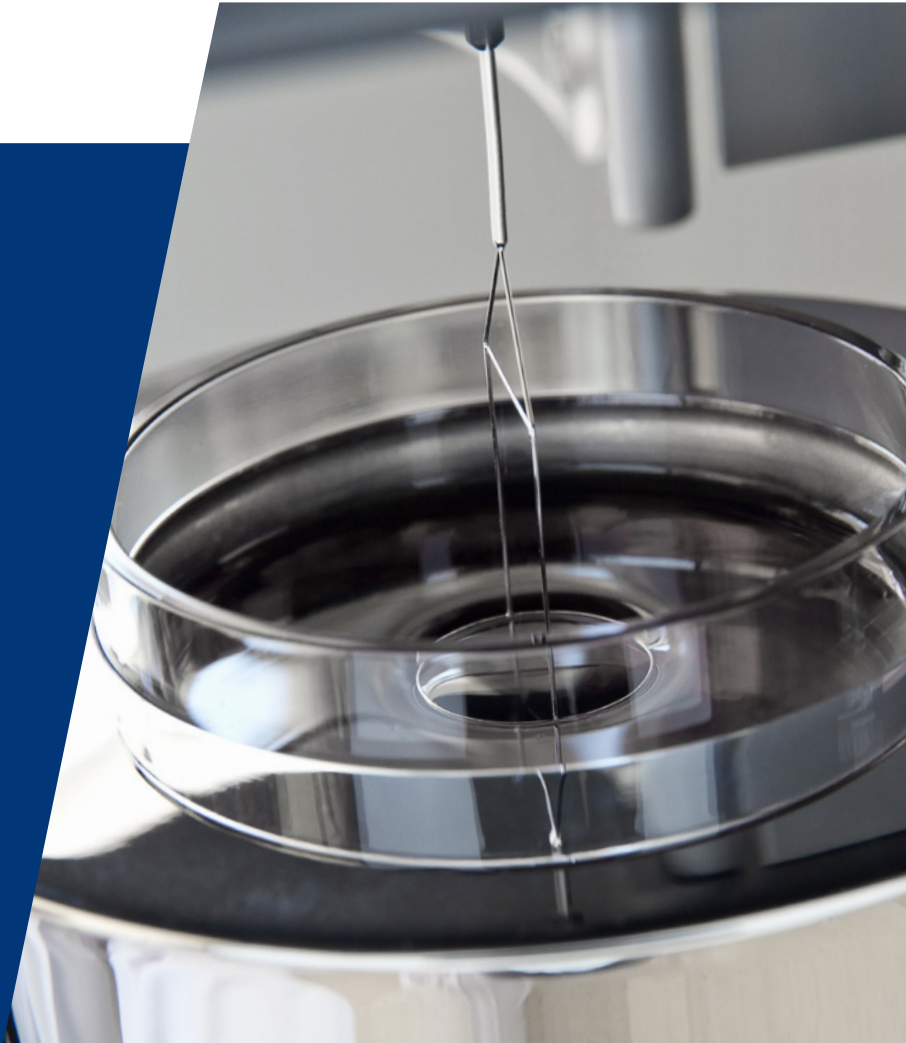


ConnectingChemistry



OIL & GAS RESEARCH AND DEVELOPMENT CENTRE

Advanced research and analysis

Oil & Gas – Research and Development Centre

Oil&Gas Research and Development Centre is a complex of modern laboratories dedicated to Oil&Gas industry. The laboratory is divided into three sections designed for drilling, production and corrosion studies, aiming to provide the complete service for Oil&Gas customers Europe.

Oil&Gas Research and Development Centre is equipped with the state-of-the-art instruments and devices to perform advanced tests and analysis. Research works performed in the Centre's laboratories enhance development of new products for drilling and oil and gas production (corrosion inhibitors, paraffin inhibitors, scale inhibitors, drilling fluids, products for stimulation and many more).

The laboratories provide professional service and technological support, constant quality control of blended products as well as sample analysis and identification (e.g. well water, crude oil, paraffin, asphaltene, scale).



Spectrometer

Spectrometer IR is used to determine substances content in the sample. This quantitative and qualitative determination method is based on recording infrared spectra of the sample and measuring the absorbance at the maximum band (bandwidth) characteristic for the tested substance.

The method is used in two ways. It allows to control quality of the products formed and to identify deposits of unknown composition.



Dynamic Scale Loop

The differential **Dynamic Scale Loop** provides an accurate, reproducible and fast method for selecting and quantifying the most effective means of controlling scale deposition under dynamic conditions. The instrument is suitable to simulate process or reservoir temperatures of up to 250°C and pressures up to 3 000psi. The system is also recommended where effects of pressure on scaling tendency are to be studied, and especially for examining the deposition of anhydride under dynamic conditions.

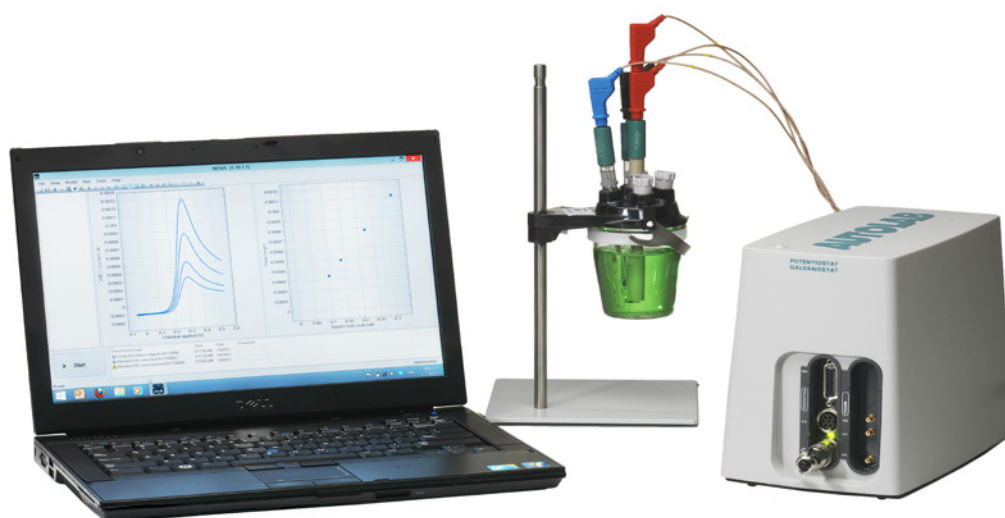
The system is equipped with a back pressure valve, which keeps the absolute pressure in the system constant and three high pressure, high precision HPLC pumps. Each pump delivers just one fluid – anionic brine, cationic brine and inhibitor, which provides maximum accuracy. The three fluids are mixed and flow through the exchangeable test pipeline.



Wax-Eval Flow Loop

Wax deposition inside tubular and pipelines reduces the effective flow area, increasing the pressure drop and potentially causing complete blockage. Therefore, it is important to fully understand the oil's behavior throughout the pressure and temperature path from the formation to the production facilities. Temperature is the dominant parameter affecting waxy crude oil viscosity, gel strength, pour point, wax crystallization and deposition. **Wax-Eval** is used to determine effectiveness of paraffin inhibitors.

Potentiostat-Galvanostat



Linear Polarization resistance monitoring is an effective electrochemical method of measuring corrosion. The monitoring of the relationship between electrochemical potential and current, generated between electrically charged electrodes in a process stream, allows the calculation of the corrosion rate. LPR is most effective in aqueous solutions and has proven to be a rapid response technique.

The **Autolab PGSTAT204** instrument includes a base potentiostat/ galvanostat with a compliance voltage of 20V and a maximum current of 400mA, a corrosion cell, electrodes system and software and can be used for most of the standard electrochemical techniques.

Capillary Suction Timer

CST is used to characterize shales and to optimize the electrolyte concentration in drilling fluids for minimizing its effect on shale formations.

CST studies of filtration characteristics of aqueous systems utilize the capillary suction pressure of porous paper to affect filtration. It is fast and reliable method for measuring the effectiveness of shale swelling inhibitors.



Multi-Place Cold Finger

The **Cold Finger** apparatus uses a rapid screening method to identify and rank potential wax deposition inhibitors. The quantity of paraffin wax adhering to the cooled surface is quantified. The efficiency of scale and paraffin inhibitors can be assessed. The MCF 6 apparatus is designed to be used with black oil samples held in six glass bottles.



Ion chromatograph

Ion chromatograph is used for determination of major inorganic anions and cations in the sample, which allows for selection of a suitable inorganic scale inhibitor or solvent. Preparation of the sample is the key step in the analysis, as it determines quality of the results.

The use of ion chromatography allows for accurate determination of ions in samples which are complex and multi-matrix, e.g. water samples from separators, re-boilers or well water containing many kinds of cations and anions and having different ionic concentration.



Grace-Rheometer HPHT

The **Grace Instrument M5600 HPHT Rheometer** is a true Couette, coaxial cylinder, rotational, high pressure and temperature rheometer (up to 1 000psi and 500°F). It is engineered to measure various rheological properties of fluids, including n , k and viscosity. Pressure range: Atm to 2 000psi, shear rate range: 0.00004 to 1870 sec⁻¹, shear stress range: 1 to 15 000 dyn/cm², viscosity range: 0.5 to 5 000 000 Centipoise.



Turbiscan

A **Turbiscan** is the ideal instrument for testing of emulsions, suspensions, dispersions and foam. The **Turbiscan** works on Multiple Light Scattering in both Transmission (T) and Backscattering (BS) mode, in order to analyse low and high concentration dispersions. It allows to detect and quantify early signs of sedimentation, flocculation, phase separation, coalescence and creaming.



It has multiple applications in our lab:

- Appraisal of the efficiency of asphaltene dispersants dedicated for crude oil. Measurement is a modified version of testing described in ASTM D7061-06.
- R&D tests of new demulsifier formulas. Device is equipped with heater, allowing to measure stability of emulsions up to 60°C.
- R&D tests of drilling additives – observation of drilling mud destabilization phenomenon.

Stability tests of produced formulas to fulfill QC check.

Flash point tester

Used for the determination of the flash point of petroleum products by the Closed Cup Test, with a Flash Point between 40°C to 360°C. Supplied complete with stirrer, shield for radiations, cast iron bath, electric heater with digital thermoregulator two thermometers ASTM 9C -5 +110°C div. 0.5°C, and ASTM 10C +90 +370°C div. 2°C.



Karl Fischer Titration



foto: www.metrohm.com

Karl Fischer Titration is used to directly determine the amount of water in the petroleum products from 0.05% to 100%. The presence of water in the sample determined by titration helps to determine the effectiveness and efficiency of demulsifier. Compact oven sample changer is used for thermal sample preparation in Karl Fischer titration. In the oven the samples can be heated up to 250°C. The moisture contained in the sample evaporates and is transported by a dry carrier gas into the titration cell, where the analysis takes place.

Force tensiometer

Force tensiometer K20 is used in Oil & Gas laboratory for determining best performing demulsifier. One which lowers surface tension of crude oil the most, allows for better water and oil separation.

The **K20** is intended only for measurement of the surface tension of liquids with the Du Noüy ring or Wilhelmy plate method, the interfacial tensions between two liquids with the Du Noüy ring or Wilhelmy plate method and measurement of the density of a liquid.



Hamilton Beach Mixer



Special attention to mixing procedures and reagent preparation is essential in any qualitative fluid analysis. Factors such as low or high shear, initial mix concentrations and ability to change mixing speeds are important considerations when choosing a laboratory or field mixer.

These mixers are perfect for formulating drilling fluids in the lab, for pilot testing and mud additive analysis.

Viscometer



Ofite's **Model 900 Viscometer** is extremely versatile. Its simplicity makes it ideally suited for the field as well as any laboratory equipment.

This fully-automated system accurately determines the flow characteristics of completion fluids and drilling fluids like viscosity, yield point in terms of shear stress, shear rate, time and temperature.

Filter press



Ofite Dynamic High-Temperature High-Pressure (HTHP) filter press measures filtration properties under varying dynamic down hole conditions.

A motor-driven shaft fitted with propellers turns at varying speeds inside a standard 500 ml **HTHP** cell. RPM settings from 1 to 1 600 RPM impart laminar or turbulent flow to the fluid inside the cell. The test procedure is exactly the same as that in the standard Bench-Mount filtration test, but it allows to measure filtration in high temperature and high pressure conditions.

Bench-Mount Filter Press



The Ofite low pressure filter press helps determine filtration and wall cake-building properties of drilling fluids. Suitable for field and laboratory use.

Filtration is an important feature of each drilling fluid. This parameter is continuously monitored and controlled. Even when filtration control additives are not used, it is usually a conscious decision based on the evaluation of potential consequences that include tightening of the drill string, falling of the well walls and loss of rheological parameters of the drilling fluid.

Lubricity tester

The Ofite combination EP (Extreme Pressure) and **Lubricity tester** is a high-quality instrument used to measure the lubricating quality of drilling fluids, provides data to evaluate the type and quantity of lubricating additives that may be required, and predicts wear rates of mechanical parts in known fluid systems.

The test consists of measuring the torque of a steel block while being pressed against a rotating steel ring.



Roller oven

The Ofite **Roller Oven** is an effective aid in determining the effects of temperature on drilling fluid as it circulates through the well bore. Aging the drilling fluid in pressurized containers effectively demonstrates the thermal effects on viscosity and how various additives behave at elevated temperatures. Aging is done under conditions that vary from static to dynamic and from ambient to highly elevated temperatures.



Garrett Gas Train

The **Garrett Gas Train** is the most widely used portable instrument for determining the presence and quantity of soluble sulfides and carbonate concentrations in drilling fluid and produced water.

Soluble sulfides include H_2S as well as sulfide (S^{2-}) and disulfides (HS^-) ions. Total soluble carbonates include CO_2 as well as carbonate (CO_3^{2-}) and bicarbonate (HCO_3^-) ions. It is a versatile apparatus allowing for test effectiveness of H_2S scavengers.



Autoclaves for corrosion rate measurement

Autoclaves for corrosion inhibitor tests in prepared brine/ well water and under conditions of high pressure and high temperature. Methods of evaluating corrosion inhibitor efficiency are performed by conducting coupon mass loss test and electrochemical measurements.

Retort Kit

The retort provides means for separating and measuring the volumes of water, oil and solids contained in a sample of drilling fluid. A known volume of sample is heated to vaporize the liquid components, which are then condensed and collected in a graduated receiver tube. Liquid volumes are determined by reading the oil and water phases on the graduated cylinder.

The total volume of solids, both suspended and dissolved, is obtained by noting the difference of the total sample volume versus the final liquid volume collected. Calculations are necessary to determine the volume of suspended solids since any dissolved solids will be retained in the retort. Relative volumes of low-gravity solids and weight materials may also be calculated.



Rheometer

Brookfield DV3T rheometer measures fluid viscosity at given shear rates. Viscosity is a measure of fluid's resistance to flow. In Oil & Gas industry it is used to determine viscosity of many different fluids like crude oil, drilling fluid and commercial products.



Ageing Cell

The Ofite **Ageing Cell** is a patented pressure vessel that enables samples to be subjected to temperatures higher than the boiling point of water and still be maintained in a liquid state. The cells may be used for static temperature exposure or in a dynamic mode in a roller oven with a preset minimum aging time of 16 hours.

For corrosion testing, a special 500 ml, alloy stainless steel Corrosion Test Cell is available with a modified inner cap designed to hold a corrosion coupon.



Stereo Microscope

SK stereo microscope is designed for 3D observation of small objects, mineral samples, metals, etc. in reflected and transmitted light and both. High quality optics, combined with high-tech light sources, guarantee the best quality of the image.

The technologically advanced application provided with the camera lets the user adjust the image parameters to best visualize the analyzed specimen on the computer screen.



Metallographic Microscope

MM-100 inverted metallurgical microscope is designed for observing the structure of metals, metal alloys and minerals in industrial laboratories. The sample is lit from the bottom through the objective.

MM-100 microscope can be outfitted with digital image acquisition system.



Shearometer

Experience has shown that many drilling fluids tend to develop excessive gel or shear strength under static conditions, when the mud is not circulating in the well bore. Excessive shear strength results in high pump pressures required to “break circulation”, in loss of circulation and difficulties in logging, perforating and other down-hole operations.

The **Shearometer** may be used to estimate the extent to which the drilling fluid will develop excessive gel strength and is the primary measuring device used in the determination of the gel strength of a drilling fluid. The scale measures gel strength in pounds per 100 square feet.



Identification and examination of pits (size, shape and distribution) and evaluation of pitting corrosion can be performed by using metallographic and stereoscopic microscope.



Contact

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