

ISPG

A Sludge fall-out Prediction System for Crude Oils in Long-Term Salt Cavern Storage

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SUMMARY

In above ground tankage the sludge settles unevenly over the tank bottom; it is believed that this is caused by concentration differentials; the sludge amount can be as big as 20% of the crude volume with a growing tendency over time.

Storage in crude oil salt caverns – the major alternative to above ground steel tanks or rock caverns – offers significantly different storage conditions and subsequently the mechanism of sludge formation in salt caverns follows very different paths. It also reaches its maximum volume rather quickly and remains a relatively small fraction of the total crude body in the cavern.

The structure of salt cavern sludge appears very different from steel tank sludge, as it is based almost exclusively on a complex emulsion formation involving sweet or sea water as well as "low-salt" and saturated brines.

Pure wax layers were never found in caverns in spite of clearly observed stratification of crude types/components by gravity.

As both steel tank and cavern sludges cause operational problems and sometimes hydrocarbon losses, the national emergency storage organisations in Europe, Japan and the USA got together to form the International Sludge Project Group (ISPG) with the objective to research sludging theories and study formation mechanisms with the objective to build a sludge prediction system, which helps to minimise sludge formation and lengthens the time period of no or little fall-outs.

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