

Development of system for semi-continuous monitoring of salinity in well streams to remove volume measurement errors and detect water breakthrough

SalinityScan – an FP7 Project

The idea behind the SalinityScan project, finalized in March 2013, was to develop a subsea sampling and analysis system capable of monitoring the salinity of produced water, thus greatly improving well management and reducing errors in subsea flow measurement. The project has developed a sample and analysis system for installation upstream from MPFMs on subsea manifolds. Integrated in the flow line, the system can sample the multiphase production from the well, allow the fluid to separate into its single phases by electrostatic coalescent and measure the salinity of the water fraction.

Technological problem addressed by SalinityScan

Multiphase flow meters (MPFMs) are used in the oil and gas industry to measure the individual phase flow rates of oil, gas and water produced during oil production processes. Most MPFMs are based on technology that is heavily influenced by variations in salinity. Thus, variations in salinity may cause erroneous flow rate data, which causes suboptimal well management and less-effective topside processing of the multiphase flow. The SalinityScan system is intended to be integrated in the multiphase flow line from a single well, upstream from the flow meter, where it will sample the flow at user-defined intervals. The sample is separated into its individual phases using an electrostatic separator, and the separated water is analyzed. An ultrasound level sensor is implemented to gauge the gas/water/oil volume fraction. Production flow is maintained through a bypass to prevent production stops. The SalinityScan data will be used to update the flow meter calibration parameters, thereby removing the offset caused by the change in salinity. Additionally, by semi-continuously monitoring the salinity it becomes much easier to detect water breakthroughs, which occur when the well starts to produce seawater that has previously been injected into the well to increase pressure or water that has penetrated the oil-carrying layer in the reservoir. By measuring the early onset of formation-water production, as a result of water breakthrough, the operators can take preventative or remedial action, such as injecting the right amount of corrosion inhibitor or, more drastically, choking the well or instigating zonal isolation². All wells will, as they mature, start to produce increasing amounts of water, but by increased instrumentation, of which monitoring the salinity is an important part, it is possible to keep these wells in operation for longer, thus increasing profits.

Summary of industry benefits gain through the SalinityScan system

- Reduction of errors in multiphase flow measurements induced by variations in produced water salinity
- More efficient use of chemicals used to curb corrosion and scaling by adjusting inject amounts to salinity level of produces water
- Provide reference data on liquid fraction volumes for verification of MPFM data
- Earlier detection of water breakthrough

The SalinityScan project was initiated in answer to the lack of instruments providing this kind of functionality available for installation on existing MPFMs.



Current Project Results:

- Analysis chamber capable of:
 - ✓ Separating multiphase fluid
 - ✓ Measuring salinity
 - ✓ Measuring volume of phases
- Test system simulating analysis chamber in use, all fitted in a small container for portable presentation

Industrial Participants:

- Tool-Tech AS, Norway (SME)
- Euro Technique Industries, France (SME)
- Intelmec ingeniería S.L, Spain (SME)
- SubC Solutions AS, Norway (SME)

R&D Institutions:

- Teknologisk Institutt AS, Norway (RTD Performed & Coordinator)
- Fraunhofer IGB, Germany (RTD)
- Robert Gordon University, UK (RTD)

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Further information:

Jon Sletvold, Group Leader, Teknologisk Institutt as

Phone: +47 406 95 310

Email: jon.sletvold@ti.no

www.salinityscan.com



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