Spectro Scientific
Confidence in knowing

QES®
Assuring you our best, always!

# Solutions for Power Generation and Industrial Plants


**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

QES®
Assuring you our best, always!

Connect With Us On LinkedIn

# In-service Oil Analysis for Machine Condition Monitoring

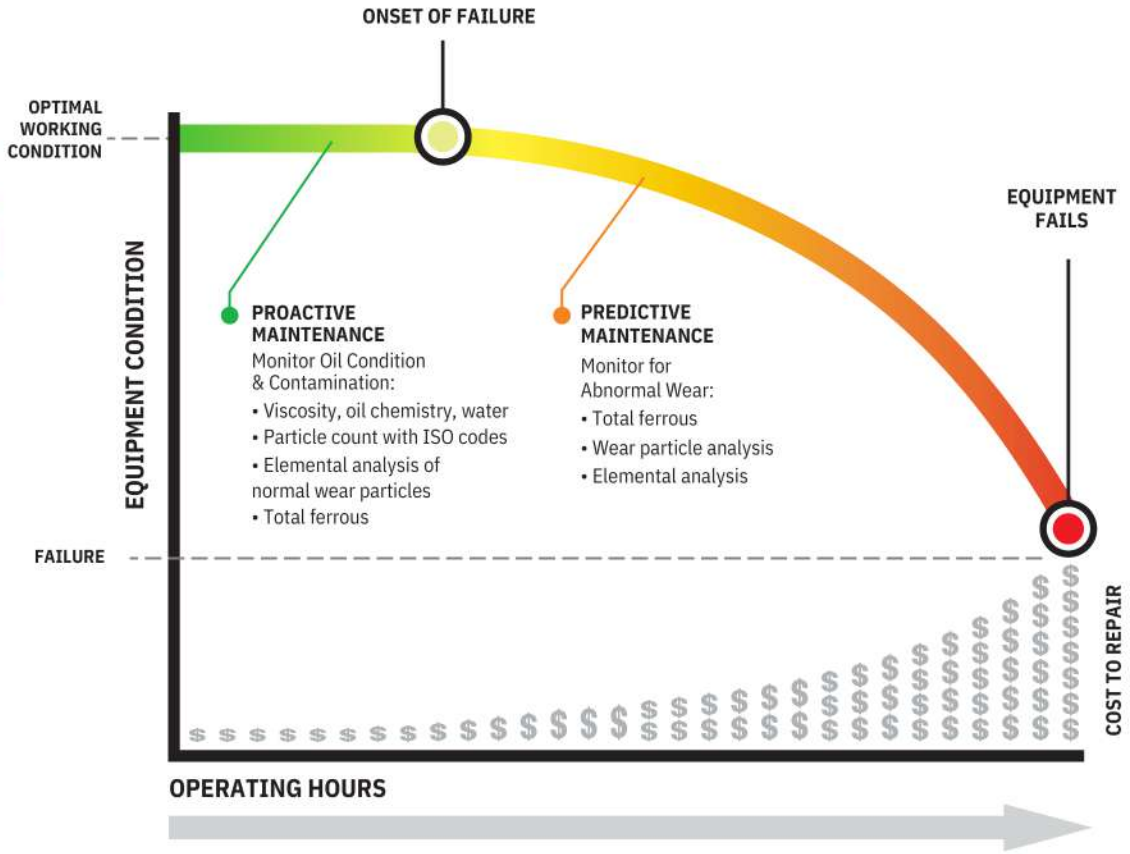
Since the reliable operation of high-value, fixed assets is critical to all industrial plants, predictive maintenance programs are implemented to manage machinery uptime.

In-service oil analysis is a key machine condition monitoring technique for Condition Based Maintenance (CBM) and Reliability programs. It complements vibration analysis, thermography, and other predictive maintenance technologies. In the time it takes external laboratories to return oil sample results, machinery conditions can change significantly. On-site oil analysis eliminates this wait and enables immediate decision-making.

Corrosion and wear cause surface degradation of the lubricated surfaces in machinery and are the root causes of most mechanically-induced equipment downtime. Corrosion is caused by water or other fluids reacting with metal surfaces, while wear is caused by surface abrasion, adhesion and fatigue. Oil analysis provides early indications of equipment wear and identifies the root causes of corrosion.

The P-F Curve (Potential-Failure Curve) illustrates how in-service oil analysis provides critical information on machine condition in both Proactive and Predictive Maintenance periods.

In the Proactive period, oil condition and contamination monitoring help prevent the onset of the root causes of machine failure. In the Predictive period, monitoring the increasing severity of wear particles allows maintenance work orders to be executed for component replacement or repair before catastrophic failure.





**QES (ASIA-PACIFIC) SDN. BHD.**

No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia

**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

As part of a proactive maintenance program, on-site oil analysis delivers rapid results with immediate decision making to:

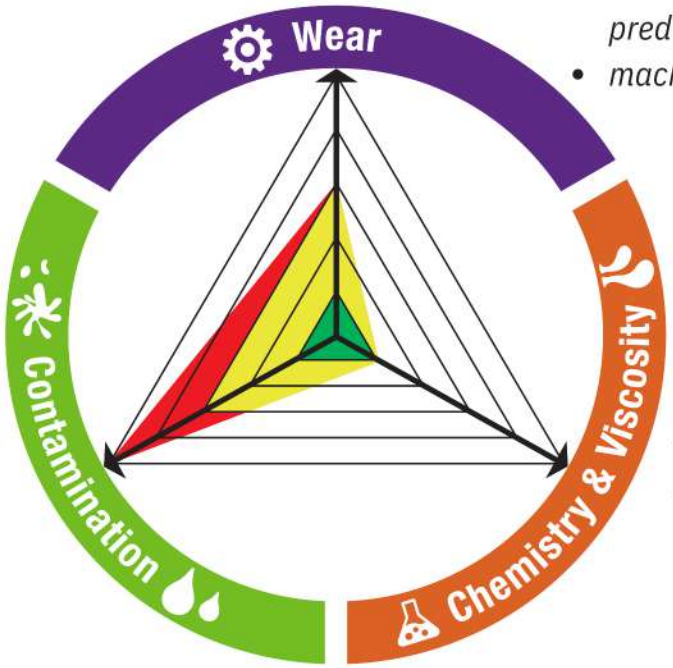
- Lower operating costs
- Reduce unscheduled downtime
- Increase machine availability
- Extend equipment life
- Decrease total lifecycle equipment costs
- Provide immediate retest capability

## Trivector™ – oil and machine health simplified

The TriVector is a simple representation of the integrity of the lubrication system and the health of the machine itself. The Trivector indicates the degree of health in each vector. Each vector is a representation of Alarm Limits based on underlying parameters, such as viscosity, water contamination, acid number, oxidation, total ferrous, particle count and ISO code, large ferrous particle count, etc.

The following questions can be answered:

- *Is the machine healthy? Can I predict when the*
- *machinery will fail?*




- *Is the oil dry?*
- *Is the oil clean/ free of dirt?*

- *Is it the right oil?*
- *Is the oil fit for use?*

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

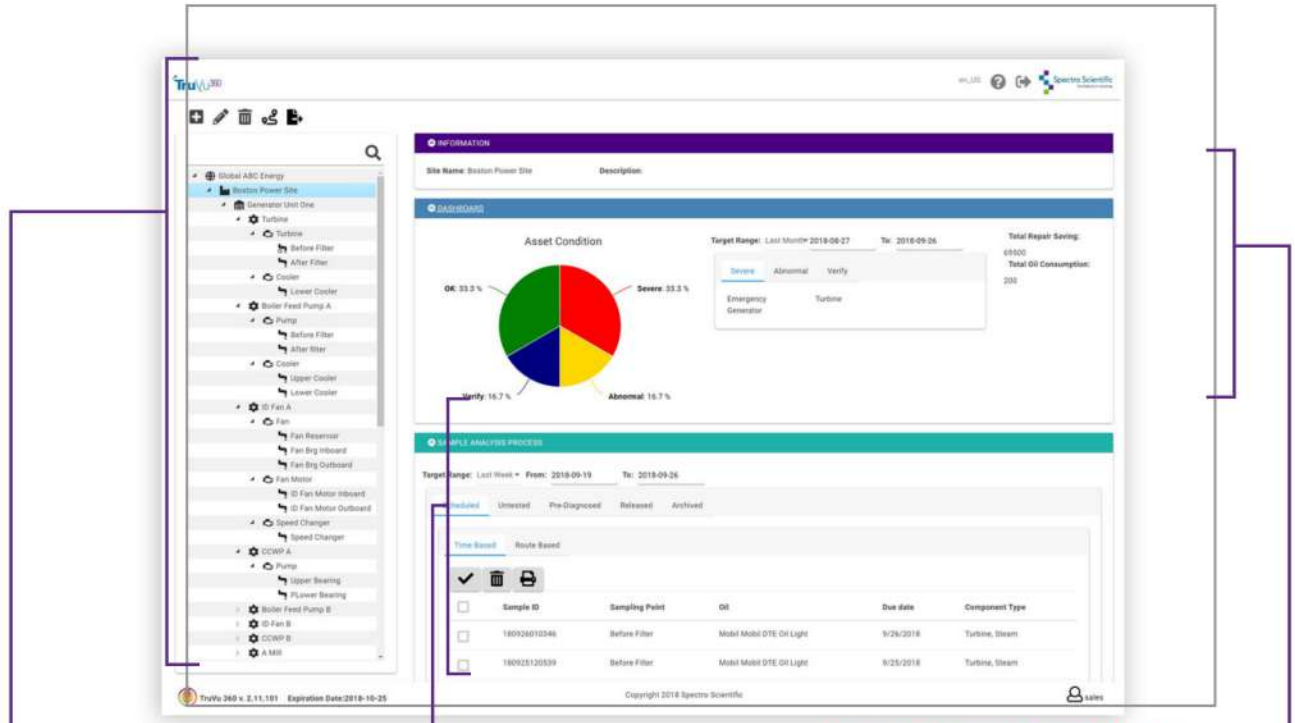
# MiniLab Series Software

The TruVu 360 software is a browser-based platform installed on a company network, a local PC or accessed using the Spectro Scientific Cloud Hosting Service. The TruVu 360 Device Console can be installed on a local PC along with the MiniLab instrument software.

TruVu 360 delivers a best practice for the on-site oil analysis process and it provides performance dashboards at the asset, plant and corporate level.

It unifies asset trending of oil condition, chemistry and machinery wear with automated diagnostics and recommended maintenance actions, and it provides maintenance and oil savings tracking for assets.

The Diagnostics Sets can be adapted to users' asset requirements including both automatic diagnostics or user editable functions at the individual asset level.




TruVu 360 Enterprise cloud software

## ASSET & TOOL BAR

- Create asset database with provided templates of component types.
- Customize your own or import existing asset structure.
- Assign pre-configured alarm limits that can be adjusted at the component level based upon operating history.
- Assess alarm trends to refine alarm limits.

## SAMPLE ANALYSIS PROCESS

- Track samples that are planned, in process and tested.
- Review results and software-generated observations, diagnostics and recommendations.
- Add additional notes and observations before sample report is released.

## DASHBOARD

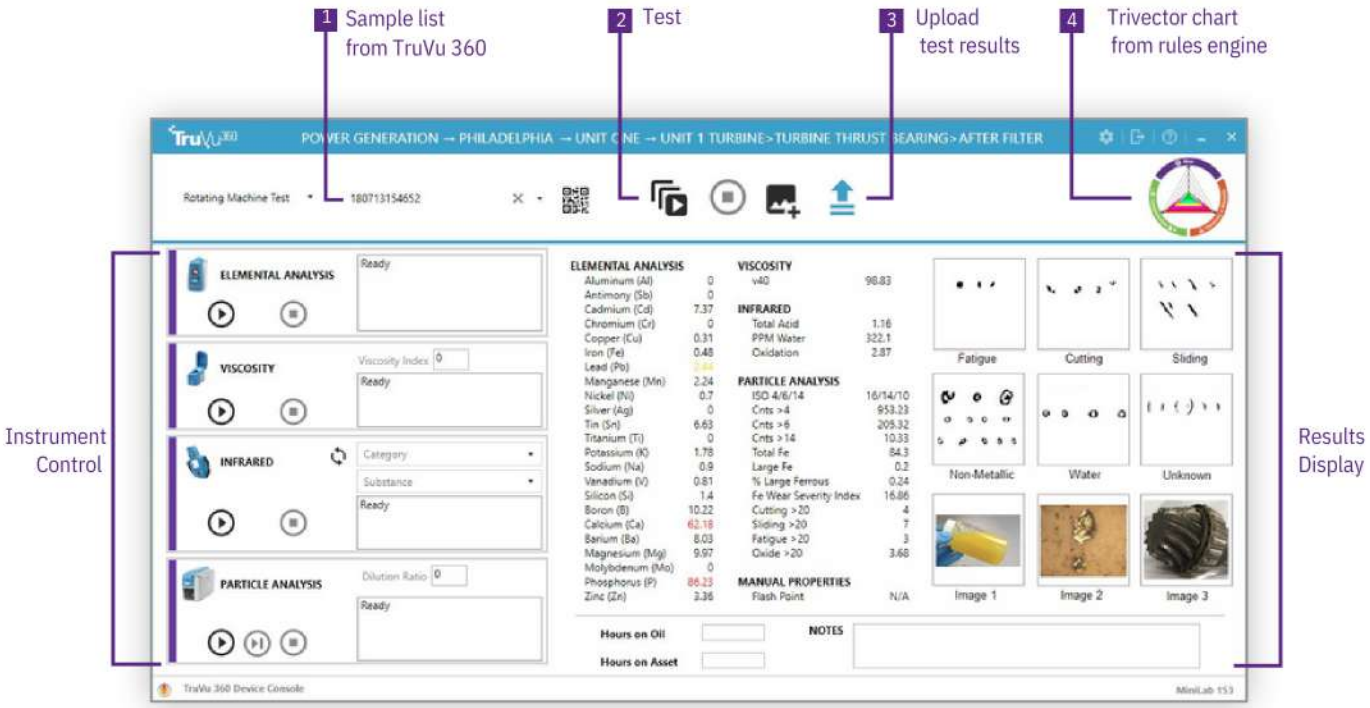
Dashboards bring visibility of lubricant management and savings at the asset, plant and corporate level:

- Oil analysis results by category
- Total repair savings
- Total oil consumption

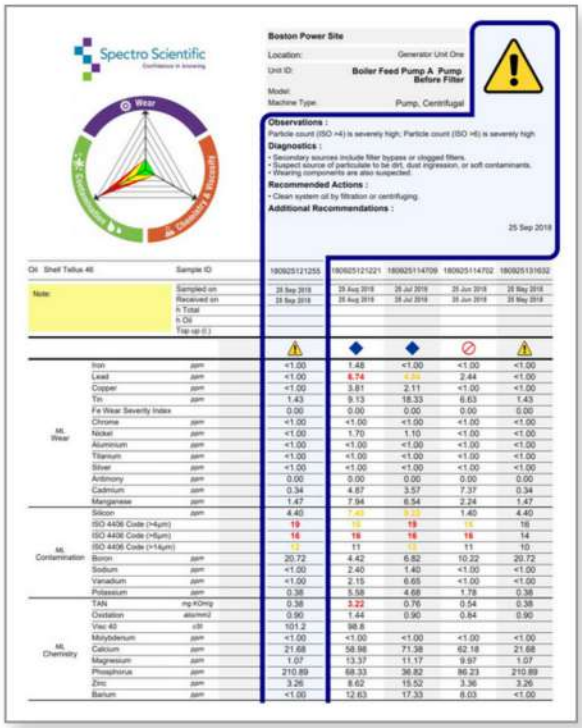

**QES (ASIA-PACIFIC) SDN. BHD.**

No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia

**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**




TruVu 360 Device Console




TruVu 360 report

# Reports

Trend reports are automatically generated including observations and recommended actions based upon alarm limit sets employed. Manual review and edits can be made before report release and automatic distribution.

TruVu 360 trending chart and historical sample data

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

# MiniLab Evolution

## 5200 MiniLab vs MiniLab 153

The MiniLab Series is the next generation of Trivector on-site oil analyzers replacing the 5200 MiniLab.

| | 5200 MINILAB | MINILAB 153 |
|---|---|---|
| Wear | Large Ferrous content, | Total ferrous particle content (ppm) |
| | trending only Wear Debris | Image import from any file for attachment to |
| | Analysis (WDA) (Optional) | sample report |
| | | Automatic wear particle shape classification, count |
| | | & distribution Large Ferrous content, ppm |
| | | Wear elements: Fe, Cu, Pb, Mg, Ag, Sn |
| Contamination | Particle count & distribution, | Particle count & distribution, ISO codes |
| | ISO codes Emulsified water | Dissolved water (ppm) |
| | only | Free water (ppm) |
| | | Glycol contamination for engine oils |
| | | Contaminate elements: Si, Na |
| Chemistry | Dynamic viscosity @ room | Kinematic viscosity @ 40°C |
| | temperature Dielectric, | Fluid Integrity index, trending only |
| | trending only | Oxidation |
| | | Total Acid Number (TAN) |
| | | Nitration, Sulfation, Anti-wear additive, Total Base Number (TBN), and soot for engine oils |
| | | Additive elements: Ca, P, Zn, Mg, Ba, Mo |
| Application | Typical mineral and synthetic lubricant and hydraulics oils for industrial rotating machinery. Not suitable for backup generators. | Mineral and synthetic lubricant and hydraulics for industrial rotating machinery, plus engine oil for backup generators and ground fleet, and special lubricants such as phosphate esters and PAG. |

## Oil library database

The MiniLab Series includes an extensive industrial oil library database to analyze in-service oils as a variety of lubricants and fluids are used in industrial equipment. The following fluid categories can be tested:

| FLUIDS | ELEMENTAL | CHEMISTRY | PARTICLE COUNT & FERROUS | VISCOSITY |
|---|---|---|---|---|
| Mineral oil based Hydraulic fluids and lubricants | Y | Y | Y | Y |
| Synthetic hydrocarbon based hydraulic fluids and lubricants | Y | Y | Y | Y |
| Ester-based Lubricant blends | Y | Y | Y | Y |
| Oil Soluble Polyglycols (OSP) | Y | Y | Y | Y |
| Organic Esters (OE) | Y | Y | Y | Y |
| Phosphate Esters (Fyrquel/Skydrol) | Y | Y | Y1 | Y |
| Polyalkylene Glycols (PAG) | Y | Y | Y1 | Y |
| Poly Alpha Olefins (PAO) | Y | Y | Y | Y |
| Polyinternal Olefins | Y | Y | Y | Y |
| Polyol Esters (POE) | Y | Y | Y | Y |
| Grease | Y | Y2 | N | N |
| Mineral Transformer Oil | Y | N | Y | Y |

1: Require factory installed Skydrol tube and fitting kits and compatible solvent 2: Oxidation and water (absorbance units) for trending

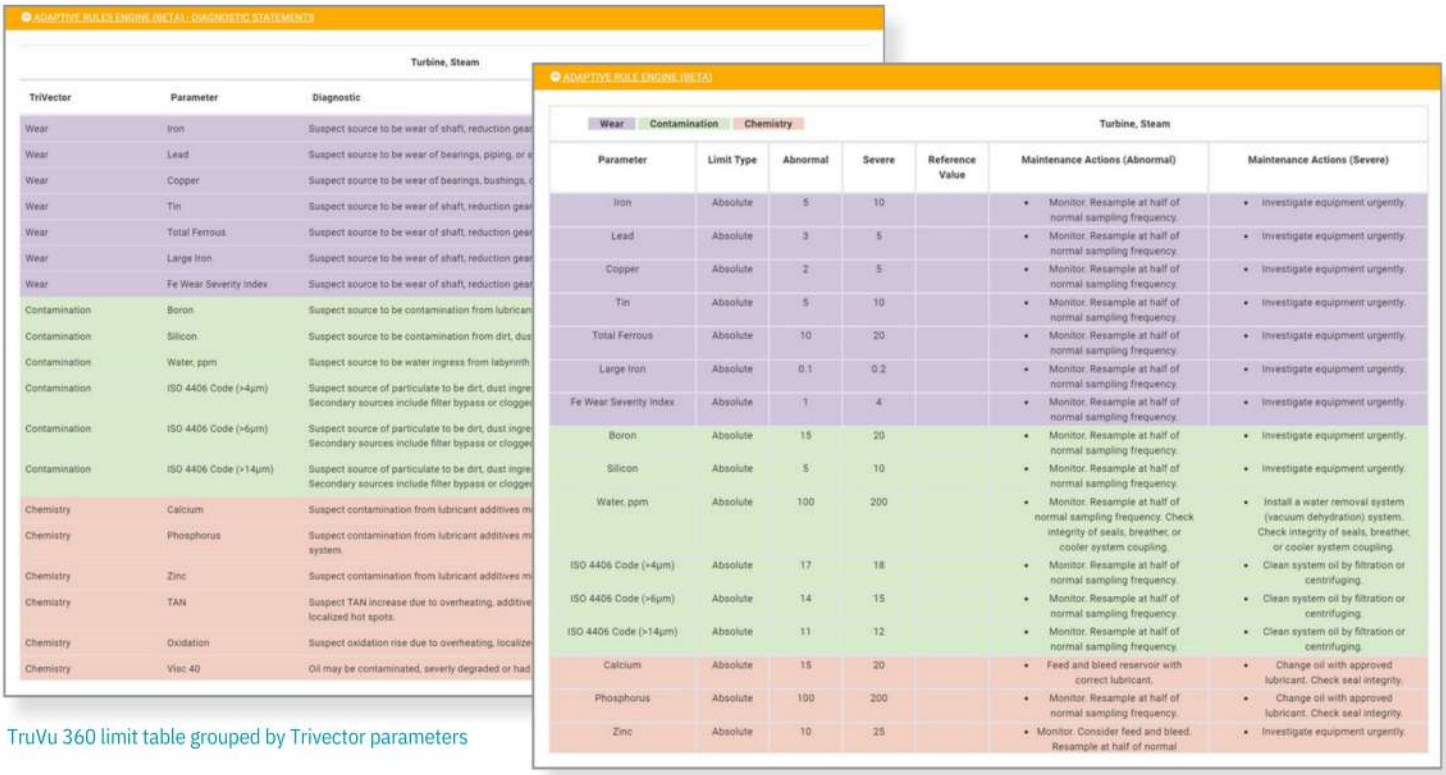
QES®
Assuring you our best, always!

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

Connect With Us On LinkedIn

## Typical limits for machinery

Factory libraries of component types, reference oils and alarm limits are provided and additional parameters and limits can be added by the user.



ADAPTIVE RULES ENGINE (BETA) : DIAGNOSTIC STATEMENTS

Turbine, Steam

| TriVector | Parameter | Diagnostic |
|---|---|---|
| Wear | Iron | Suspect source to be wear of shaft, reduction gear |
| Wear | Lead | Suspect source to be wear of bearings, piping, or s |
| Wear | Copper | Suspect source to be wear of bearings, bushings, c |
| Wear | Tin | Suspect source to be wear of shaft, reduction gear |
| Wear | Total Ferrous | Suspect source to be wear of shaft, reduction gear |
| Wear | Large Iron | Suspect source to be wear of shaft, reduction gear |
| Wear | Fe Wear Severity Index | Suspect source to be wear of shaft, reduction gear |
| Contamination | Boron | Suspect source to be contamination from lubricant |
| Contamination | Silicon | Suspect source to be contamination from dirt, dus |
| Contamination | Water, ppm | Suspect source to be water ingress from labyrinth |
| Contamination | ISO 4406 Code (>4µm) | Suspect source of particulate to be dirt, dust ingre Secondary sources include filter bypass or clogge |
| Contamination | ISO 4406 Code (>6µm) | Suspect source of particulate to be dirt, dust ingre Secondary sources include filter bypass or clogge |
| Contamination | ISO 4406 Code (>14µm) | Suspect source of particulate to be dirt, dust ingre Secondary sources include filter bypass or clogge |
| Chemistry | Calcium | Suspect contamination from lubricant additives m |
| Chemistry | Phosphorus | Suspect contamination from lubricant additives m system. |
| Chemistry | Zinc | Suspect contamination from lubricant additives m |
| Chemistry | TAN | Suspect TAN increase due to overheating, additive localized hot spots. |
| Chemistry | Oxidation | Suspect oxidation rise due to overheating, localize |
| Chemistry | Visc 40 | Oil may be contaminated, severly degraded or had |

ADAPTIVE RULE ENGINE (BETA)

Wear | Contamination | Chemistry

Turbine, Steam

| Parameter | Limit Type | Abnormal | Severe | Reference Value | Maintenance Actions (Abnormal) | Maintenance Actions (Severe) |
|---|---|---|---|---|---|---|
| Iron | Absolute | 5 | 10 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Lead | Absolute | 3 | 5 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Copper | Absolute | 2 | 5 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Tin | Absolute | 5 | 10 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Total Ferrous | Absolute | 10 | 20 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Large Iron | Absolute | 0.1 | 0.2 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Fe Wear Severity Index | Absolute | 1 | 4 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Boron | Absolute | 15 | 20 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Silicon | Absolute | 5 | 10 | | • Monitor. Resample at half of normal sampling frequency. | • Investigate equipment urgently. |
| Water, ppm | Absolute | 100 | 200 | | • Monitor. Resample at half of normal sampling frequency. Check integrity of seals, breather, or cooler system coupling. | • Install a water removal system (vacuum dehydration) system. Check integrity of seals, breather, or cooler system coupling. |
| ISO 4406 Code (>4µm) | Absolute | 17 | 18 | | • Monitor. Resample at half of normal sampling frequency. | • Clean system oil by filtration or centrifuging. |
| ISO 4406 Code (>6µm) | Absolute | 14 | 15 | | • Monitor. Resample at half of normal sampling frequency. | • Clean system oil by filtration or centrifuging. |
| ISO 4406 Code (>14µm) | Absolute | 11 | 12 | | • Monitor. Resample at half of normal sampling frequency. | • Clean system oil by filtration or centrifuging. |
| Calcium | Absolute | 15 | 20 | | • Feed and bleed reservoir with correct lubricant. | • Change oil with approved lubricant. Check seal integrity. |
| Phosphorus | Absolute | 100 | 200 | | • Monitor. Resample at half of normal sampling frequency. | • Change oil with approved lubricant. Check seal integrity. |
| Zinc | Absolute | 10 | 25 | | • Monitor. Consider feed and bleed. Resample at half of normal | • Investigate equipment urgently. |

TruVu 360 limit table grouped by Trivector parameters

## Particle analysis and wearing mechanism

With total ferrous, large ferrous total particle counts and ISO codes, wear particle counts users can make informed decisions to identify oil drain points, corrosive wear and the onset of a serious abnormal machine wear mechanism.

| MONITORING | TOTAL Fe, ppm | LARGE FERROUS CONTENT, ppm | LASERNET LARGE PARTICLES >20 µm | LASERNET CLASSIFIER |
|---|---|---|---|---|
| | Establish constant wear rate | Dynamic equilibrium levels | Dynamic equilibrium levels | Dynamic equilibrium levels |
| Oil change interval | Reaches limit | NA | NA | NA |
| Onset of corrossive wear | level Increase in | No change | No change | No change |
| Transition into abnormal wear mode | rate | Increase | Increase | Increase – cutting/sliding/ fatigue |
| Ongoing severe wear mechanism (breakdown shear mixed layer) | Increase in rate | Increase | Increase | Increase – cutting /sliding/ |
| Temporary wear rate change due to increased load and speed | Same or decrease in rate | No change | No change | fatigue |
| Onset of external contamination | Increase in rate | No change | Increase | No change |
| 3 Body abrasive mechanism iron | | Increase | Increase | |
| 3 Body abrasive mechanism non-ferrous (copper, aluminum) | No change<br>No change | No change | Increase | Increase – non-metallic<br>Increase – cutting/sliding |
| Onset of rolling contact failure | No change<br>No change | Increase | Increase | Increase – cutting/sliding<br>Increase – fatigue |


QES (ASIA-PACIFIC) SDN. BHD.
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com

# Elemental Analysis

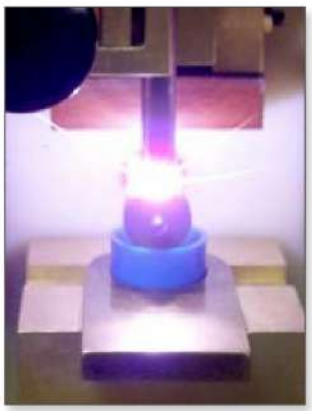
- Wear particle by metal type
- Contamination ID by source
- Oil additive levels

The SpectrOil 100 Series analyzes small particulate wear, lubricant additives and contaminants for trace quantities of elements dissolved or suspended as fine particles. Using the proven rotating disc electrode (RDE) technique, the SpectrOil 100 Series has become the workhorse of industrial, commercial and military oil analysis laboratories requiring rapid analysis of wear metals, contaminants and additives in lubricants.

Coolant, wash-down water and JOAP calibrations are available in addition to in-

- service lubricating oil and hydraulic fluid analysis.
- Measures ppm levels of up to 32 elements in less than 30 seconds
- Easy to operate – no sample preparation, gases, coolants or solvents needed
- Compliant with ASTM D6595 for used oil analysis

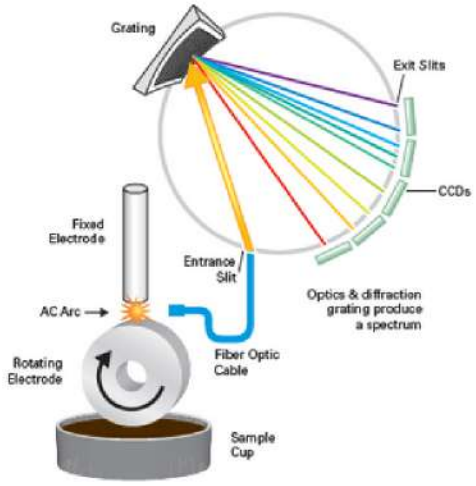

SpectrOil 100 Series instrument can be purchased separately.



Sample consumed using RDE technology is optically analyzed with AE spectroscopy to detect elements.

On-site oil analysis provides greater insight into contaminant sources by linking elemental parameters with the probable source:

| ELEMENT | Oil Chemistry – metallic additives possible sources |
|---|---|
| Sodium | Corrosion inhibitor additive, also indicates coolant leak into oil, can also be road salt, sea water, ingested dirt |
| Boron | Corrosion inhibitor additive, antiwear/antioxidant additive; can indicate coolant leak, grease contamination |
| Magnesium | Detergent/dispersive additive, can also be alloying element in steels |
| Calcium | Detergent/dispersant additive, alkaline reserve additive for high sulfur fueled engines, can be grease contamination, |
| Molybdenum | Solid/liquid antiwear additive, alloy in bearing and piston rings |
| Barium | Corrosion inhibitors, detergents, rust inhibitors |
| Zinc | Antiwear, corrosion inhibitors, anti-oxidants, alloying element for bearings, thrust washers, galvanized cases |
| Phosphorus | Antiwear, corrosion inhibitors, anti-oxidants additives, EP additives |




SpectrOil 100 Series rotating disc electrode optical emission spectrometer schematic

Emission spectrum of hydrogen

Emission spectrum of iron

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

QES® Assuring you our best, always!

Connect With Us On LinkedIn

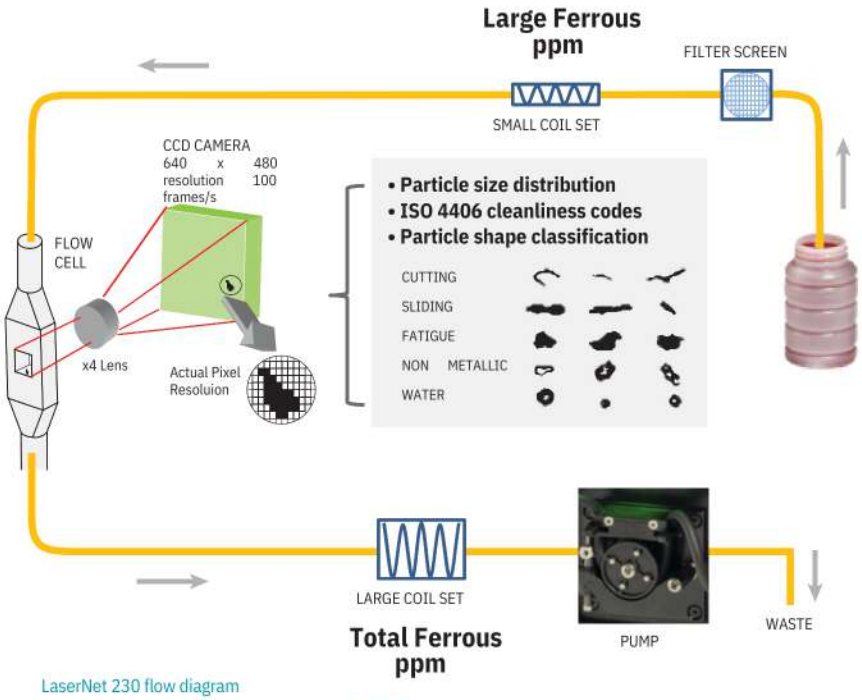
# Particle Count and Ferrous Monitor

- The LaserNet 200 Series provides particle counts and codes, large wear particle classification and ferrous wear monitoring.
- Particle count, size distribution and codes (ISO 4406, NAS 1638, NAVAIR 01-1A-17,
- SAE AS 4059, GOST, ASTM D6786, HAL, and user-defined bins)
- Differentiates contaminants (silica and fibers from machine-wear metal)
- Classifies wear particles, stores images, and reports particle count for each wear type of Cutting, Sliding, Fatigue, Fibers and Nonmetallic
- Ferrous Monitor measures the total ferrous content in the sample and large ferrous
- Widest range is up to 5,000,000 particles/ml
- Test oil viscosity up to ISO320 without dilution
- Images through dark fluids containing up to 2% soot
- Error corrections for water and air bubbles
- Options include configurations without the ferrous monitor and wear classification.

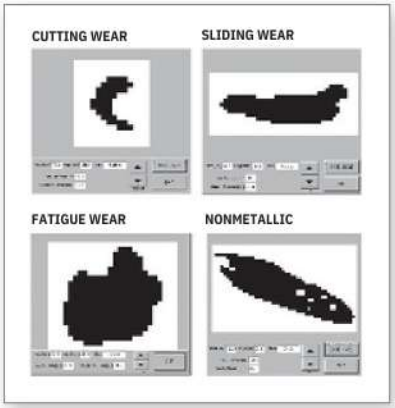
› **Ferrous content**
› **Wear particle shape**

› **Particle count and codes**


LaserNet 200 Series instrument can be purchased separately.




LaserNet 230 flow diagram




**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

# Chemical Analysis

- Water
- TAN
- TBN
- Oxidation
- Nitration
- Sulfation
- Soot
- Additive depletion
- Glycol

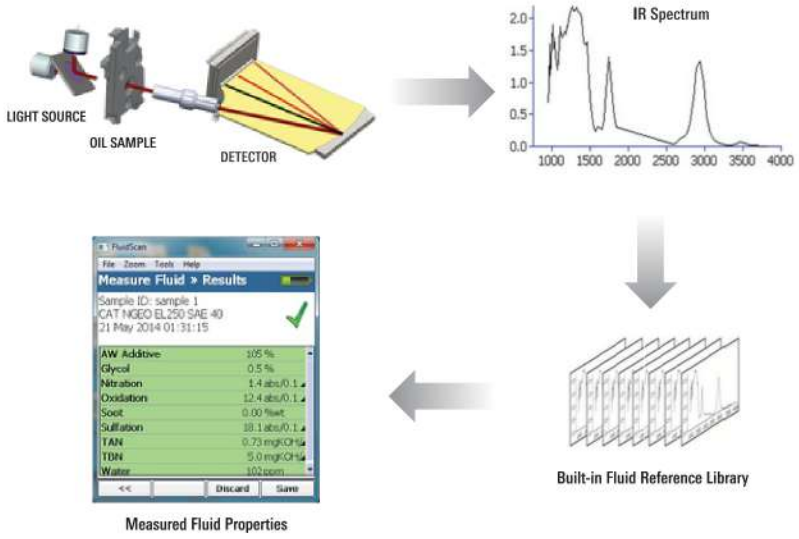
The FluidScan® 1000 Series oil chemistry analyzer determines when in-service oil is no longer fit for use due to oil degradation or the ingress of water or glycol. It is fast and easy to use, with just one drop of oil needed for the sample and less than one minute for test results. The analyzer includes an extensive oil library; additional oils can be added by the user.

- Compliant to ASTM D7889 "Standard Test Method for Field Determination of In-service
- Fluid Properties Using IR Spectroscopy"
- High correlation to TAN and TBN laboratory tests conducted with ASTM D664 and D4739
- The patented, Comprehensive Water Measurement option extends the range to 6.5%. (Included with all MiniLab systems.)
- Fluid Integrity Index

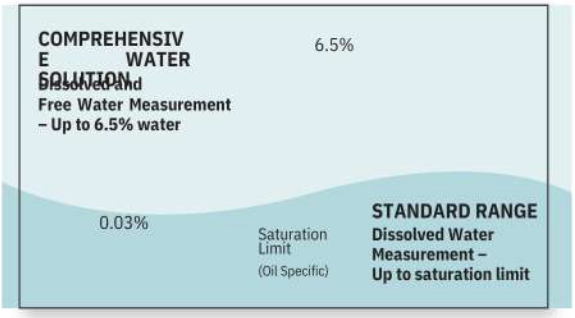
FluidScan 1000 Series handheld infrared spectrometer can be purchased separately.

The oil library contains various categories of fluids. The industrial library provided with the MiniLab series includes the Comprehensive Water Solution and the Industrial Fluid Oil Library.

| CATEGORY | Industrial Fluid Library |
|---|---|
| ASTM EP Gear/Hydro | ✓ |
| ASTM Petroleum | ✓ |
| Crankcase ASTM | ✓ |
| Polyol Ester | |
| BIODIESEL | ✓ |
| FEEDSTOCK CHILLER | ✓ |
| ENGINE | |
| ENGINE-HEAVY DUTY | |
| ENGINE-HFO | |
| ENGINE-NAT GAS | |
| ETHANOL IN GASOLINE | |
| FAME | |
| FAME in DIESEL | ✓ |
| GEAR-PRESSURE | ✓ |
| GEAR-SPLASH | ✓ |
| HEAT TRANSFER | ✓ |
| HYDRAULIC | ✓ |
| HYDRAULIC-FIRE RESISTANT | ✓ |
| SLIDEWAY | ✓ |
| TRANSMISSION | ✓ |
| TURBINE-AERO | ✓ |
| TURBINE-CCGT | |
| TURBINE-STEAM | |




FluidScan operating principle




Water measurement range


**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

# Viscosity

The MiniVisc 3000 Series provides fast, accurate 40°C kinematic viscosity measurements for easy detection of viscosity variations caused by contamination, mix-up and oil degradation.

- Solvent free, portable, and easy to use
- Viscosity range 1-700 cSt @40°C
- Accuracy +/- 3% to NIST viscosity standards
- Fast results: ISO 15 ~10 seconds, ISO 320 ~ 3 minutes

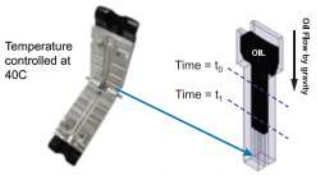


MiniVisc 3000 Series portable viscometer can be purchased separately.

For machinery oils, the 40°C kinematic viscosity is used as the reference value. Engine oils operate at higher temperatures than rotating machinery, so they require V100°C kinematic viscosity. The Viscosity Index of an oil is a parameter that relates the V40°C measurement value to the V100°C value. A reference Viscosity Index value can be entered in the viscometer and both the measured V40°C viscosity and the calculated V100°C viscosity values are displayed.

Positive displacement pipette

Open the two parallel plates for easy cleaning.




MiniVisc 3000 Series kinematic viscometer schematic

# Total Ferrous

The MiniLab 33 includes the FerroCheck, a portable ferrous analyzer that measures the total ferrous content of a sample. It is easy to operate; simply insert the sample vial with fluid sample to measure.

- Small sample requirement with results in 30 seconds
- No sample preparation and no solvents required to clean
- Measurement range 0-10,000 ppm for oil, 10-150,000 ppm for grease

Grease boat and sample introduction vials


FerroCheck 2000 Series portable ferrous analyzer can be purchased separately.

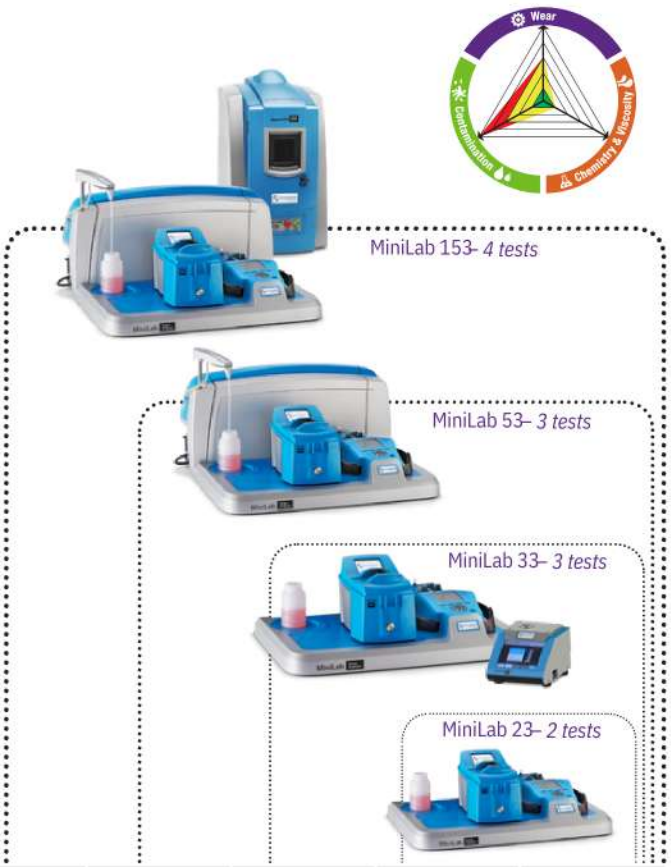
QES®
Assuring you our best, always!

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

Connect With Us On LinkedIn

# Four MiniLab Options. Which One is for You?

- MiniLab 153 – provides a complete oil analysis report with elemental analysis, comprehensive wear particle analysis, solid and water contamination, fluid chemistry and viscosity. It is ideal for large power plants and manufacturing plants with many assets.
- MiniLab 53 – provides a Trivector report with
- comprehensive wear particle analysis, solid and water contamination, fluid chemistry and viscosity.
- MiniLab 33 – provides a basic Trivector report with total ferrous wear, fluid chemistry, water in oil and viscosity.
- MiniLab 23 – provides basic oil condition information including viscosity, chemistry and water in oil.




| | PARAMETER | Elemental ASTM METHOD D6595 | Particle Count and Ferrous ASTM METHOD D7596 | Ferrous ASTM METHOD D8120 | Viscosity ASTM METHOD D8092 | Chemical ASTM METHOD D7889 |
|---|---|---|---|---|---|---|
| Contamination | Particle count and ISO codes | | ✔ | | | |
| | Non-metallic particle count, distribution and images | | ✔ | | | |
| | Sodium and Silicon | ✔ | | | | |
| | Total Water | | | | | |
| | Viscosity | | | | | ✔ |
| Chemistry & Viscosity | Total Acid Number (TAN) | | | | ✔ | |
| | Oxidation | | | | | ✔ |
| | Fluid Integrity | | | | | ✔ |
| | Total Base Number (TBN), Oxidation, Nitration, and Sulfation for engine oils | | | | | ✔ |
| | Magnesium, Calcium, Barium, Zinc, Molybdenum, and Phosphorus | ✔ | | | | |
| | Wear particle images and counts | | | | | |
| Wear | Total Ferrous content, ppm | | ✔ | | | |
| | Large Ferrous content, ppm | | ✔ | ✔ | | |
| | Copper, Silver, Chromium, Titanium, Aluminum, Nickel, Iron, Manganese, Lead, Tin, Cadmium, and Vanadium | | ✔ | | | |
| | | ✔ | | | | |


QES®
Assuring you our best, always!

**QES (ASIA-PACIFIC) SDN. BHD.**
No.2, Jalan Jururancang U1/21,
Hicom Glenmarie Industrial Park Seksyen U1,
40150, Shah Alam, Selangor, Malaysia
**www.qesnet.com | +(603) 5882 6668 | marketing@qesnet.com**

Connect With Us On LinkedIn