

INDEPENDENT/ 3rd PARTY TESTING

Common Analytical Testing List

■ WATER ANALYSIS

- Alcohols
- Alkalinity
- Ammonia
- Ammonium
- Anions by IC (Bromide, Fluoride, Chloride, Nitrate, Nitrite, Phosphate, Sulfate)
- Chloride
- Chlorine, Free
- Chlorine, Total
- Dissolved CO₂
- Color
- Conductivity
- Cyanide
- Density
- Dissolved CO₂
- Dissolved Oxygen (DO)
- Dissolved Methane, Ethane by GC/FID
- Fatty acids
- Fluoride
- Glycols by GC/FID
- Hardness
- Hydrogen Sulfide (aqueous)
- ICP-MS Full Suite (As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Se, Tl, Zn, U)
- ICP-OES Full Suite (Al, B, Ba, Ca, Fe, K, Li, Mg, Na, Si, Sr)
- Individual Ions by ICP-OES (full list available upon request)
- Interfacial Tension (IFT)
- Iodide
- Nitrate
- Nitrite

- Non-halogenated Volatiles by GC/FID
- Oil and Grease (HEM)
- Organic Acid Breakdown
- Oxidation Reduction Potential (ORP)
- pH
- Phenols
- Phosphate
- Phosphorous, Total
- Phosphorous as P₂O₅
- Resistivity
- Settleable Solids (SS)
- Specific Gravity
- Sulfate
- Sulfide
- Total Carboxylic Acids and Alkalinity
- Total Dissolved Solids (TDS)
- Total Inorganic Nitrogen (TIN)
- Total Nitrogen
- Total Kjeldajhl Nitrogen (TKN)
- Total Suspended Solids (TSS)
- Total Volatile Solids (TVS)
- Turbidity
- Water in Oil (via Karl Fisher)

▪ **PRODUCTION CHEMICALS**

- Detergent/Surfactant
- Friction Reducer Performance Testing in Flow Loop
- Oxygen Scavengers
- Polymer Hydration Viscosity
- Residual Chlorine Dioxide
- Residual Polymer

▪ **SCALE ANALYSIS**

- Bottle test for scale inhibitor performance
- Bottle test for scale inhibitor performance (with laser monitoring)
- Dynamic Scale Loop (DSL) for scale inhibitor performance testing
- Dynamic Scale Loop MIC determination
- Scaling Tendencies
- Solubility
- Squeeze simulation
- Squeeze core flood
- Compatibility
- NACE 0374 scale inhibitor testing
- Thermal aging
- Fourier transform infrared spectroscopy (FTIR)

▪ **CORROSION**

- Autoclave (up to high temperature, pressure)
- Autoclave with in situ electrochemistry
- Corrosion inhibitor performance evaluation via autoclave
- Rotating Cage Autoclave (RCA)
- Coupon analysis by weight loss
- Glass cell corrosion inhibitor evaluation
- Scanning electron microscopy (SEM)
- 3D Optical Microscopy (via vertical scanning interferometry – VSI)
- Surface roughness analysis
- Pitting identification
- X-ray diffraction (XRD)
- Electrochemistry methods (various)
- Linear polarization resistance (LPR)
- Electrochemical Impedance Spectroscopy (EIS)
- Flow through high pressure high temperature corrosion testing
- Fourier transform infrared spectroscopy (FTIR)
- Failure / fracture analysis
- Corrosion resistant alloy (CRA) testing

▪ **ORGANICS ANALYSIS**

- Asphaltene (%)
- API Gravity
- Aromatics - Benzene, toluene, ethylbenzene and xylenes (BTEX) via GC
- Basic Sediment and Water (BS&W)
- Carbon fraction (C-fraction) analysis by GC
- Cloud Point by Differential Scanning Calorimeter (DSC)
- Cold Finger Deposition Analysis – paraffin inhibitor testing
- Diesel Range Hydrocarbons (DRO)
- Extractable Petroleum Hydrocarbons by GC/FID
- Flash Point – TAG Closed Cup
- Gasoline Range Hydrocarbons (GRO)
- Hydrocarbon Identification (HCID)
- Interfacial Tension (IFT)
- Oxygenates by GC/MS
- Paraffin Percentage
- Pour Point
- Solids Identification
- Viscosity
- Volatile Aromatics by GC/MS
- Volatile Organic Compounds (VOC) by GC/MS
- Volatile Petroleum Hydrocarbons (VPH) by GC/FID
- Detailed Hydrocarbon Analysis (DHA)
- Petroleum Oxygenates by GC/MS
- Total Petroleum hydrocarbons (TPH)
- Alcohols and Acetates
- Solvents
- Petroleum Wax
- Simulated distillation