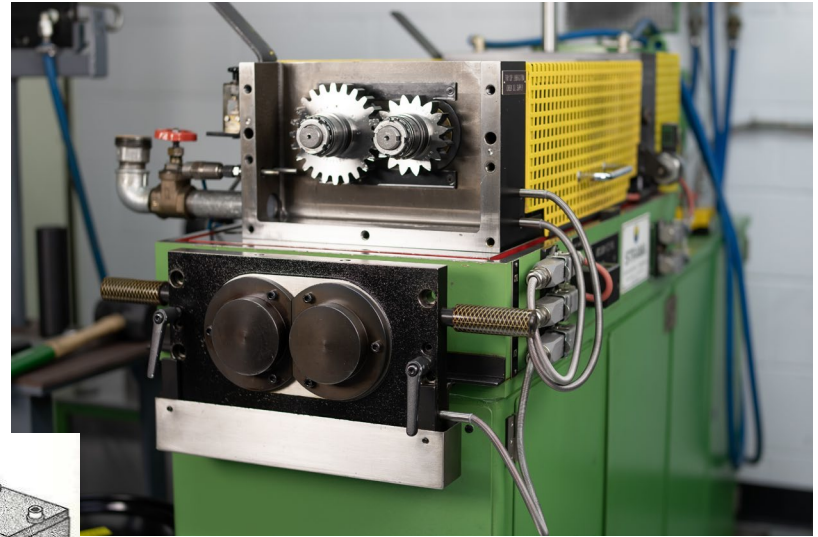




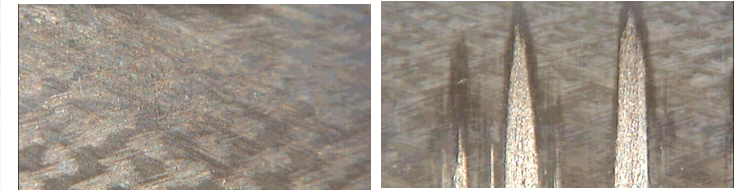
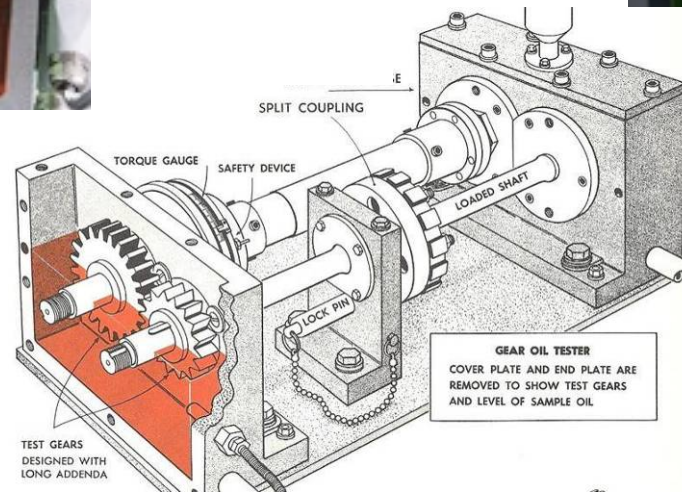
Technical Service Laboratory Test Capabilities

Mechanical Test Rigs

- FZG Gear Test Rig (DIN 51 354 Parts 1 + 2)

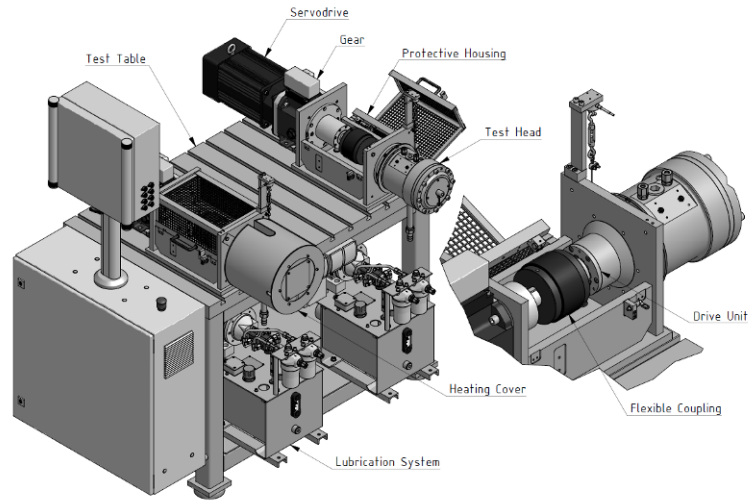
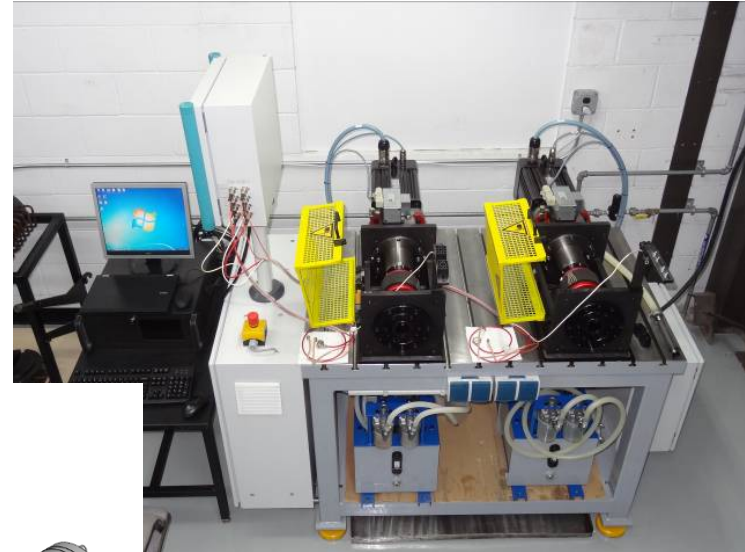


Gears are loaded in 12 “stages”
Typical report is failure stage
If not failed at 12, report “>12”



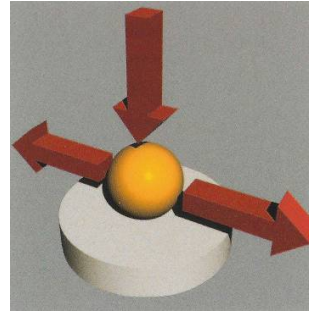
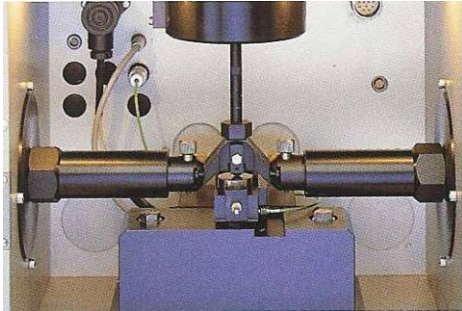
Mechanical Test Rigs

- FE8 Lubricant Test Rig (DIN 51 819)

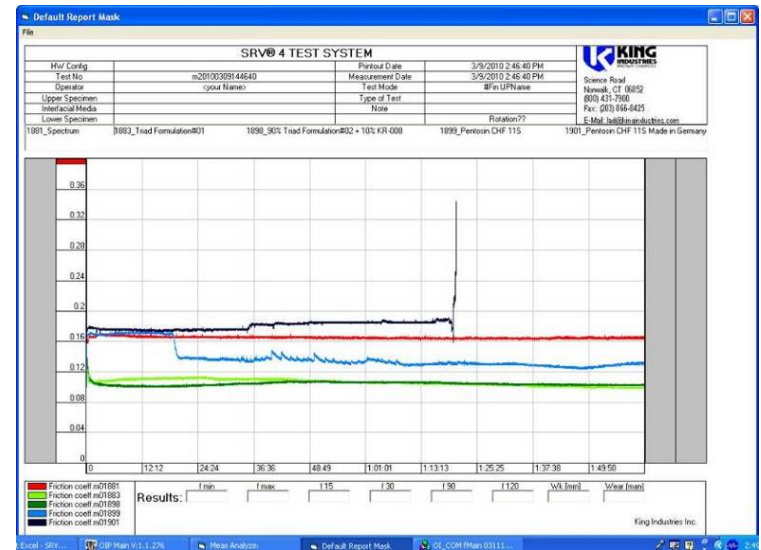
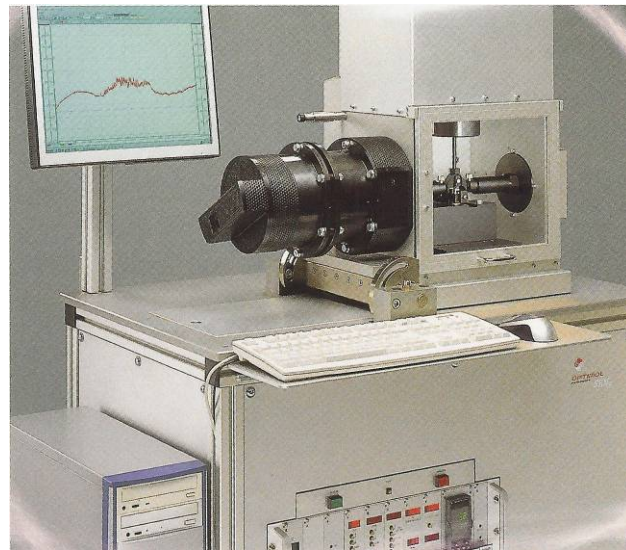


Mechanical Test Rigs

- SRV 4 Coefficient of Friction and Wear Oscillation Module



High frequency linear oscillatory motion
Load, temp, frequency are controlled
Typically run for 2 hours
Wear scar is also measured.

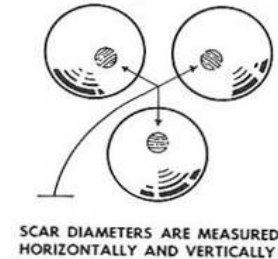
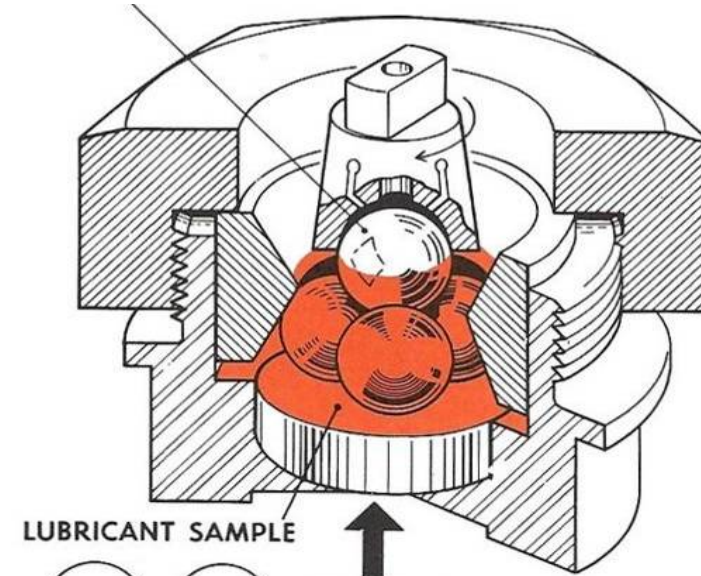


Mechanical Test Rigs

- Four Ball Wear – Oils & Greases (ASTM D4172 & D2266)



Top ball rotates, bottom three are fixed



Constant load 15-40 kgf
Run for one hour @ 75°C
Measure wear scar

Mechanical Test Rigs

- Four Ball Weld – Oils & Greases (ASTM D2783 & D2596)



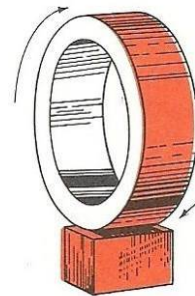
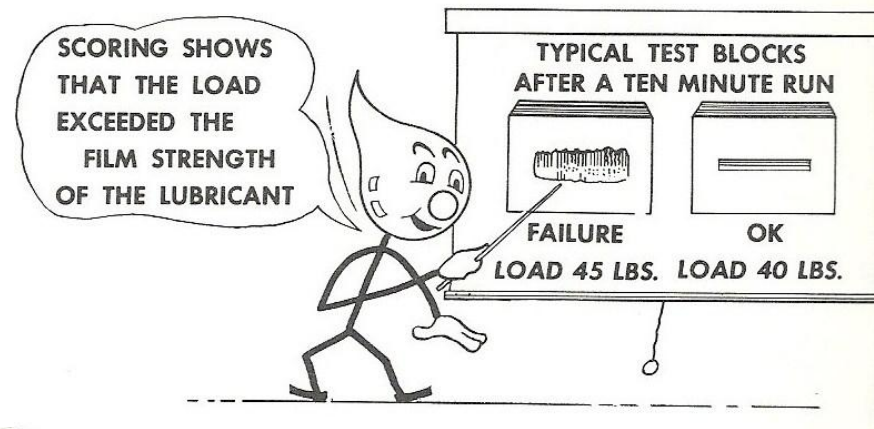
Same set-up as wear test

Load is increased in specified increments

Run to failure

Mechanical Test Rigs

- Falex Timken Test – Oils & Greases (ASTM D2782 & D2509)



Cup rotates against block

Load is applied in 5 lb increments

“OK Load” is the highest load before the lubricant will no longer prevent metal loss

Laboratory Test Capabilities – Rust & Corrosion

- Salt Fog Cabinet (ASTM B117)
- Kesternich Cabinet (DIN 50 017)
- Humidity Cabinet (ASTM D1748)
- QCT Cleveland Condensing Cabinet (ASTM D4585-92)
- Outdoor Rust Performance
- Steel Corrosion (ASTM D665 A & B)
- Emcor (ASTM D6138, IP 220)
- Grease Bearing Corrosion (ASTM D1743, D5969)

Rust & Corrosion Tests

- Salt Fog Cabinet (ASTM B117)

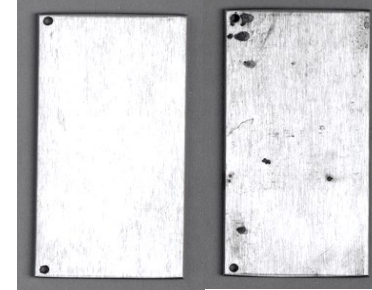


- Kesternich Cabinet (DIN 50 017)

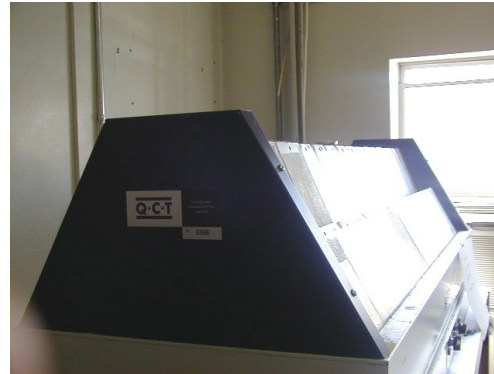


Rust & Corrosion Tests

- Humidity Cabinet (ASTM D1748)



- QCT Cleveland Condensing Cabinet (ASTM D4585-92)

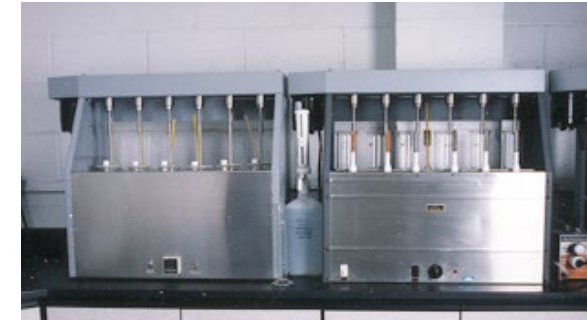
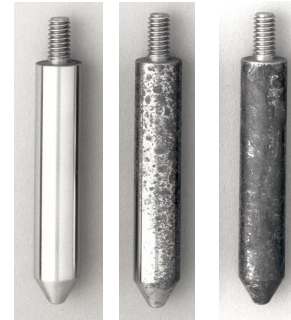


Rust & Corrosion Tests

- Outdoor Rust Performance

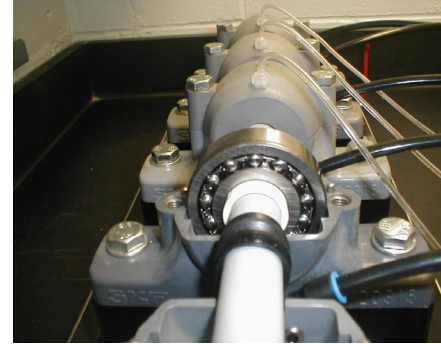


- Steel Corrosion (ASTM D665 A&B)



Rust & Corrosion Tests

- Emcor - Corrosion Test (ASTM D6138, IP 220)



- Grease Bearing Corrosion (ASTM D1743, D5969)



Laboratory Test Capabilities – Oxidation

- Turbine Oil Oxidation (ASTM D943)
- Turbine Oil Sludge 1000 hours (ASTM D4310)
- Industrial Gear Oil (ASTM D2893)
- Rotating Pressure Vessel Oxidation Test (ASTM D2272)
- DKA (CEC L-48-A-95) Apparatus B
- PDSC (ASTM D6186 & D5483)
- Grease Oxidation (ASTM D942)

Oxidation Tests

- Turbine Oil Oxidation (ASTM D943)
- Turbine Oil Sludge 1000 hrs (ASTM D4310)
- Industrial Gear Oil (ASTM D2893)



Oxidation Tests

- Rotating Pressure Vessel Oxidation Test (ASTM D2272)



Oxidation Tests

- DKA (CEC L-48-A-95)
Apparatus B



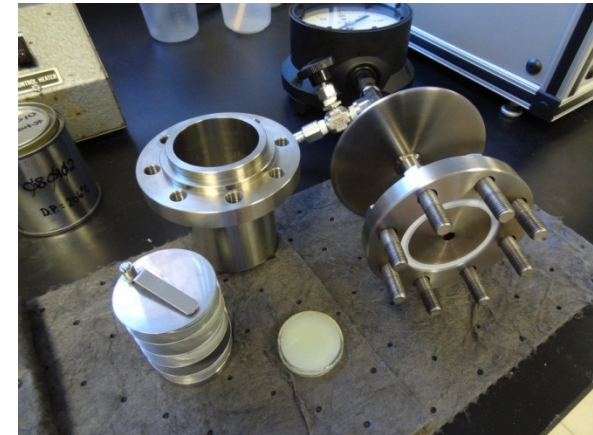
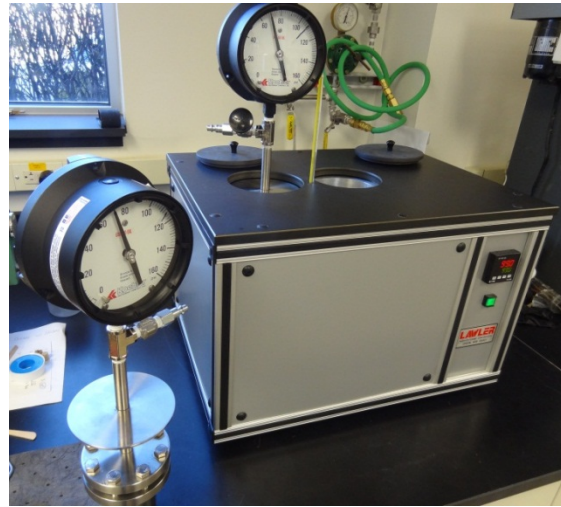
Oxidation Tests

- Pressure Differential Scanning Calorimetry – PDSC, Oils & Greases
(ASTM D6186 & D5483)



Oxidation Tests

- Grease Oxidation
(ASTM D942)



Laboratory Test Capabilities - Grease

- Grease Shear Stability (ASTM D217A)
- Cone Penetration (ASTM D217)
- Dropping Point (ASTM D2265)
- Low Volume Grease Mill

Grease Tests

- Grease Shear Stability (ASTM D217A)



- Cone Penetration (ASTM D217)



Grease Tests

- Dropping Point (ASTM D2265)



- Low Volume Grease Mill



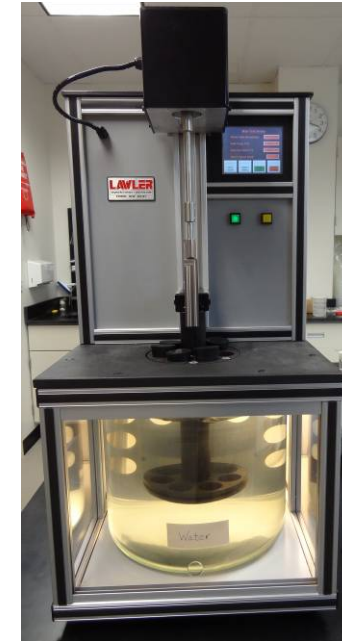
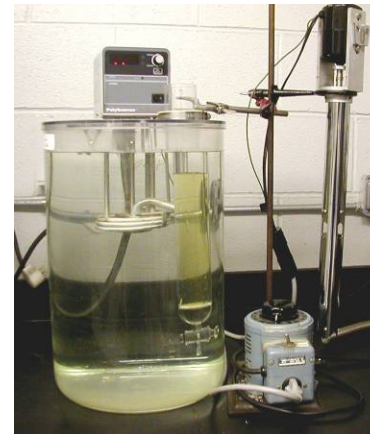
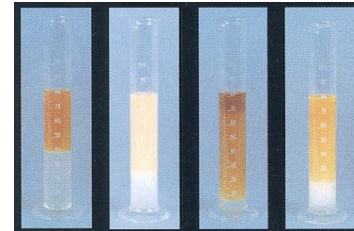
Laboratory Test Capabilities – Water Separability

- Demulsibility (ASTM D1401)
- Gear Oil Demulsibility (ASTM D2711)
- Steam Demulsibility (DIN 51 589)

Water Separability Tests

- Demulsibility (ASTM D1401)

- Gear Oil Demulsibility (ASTM D2711)



Water Separability Tests

- Steam Demulsibility
(DIN 51 589)



Laboratory Test Capabilities – Other Tests

- Hydrolytic Stability (ASTM D2619)
- CM Thermal Stability (ASTM D2070)
- Foam (ASTM D892)
- Filtration – Wet & Dry (AFNOR E 68691)
- Filtration – Wet (DIN ISO 13357-1)
- Filtration – Dry (DIN ISO 13357-2)
- Air Release Properties of Petroleum Oils (ASTM D3427)
- Panel Coker (In-house Test)

Other Performance Tests

- Hydrolytic Stability (ASTM D2619)

- CM-Thermal Stability (ASTM D2070)



Other Performance Tests

- Foam
(ASTM D892)

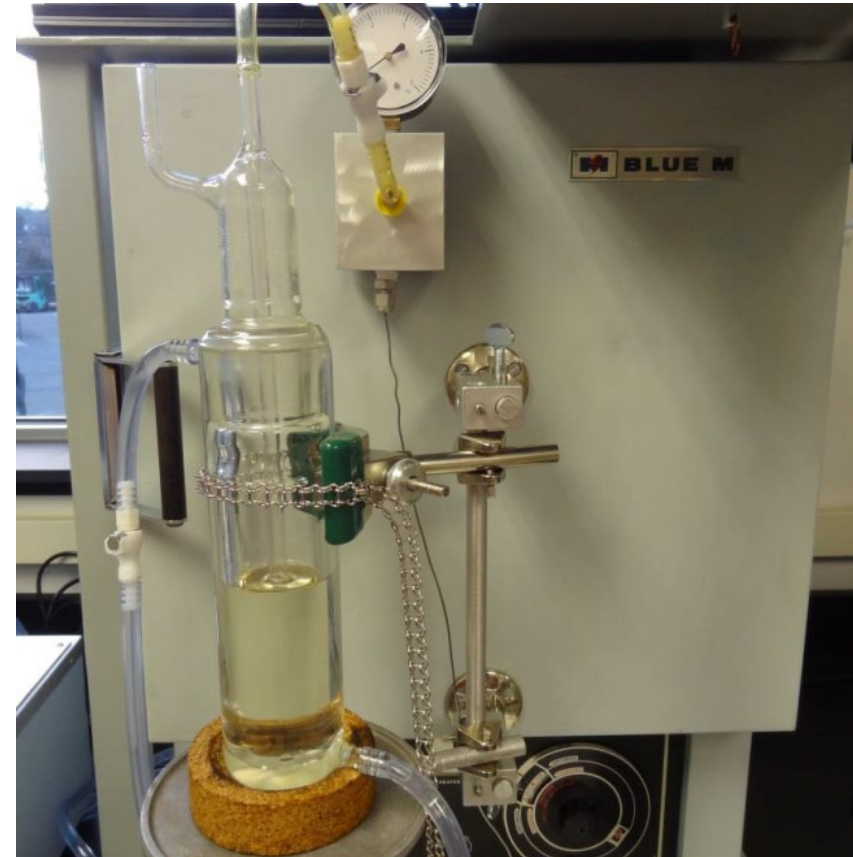


- Filtration - Wet & Dry
(AFNOR E 68691, DIN ISO 13357)



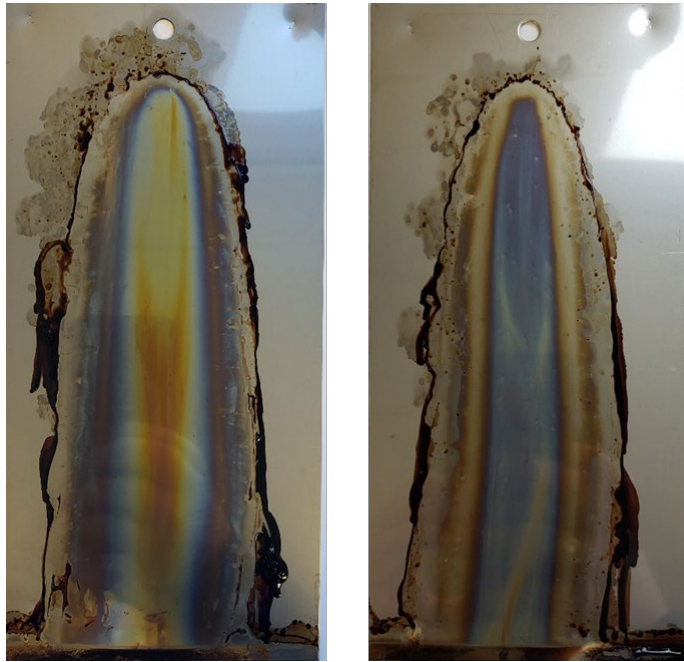
Other Performance Tests

- Air Release Properties of Petroleum Oils (ASTM D3427)



Other Performance Tests

- Panel Coker (In-house test)



Laboratory Test Capabilities

