

Handling Scale in Oil & Geothermal Production Facilities

Akiet's research has been aimed at understanding scale formation, by a literature study and field test at production facility of ECW Geomanagement.

Forming Scale

Oil (and Geothermal) field scale consists mainly of inorganic salts, with calcium carbonates, barium and strontium sulphates as the commonest components.

The driving force for scale formation are temperature or pressure changes, outgassing, a pH shift, or contact with incompatible water. Scale can form from brine (formation water) as it undergoes changes in pressure and temperature, or where two incompatible fluids are intermingled.

In order for a scale to form it must grow from solution. The first development within a saturated fluid is a formation of unstable clusters of atoms, a process called homogeneous nucleation. The atom clusters from small seed crystals triggered by local fluctuations in the equilibrium ion concentration in supersaturated solutions.

The first of these mechanism generally gives rise to carbonate scales, while the second usually produces sulphate scales.

Scale problems can arise in various circumstances:

- during drilling and well completion, if the drilling mud or completion fluid is incompatible with the formation water
- at the commissioning stage of new injectors, if the injection water is incompatible with the formation water
- during production, when a well starts to produce formation water with the hydrocarbons
- during wellstream processing, when significant quantities of produced water put process equipment at risk
- commingled production, where wellstreams from various formations, reservoirs or individual wells are mixed together, can make matters worse.



Examples of heavy scale precipitation

Crystal growth also tends to initiate on a pre-existing fluid-boundary surface, a process called heterogeneous nucleation. Heterogeneous nucleation sites include surface defects such as pipe roughness in production tubulars or even joints and seams in tubulars. A high degree of turbulence can also catalyze scale deposition.

Field test

Akiet has inserted composite High Strength Composite Tubulars (HSCT) pieces with perforations at the surface filter house of the geothermal production facility of ECW Geomanagement. This field test is performed to monitor scaling effect of the formation water with the composite. At the moment are the results very promising after 5 months monitoring, no scaling is detected.



HSCT samples at ECW with perforations

Extremely smooth

With the Rotary Casting technology that Akiet has developed the outside of the tubulars sits against the smooth inside of the mould and the resulting outer surface of the tubulars is as smooth as the inner surface of filament wound tubulars. Because of the smooth outside surfaces any handling tools do not damage the surface yet. They have good grip as demonstrated in real applications. For higher loads strain compensated slips ensure a tight and effective grip.

The inner surface of the Akiet tubulars is the result of hundreds of g-forces that are created by spinning the mould. The smoothness reduces friction and gives pressure loss improvements in applications where pumping costs are relevant. Akiet's rotating casting technique improves production performance and significantly reduces operating costs.

References

Handling scale in oil production facilities - statoil.com

Modeling and Management of Scale Potential in an Oil Field Production Network - ntnu.trondheim

Extremely smooth - akiet.com

Learn more about HSCT

For questions or further installation details please contact:

Akiet Downhole Composite Tubulars

Betonstraat 8 | 8211 AE Lelystad | The Netherlands

info@akiet.com | +31 6 2451 3869

