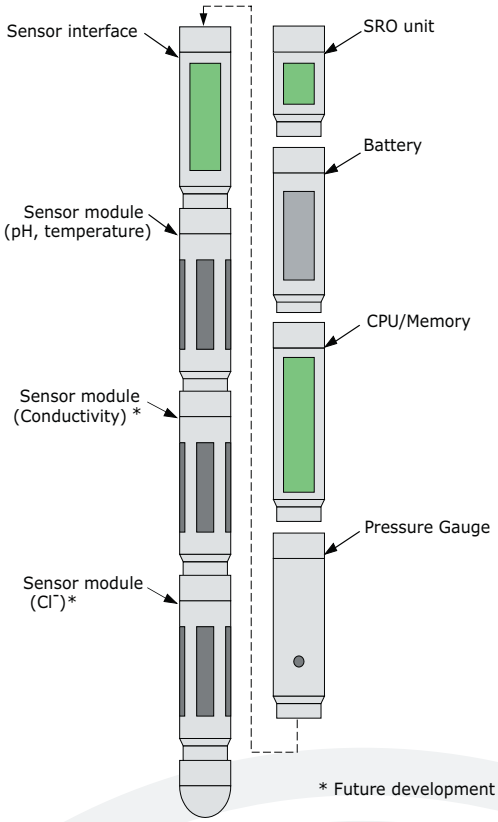
EXPRO
WELL TESTING & COMMISSIONING

MultiTool® A downhole tool for measurements of water properties

During the exploration phase it is particularly important to collect data which will enable the prediction of both the eventual amounts of petroleum and possible operational problems.

Chemical and physical data collection from mixtures of injection/ formation water, oil and gas have been given very low priority in the past and have therefore been little studied. This has motivated the development of this new tool.

From studies carried out over several years we have recorded shortcomings in the data collection from well testing (both in the exploration and the production phases). It is often only when fields have come to the production phase that the problems are seen. An example of this is the development of the so-called "MultiScale" simulation program for mineral deposition where we are only now, starting to look at the pH measurements under reservoir conditions, something which is difficult to predict. pH has also a central role in the evaluation of corrosion.



The MultiTool

Currently the MultiTool measurement probe system contains instruments for the measurement off pH. A platinum temperature element is integrated in the sensor-system for measurement of well temperature. pH is temperature dependent and accurate temperature measurement is therefore very important.

Future development will also provide measurements of Cl-, conductivity and other ions by use of the same technology.

The MultiTool measurement concept can be used downhole for logging in exploration or production wells or for permanent installation in future smart wells, sub-sea on templates or topside in process systems. One of the main advantages of this measurement technique, is the possibility of doing measurements directly in multiphase flow of oil and water. Reliable pH measurements in water/oil mixtures with down to 1-2% water have been accomplished.

Expro has also developed an offshore laboratory service for doing pH-measurements in reservoir fluid at reservoir conditions. For downhole applications, a quartz pressure gauge can also be added to get the exact well pressure.

The MultiTool system can be run on both slick-line (with datalogger and batteries) or with monoconductor wire-line for surface readout (SRO) of "real-time" data .

Applications:

By use of the MultiTool in combination with downhole samplers and computer simulations, it is possible to establish a better understanding of deposits, scale, corrosion, rheology, asphaltenes, well chemistry, wax and composition.

The measurement probe is capable of being used in all wells, particularly in long horizontal wells, where there is a pronounced need due to the lack of technical development in well intervention and well testing.

The main use of this tool will be for well monitoring at critical locations for the inflow of formation fluid. The demands on the probe and its properties are determined by several conditions, such as corrosion, potential for formation of calcium deposits, emulsion formation, asphaltene deposition and how many of these critical parameters can be controlled.

The value to users (oil companies) lies in the areas of:

- Better well control and supervision
- Better control of problems with deposit formation and corrosion
- Optimisation of chemical well treatment
- Increased well production time
- Reduction in the need for well "Work Over"
- Economical savings due to less need for onshore analysis

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Technical Specification:	
General specifications	
Maximum working pressure	690 barg
Working temperature	0 – 150°C
No of data samples	100.000 1)
Sampling rate (minimum)	2 sec
pH-sensor tool	
Measurement range	3-11 pH
Usable range	1-12 pH 2)
Accuracy	± 0.05 pH
Resolution	0.01 pH
Water-cut required	>1-2 %
Temperature range (built-in sensor)	0-180 °C
Pressure sensor tool (Quartz)	
Pressure range	0-1100 barg
Accuracy (pressure)	0.02 % FS
Mechanical (housings)	
Service	Extreme sour
Material	Non-corrosive
Outer diameter	$1^{3}/_{4}$" /44,5mm
Sensor tool length	1982 mm
Weight	18 kg
Addition for each chemical sensor	650 mm
Maximum no of chemical sensors	4
Addition for well pressure measurements	400 mm

1) For 1 pH-sensor (well- temperature measurement included)
2) Without specified accuracy.