kazakhstan. Major salt dome provinces have also been discovered along the coast of North, Central and South America, Europe and Africa.

More information on salt structures and their genesis has been provided over the years by seismic and geological surveys conducted as part of hydrocarbon exploration, salt mining and the construction of underground storages. Classic salt diapirs were formed under the influence of tectonic and halotectonic processes from formerly flat-bedded salt sequences. Salt domes by definition are only considered to be those diapiric structures which have pierced the cover rock. They can extend vertically for several kilometres forming either elongate vertical structures as in the Gulf of Mexico or mushroom-shaped structures as in the North German Basin.

Research into salt structures for scientific and engineering purposes has made it possible to identify numerous different types of salt structures. Cavern locations today are found in a number of different salt formations. The theories of salt dome genesis have changed over the years. Earlier theories have been and are undergoing further modification, and new ideas are being developed.

This study describes 145 cavern fields operated in domal salt. They are found in 9 European countries as well as in the USA, Canada and Mexico. No information is available to indicate the presence of other localities. More than 90 per cent of the known cavern fields are found in the US Gulf Coast Basin, in Texas, Louisiana, Mississippi and Alabama, and in the salt domes of the Southern Permian Basin in North Germany, the Netherlands and Central Poland. The main concentration is in the USA with 99 cavern fields in 48 salt domes and over 600 caverns. Germany comes second with almost 150 caverns in 27 cavern fields at 18 different locations associated with 14 North German salt domes. Poland operates four different cavern fields, Spain three, and there are two each in Denmark, the Netherlands and France, and one each in Portugal, Romania, Bulgaria and Mexico.

Most of the cavern fields constructed in salt domes in the USA are used for the storage of LPG and crude oil (US strategic petroleum reserve). These storages are located in 37 facilities with over 300 caverns. Brine production localities are found at 30 facilities in North America, two of them in Canada. Further brine producing facilities have already been abandoned. Natural gas caverns in salt diapirs are found in 24 localities on the US Gulf coast. They only account for around 20 per cent of all salt dome caverns. Cavern repositories have been constructed at four localities. Two facilities in Texas store hydrogen. Compressed air for a CAES power plant has been stored in caverns in the Mackintosh salt dome in Alabama since 1991. The salt dome caverns of Mexico are used for crude oil storage.

Of the more than 270 caverns in Europe, over 70 are used for natural gas storage, of which more than 70 per cent are located in Germany. Germany also has 90 per cent of the around 100 caverns for storing crude oil and petroleum products. 37 per cent of all the caverns in domal salt involve brine production facilities, primarily in France, the Netherlands, Spain, Poland, Romania and Bulgaria. A CAES power plant consisting of two caverns is operated in Germany.