Schlumberger

Houston, Texas, USA

The Schlumberger Reservoir Laboratory in Houston, Texas, provides laboratory analysis services for the most demanding field-development projects in challenging environments, including deepwater Gulf of Mexico and offshore Africa. With an integrated suite of laboratory services, advanced technologies, regional and international expertise, and strict QA/QC processes, the Houston facility supports a wide range of reservoir characterization and production studies that contribute to better-informed decisions across the E&P lifecycle.

The recent addition of advanced aqueous and petroleum geochemistry capabilities ensures that a variety of reservoir fluid characterization studies can be performed at one location. Laboratory personnel aim to better understand industry requirements and challenges by collaborating with regional experts, Schlumberger global advisors, and operators. Every project performed at the reservoir laboratory—from routine PVT analysis to complex integrated fluids characterization—is considered unique, leading to fit-for-purpose solutions built around a customized sampling and analysis program.

Mercury-free, visual PVT analysis systems manufactured by the Schlumberger DBR Technology Center in Edmonton, Canada, are at the heart of each fluid analysis operation performed at the Houston facility.

Close cooperation with a colocated Schlumberger Reservoir Laboratory in Houston that specializes in conventional core and digital rock analysis, enables further integration for complex reservoir solutions. Current and prospective customers are encouraged to tour both facilities to see firsthand the laboratories' equipment and technology and to meet the facilities' dedicated personnel.

FLUID SERVICES

- Sample handling, restoration, and validation using unique workflows
- PVT services
  - Standard hydrocarbon fluid studies, including flash, constant composition expansion, differential liberation, constant volume depletion, and separator testing
  - Heavy oil studies using a customized workflow and a heavy oil PVT cell
  - High-pressure PVT studies
  - Formation-water PVT studies
  - Data interpretation and equation-of-state examination
- Compositional analyses
  - Standard C_{12+} gas and C_{36+} liquid compositions using gas-chromatography (GC) flame-ionization detection (FID) and thermal-conductivity detection
  - Sulfur-compounds speciation using GC sulphur chemi-luminescence detection
  - Paraffin and wax analysis using high-temperature GC-FID
  - Advanced composition using GC mass spectrometry (MS)
- Flow assurance and rheology measurement
  - Live oil wax and asphaltene studies using near-infrared (NIR), high pressure microscopy (HPM), and particle-size-analysis technology
  - Advanced RealView* technology for live solids deposition studies of wax and asphaltenes from live reservoir fluids under realistic production and transportation conditions
  - Live oil and stock-tank liquid wax appearance temperature study by cross-polar microscopy (CPM)
  - Live and stock-tank liquid oil rheology for non-Newtonian fluids
  - Live oil emulsion stability testing
- Physical fluid analyses
  - Live and stock-tank liquid oil viscosity measurement using electromagnetic and capillary viscometer
  - Stock-tank fluids property analysis related to organic solids behavior (e.g., asphaltene content and saturates, aromatics, resins, asphaltenes, cloud point and pour point, and wax content)
  - Basic physical stock-tank fluid properties studies (e.g., density, water content, and sulfur content)
- EOR measurements
  - Live oil swelling testing for EOR studies
  - Forward and backward multicontact study
  - Determination of minimum miscibility conditions of pressure and enrichment using a slim-tube apparatus for EOR studies
  - Interfacial tension testing on oil-water-gas for EOR studies
- Petroleum geochemistry
  - Geochemical fingerprinting using high-resolution GC-FID for production back allocation and compartmentalization studies
  - Studies for gas, oil and source-rock characterization (GC-MS and isotope-ratio-monitoring GC), including interpretation

- Water chemistry
  - Basic water properties (pH, conductivity and resistivity, gravimetric total dissolved solids [TDS], total suspended solids [TSS], specific gravity, and total alkalinity)
  - Extended water properties (basic plus Rice alkalinity [OH, HCO_2, CO_3], turbidity, free sulfide, and ions by inductively coupled plasma spectroscopy), including interpretation
  - Live water pH analysis

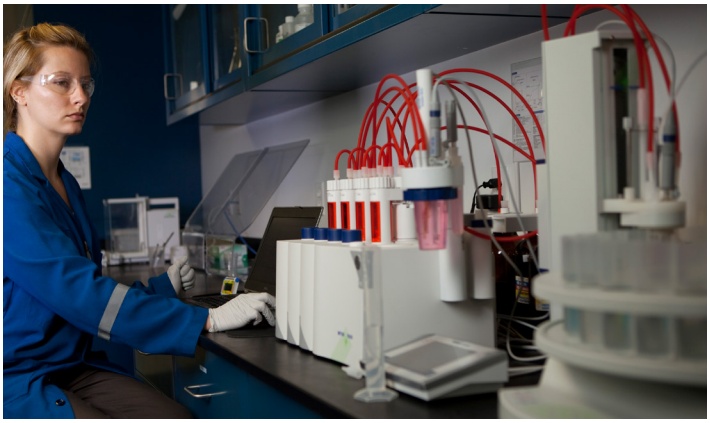
EQUIPMENT AND TECHNOLOGY

The laboratory operates HPHT equipment designed and manufactured by the Schlumberger DBR Technology Center in Edmonton, Canada. Products are continually engineered and added to the list of unique technologies that provide PVT, flow assurance, and EOR measurement. Visual, low-volume, H_2S-compliant, and mercury-free PVT cells have reliably operated for decades, performing thousands of studies. All compositional laboratory equipment is internationally standardized and selected from the highest-quality suppliers offering cutting-edge solutions.

- Heavy oil PVT cell with operating range of 15,000 psi [34 MPa] and 482 degF [250 degC]
- High-pressure PVT cell with operating range of 25,000 psi [172 MPa] and 392 degF [200 degC]
- Solids-detection systems based on NIR technology with bulk HP filtration
- High-pressure microscopy and cross-polar microscopy (HPM-CPM) cell with pressures up to 20,000 psi [138 MPa] and 392 degF [200 degC]
- RealView technology for unique measurement of organic solids deposition, including wax and asphaltenes at live conditions
- Live water pH system allowing for measurements of single-phase water pH in 4–9 pH range and calibrated up to 10,000 psi
- Sample conditioning systems for up to 60 samples at reservoir pressure and temperature

New globally standardized procedures, supported by proprietary QA/QC processes, ensure the delivery of the highest quality compositional data.

NIR solids detection supported by HPM became the industry-standard technique for assessing reservoir-fluid instability with respect to asphaltene precipitation.



Accurate evaluation of formation water properties are key to field development.

The state-of-the art Schlumberger Reservoir Laboratory in Houston delivers accurate PVT data through representative sampling and secure transfer and handling.

www.slb.com/labs

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