Salt Precipitation Modelling Extension

Publieke samenvatting / Public summary

Summary

In a previous project (TKI ref. TKIG01001), TNO developed a macroscopic model to simulate salt precipitation in the reservoir and the effect of water washes on well performance. This model was developed using the University of Stuttgart's open source Dumu^{x} simulator, incorporating the applicable physics for our application.

The current project improved the physics in the model by enabling the simulator to adjust the capillary pressure internally to account for the changing porosity and permeability caused by salt precipitation. The Dumu^{x} code was also adjusted to support the incorporation of experimental data obtained in another TKI project (TKI ref. TEG00213004).

Background

As salt moves up from the reservoir to the well, it causes a drop in pressure that leads to water evaporation and salt precipitation. This salt deposition mainly occurs around the well and in the rock, rather than deep in the reservoir. To mitigate this problem, several production strategies are used. However, there are no models available that can predict salt deposition and the effect on gas production with the degree of accuracy required. There are also no models to predict the effect of rinsing with water or the effect of other mitigation methods.

Project Objective

Salt precipitation is a regular occurrence in gas-

Projectinformatie / Project information

Projectnummer / Project number
TKITOET2014-06-UG
Subsidiebedrag / Grant amount
€ 150.000,00

Algemene informatie / General information

Volg Topsector Energie op X / Follow Topsector Energie on X

@TSEnergie

producing wells in the Dutch and English sector of the North Sea, where it can reduce gas production and prematurely shorten the life of a well. Having a good understanding of the applicable mechanisms and mitigation techniques is central to preventing this happening. This project involved modelling salt precipitation and mitigation to enable the development of strategies to optimise and prolong gas production.

Project Results

A sensitivity analysis showed that the location and rate of salt deposition is a balance between evaporation (drying) and liquid transport, and that two regimes can be distinguished: 1) A liquid-transport-dominated regime, which results in clogging close to the well bore and which is relatively fast; 2) A drying-dominated regime in which clogging occurs further away from the well bore and which is relatively slow.

Salt precipitation is observed to be the most sensitive to changes in the following four parameters:

- the initial water saturation
- initial salinity of reservoir brine
- reservoir pressure, and
- drawdown pressure

Capillary capping influences the salt precipitation profile when initial water saturation is close to the irreducible limit, and this effect needs to be investigated in more detail. Vapour pressure lowering and film flow shift the salt precipitation phenomenon from a drying-dominated regime to a liquid-transport dominated regime.

Finally, reservoir management strategies for mitigating salt precipitation were investigated. The results showed that salt precipitation varied according to specific drawdown values at different reservoir pressures. This means there is an opportunity to optimise production by varying the

drawdown. This could be a topic of further research involving looking at different types of reservoirs.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
Voor meer informatie over de Topsector Energie, ga naar **www.topsectorenergie.nl**.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar **www.rvo.nl/tse**.