



# CAPABILITIES OVERVIEW - CALGARY LABORATORY

| Test or Analysis             | Equipment / Method  |
|------------------------------|---|
| Corrosion Testing            | <ul style="list-style-type: none"><li>• Linear Polarization Resistance Autoclave Corrosion Cells</li><li>• Rotating Cylinder Electrode</li><li>• Parr HTHP Acid Corrosion Cell</li><li>• Under Deposit Corrosion Accessory</li><li>• Vapour Phase HTHP Autoclave</li></ul>  |
| Specialty Testing            | <ul style="list-style-type: none"><li>• Sulfur in Water XRF</li><li>• High Pressure Liquid Chromatograph (HPLC)</li><li>• Dynamic Light Scattering Particle sizer</li><li>• Zeta Potential Analyzer</li><li>• Laser Particle Size Analyzer</li><li>• <sup>1</sup>H, <sup>13</sup>C, <sup>31</sup>P NMR Spectrometer</li></ul> |
| Wax Analysis                 | <ul style="list-style-type: none"><li>• Brookfield PVS HTHP Viscometer</li><li>• Cold Finger Apparatus</li><li>• Dynamic Scanning Calorimeter</li><li>• Gas Chromatograph</li></ul>   |
| Scale Analysis               | <ul style="list-style-type: none"><li>• Dynamic Scale Loop</li></ul>  |
| Gas Liquid/Residual Analysis | <ul style="list-style-type: none"><li>• Gas Chromatograph</li></ul>   |

## CES CORPORATE LAB

CALGARY, ALBERTA



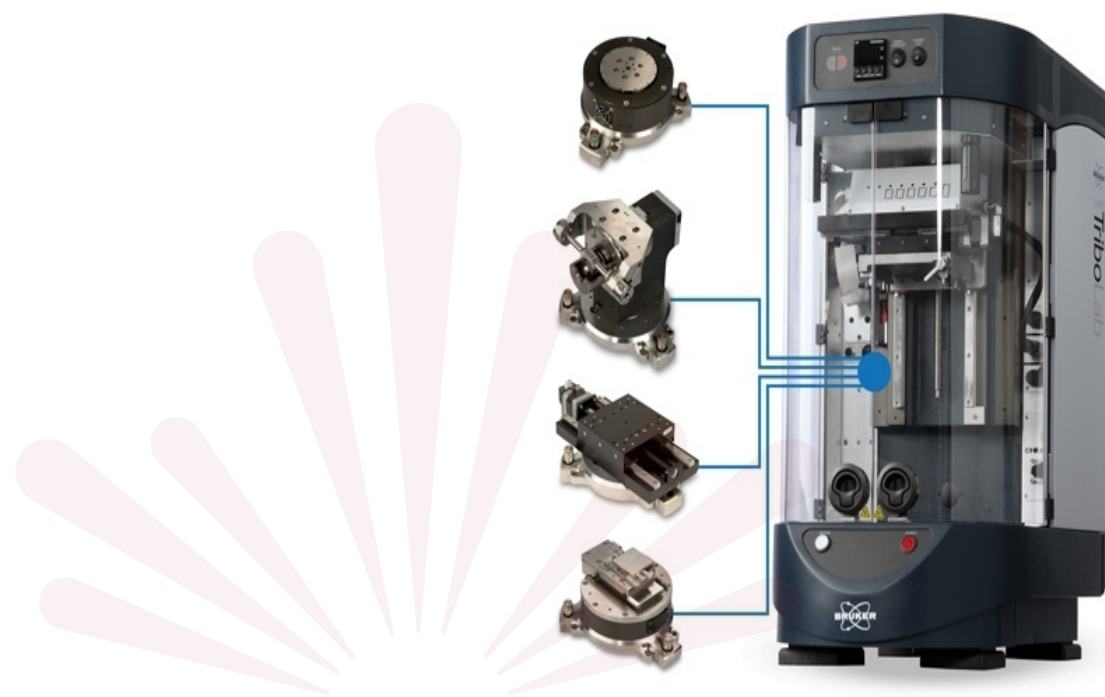
## OUR LAB IS FULLY EQUIPPED

- Bruker UMT Tribolab Lubricity Tester
- Gamry Corrosion Potentiostat / Multiplexor
- LPR Autoclave Corrosion Cells
- X-Ray Fluorimeter
- FTIR spectrometer
- Laser Particle Size Analyzer
- Nano Particle Size / Zeta Potential Analyzer
- Brookfield PVS HTHP Viscometer
- Dynamic Scale Loop
- Gas Chromatograph
- Cold Finger Apparatus
- PMCC Flashpoint tester
- Dynamic Scanning Calorimeter
- NMR Spectrometer (hydrogen, carbon, phosphorus)
- RCE corrosion cells
- Combination gel permeation / ion / high performance liquid chromatograph.
- **Complete array of standard Mud Testing equipment including:**
  - » HTHP/API Filter Press
  - » Hot Roll Over/Aging Cells
  - » Particle Plugging Apparatus
  - » Fann/OFITE Viscometers
  - » Capillary Suction Time Apparatus
  - » Bulk Hardness Tester
  - » Lubricity Meters

**The CES Corporate Laboratory opened its doors in the fall of 2015.**

The **17,000 sq. ft. facility** is located in the North East of Calgary. Within the facility there are **three labs:** a **dedicated sour service and corrosion lab**, a **drilling fluids lab**, and a **general purpose lab** for analytical chemistry and work with non-noxious chemicals.

A workshop for repair and calibration of lab and field equipment is also located on site, as well as a large boardroom for meetings and training sessions. **There are currently 9 full-time staff members.** Of the lab personnel, 4 members are dedicated to the drilling fluid laboratory (3 BSc, 1 BEng). Those staff members dedicated to drilling fluids maintain valid first aid and H2S Alive certificates and are therefore able to travel on field trips should the need arise to aid in experimentation, troubleshooting rig issues, and further have hands on experience running mud in the field.



## BRUKER UMT TRIBOLAB

### LUBRICITY TESTER

The UMT Tribolab system is built on the Universal Mechanical Test (UMT) platform from Bruker. **Canadian Energy Services' Bruker unit is an industry exclusive advanced tribology tester in North American drilling fluids laboratories.**

#### The Bruker UMT:

- Is a modular design allowing different test configurations.
- Is better able to distinguish between lubricants in a given fluid, and is more reproducible than the older technology.
- Measures forces directly instead of calculating from the electrical current used.
- Can establish the trends of lubricants in different fluids.
- Can test consolidated rock on metal in addition to metal on metal.
- Has a temperature controlled environment.
- Enables the selection of the optimal lubricant and dosage for each fluid system.