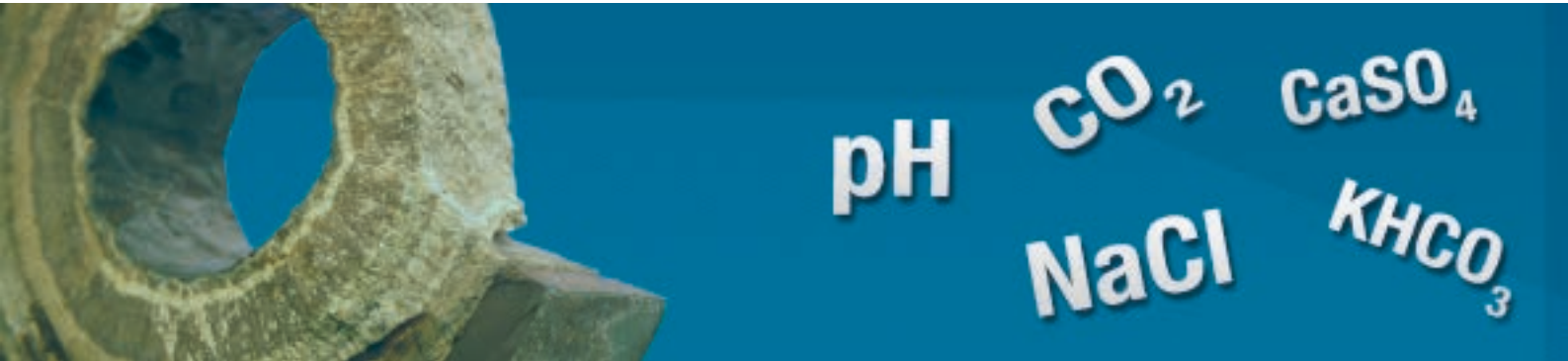**EXPRO**

FLUIDS

MultiScale™

What is MultiScale?

MultiScale is a simulation software developed to calculate the mineral scaling potential all the way through the production system, from reservoir to top side. It is possible to run simulations up to 1000 bar and 300°C in salt saturated systems due to MultiScale's powerful underlying thermodynamic model.

Input

- Water analysis
- Oil / gas analysis
- Pressure / temperature / rates

Output

- 3-phase equilibrium, phase compositions of oil, gas and water
- pH, ion concentrations etc.
- Scale potential and amount of salt precipitated
- Phase properties

Overview

- MultiScale can be used to predict the scaling tendency of the following minerals:
  - NaCl, KCl
  - $BaSO_4$, $SrSO_4$, $CaSO_4$ (a, g, h)
  - FeS
  - $CaCO_3$ (c, a, v) , $FeCO_3$, $BaCO_3$, $SrCO_3$, $NaHCO_3$, $KHCO_3$, Na_2CO_3 (a, d, m), K_2CO_2 (h, a)
  - NaAc (t, a)
  - $Mg(OH)_2$
- Single point and simplified pH calculations
- Automatic tuning of water; alkalinity, CO_2 and correction for water evaporation
- SR can be choosen (<>1 or in %) and you can select if precipitated salts shall be taken into the next calculation level or not
- Very good handling of water evaporation also for gas/condensate systems with very little water
- Organic acid can be entrered as separate acids (Methanoic, Acetic, Propanoic, Butanoic)

- Accurate model for water equilibria
- Especially developed to meet the challenges related to the pH dependent carbonate scaling (HPHT wells, injection of produce water, reinjection of CO_2)
- Complete PVT-model which can calculate bubble point and phase distribution
- Very accurate model for calculating evaporation of water at various conditions

- Organic acid distribution in gas and oil phase
- pH predictions have been verified with actual measurements at high temperatures and pressures
- Program parameters are updated with latest available data from reliable sources

User interface

- Excel format on report data (optional)
- Loading/storing of ongoing projects
- Integrated manual as web pages and pdf format
- Tree view
- 6 waters, 6 oils and 6 gases

Stream calculations

- Waters, oils and gases are combined to streams
- A stream can contain water and/or oil and/or gas
- Streams can be saved, used later and may be combined with any other stream
- Streams can be used in process simulations (see brochure "MultiScale™ Process Simulation Module")

PVT model

- Similar to standard PVT packages
- 16 components + 9 pseudo components (+ fraction)
- SRK or PR with Peneloux and Huron-Vidal mixing rule
- Accurate volumetric and phase distribution

Save results for later use

- Water phase, oil phase, gas phase and oil+gas phase are saved as analyses that can be opened in later calculations
- Results are also saved as streams
- Process calculations much easier
- Ongoing project calculations can be saved/reloaded

Add-on options (Ref. own tech-sheets)

- MEG module for simulation in systems treated with MEG
- H_2S scavenger module
- Process simulation module

Summary

- Working range: 300°C and 1000 Bar
- Mixing of up to 6 waters, 6 oils and 6 gases
- Stream calculations
- Accurate PVT model, similar to standard PVT packages
- Automatic tuning of water; alkalinity, CO and correction for water evaporation
- Prediction of the water chemistry and the scaling tendency for the following minerals:
  - NaCl, KCl
  - $BaSO_4$, $SrSO_4$, $CaSO_4$ (a, g, h)
  - FeS
  - $CaCO_3$ (c, a, v) , $FeCO_3$, $BaCO_3$, $SrCO_3$, $NaHCO_3$, $KHCO_3$, Na_2CO_3 (a, d, m), K_2CO_3 (h, a)
  - NaAc (t, a)
  - $Mg(OH)_2$

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