Sustainable Garage Solutions with MicroLab® On-site Oil Analysis

Janet Keefe
Global Product Manager
Spectro Scientific
“Why would you drain perfectly good oil?”

Gary Lentsch, CAFM, Fleet Manager, Eugene Water & Electric Board
Oil Analysis – The Blood Test for Vehicles

Your doctor uses a blood test to evaluate your health and diagnose the condition of your internal organs to prescribe proper treatment.

Your mechanic uses an oil test to evaluate the health of the oil and diagnose the condition of internal components to determine proper maintenance actions.
Achieving Sustainability Goals with On-site Oil Analysis

Reduce disposal of waste oil
Reduce consumption of new oil
Conditioned based maintenance

- Replace something only when condition indicates need
- Condition based maintenance practices are used for vehicle parts – Gauges used for evaluating tire and brake pad condition
- Oil analysis is the gauge for oil condition
Key parameters for conditioned-based oil drains

- **Additives**
  - TBN decreases as stabilizer additives deplete and cause acidic buildup in oil
  - Ca, Zn and P will deplete over time

- **Oil condition**
  - Oxidation & Nitration increase as oil breaks down

- **Viscosity**
  - Increases as oil becomes over-extended with varnish & sludge buildup
  - Decreases with contamination like fuel, coolant and water

- **Contamination & mechanical breakdown**
  - Water
  - Soot
  - Fuel
  - Particulates
  - Glycol
  - Dirt
  - Wear metals
## MicroLab report

### Account:
- **MICROLAB SYSTEM TEST**
- 1 EXECUTIVE DR
- CHELMSFORD MA 01824

### Vehicle:
- **Vehicle ID:** OVER ROAD
- **Make:** FORD
- **Model:** EXPLORER LIMITED
- **Year:** 2017

### Component:
- **Component ID:** OVER ROADSS GENERAL
- **Type:** GASOLINE ENGINE

### Oil:
- **Brand:** MOBIL
- **Type:** MOBIL 1 FORMULA
- **Weight:** 5W30

### Diagnosis:
HEAVY CONCENTRATION OF WATER PRESENT. CHECK FOR SOURCE OF WATER ENTRY. OIL DRAIN AND REFILL MAY BE NECESSARY. CONSULT SERVICE PROVIDER FOR FURTHER RECOMMENDATIONS. TO CONFIRM, RESAMPLE AT 5,000 MILES (8,000 KM) OR 100 HOURS.

### Laboratory Analysis:

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<th>Parameter</th>
<th>Unit</th>
<th>Current Sample</th>
<th>Sample ID</th>
<th>Date Analyzed</th>
<th>Date Sample Taken</th>
<th>Top Up</th>
<th>Miles on Oil</th>
<th>Miles on Component</th>
<th>Oil Changed</th>
<th>Oil Condition</th>
<th>Nitrogen</th>
<th>Oxidation</th>
<th>Total Base Number</th>
<th>Viscosity @ 100°C (M)</th>
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</table>

### Laboratory Parameters:

- **Glycol:** %
- **Potassium:** ppm
- **Silicon:** ppm
- **Sodium:** ppm
- **Sulfur:** %
- **Vapor:** %
- **Water:** %

### Wear Metals:

- **Aluminum:** ppm
- **Chromium:** ppm
- **Copper:** ppm
- **Iron:** ppm
- **Manganese:** ppm
- **Nickel:** ppm
- **Lead:** ppm
- **Titanium:** ppm
- **Vanadium:** ppm

### Additives:

- **Barium:** ppm
- **Boron:** ppm
- **Calcium:** ppm
- **Magnesium:** ppm
- **Phosphorus:** ppm
- **Zinc:** ppm

### Additional Tests:

- **Fuel Dilution:** %
- **Total Acid Number:** mg KOH/g
- **Total Iron:** ppm
- **Total Zinc:** ppm
- **Water:** %
Traditional oil analysis approach

Cycle time: 3 days to 3 weeks
Implementing On-site Oil Analysis

1. Pull oil sample
2. Enter info into MicroLab & test sample
3. Get report with maintenance recommendations
4. Conduct necessary maintenance

Cycle time: 10 – 15 minutes
MicroLab Module Overview

**Automation**
Runs up to four independent analysis components seamlessly, with self-cleaning and reporting

**Artificial Intelligence**
Translates all test data into maintenance action statements and color coded alarms

**Patented design**
On-site analyzer, Patent No. D358105, 5537336, 5517427, 6452179, 6455850, 7237431
Municipal Fleet Issues Identified with Oil Analysis

- Engine Unnecessary Oil Changes: 69.9%
- Transmission Abnormal Wear: 17.6%
- Overextended Oil: 13.8%
- Engine Abnormal Wear: 8.4%
- Coolant Leak: 7.6%
- Fuel Dilution: 3.3%

Municipal fleet data during a 12 month period
Mining Fleet Issues Identified with Oil Analysis

Mining fleet data during a 12 month period
A Green Technology that Pays for Itself

Oil drain interval extension is made possible by instant results from on-site oil analysis

- **Green**: reduces oil use & waste oil disposal
- **Pays for itself**: savings from oil drain extension can pay for analyzer in <2 years
- **Improves asset utilization**: more significant savings from reduction in mechanical failures, increased uptime and extended asset lifetime
Technologies working together to optimize oil drains
The value of extended oil drains

Reduce maintenance costs
- Do fewer oil changes

Increase equipment availability
- Shorter PM service gets equipment back to work faster

Reduced labor
- Save time and costs by doing only the maintenance needed
OEM offering extended oil drains with oil analysis

**from International A26 Product Information

- Extended service intervals offered by International was a key buying decision for EWEB who uses a MicroLab 40.
- International approved their on-site oil analysis program for extended service intervals.
260 vehicles including light-duty, heavy-duty and construction equipment

- Estimated $50-200 per engine oil change

- Goal to do condition-based oil change to reduce oil drains

- Reduced frequency of most oil drains by half

Cost Savings
$88 ave engine oil x 391 eliminated oil changes/yr = $34,408 per year

Oil Reduction
Average 6 gal/oil change x 391 eliminated oil changes/yr = 2,346 gal per year
Boston Central Fleet

- 380 heavy duty trucks
- Transition to condition-based oil change to:
  - reduce oil drains
  - improve shop workflow
- Identify problems before they lead to mechanical failure

Cost Savings
$150 oil change costs x 380 eliminated oil changes/yr
= $57,000 per year

Oil Reduction
~ 10 gal/oil change x 380 eliminated oil changes/yr
= 3,800 gal per year

Scott Alther | Superintendent, Repair and Maintenance | City of Boston Central Fleet

….”It has been very beneficial for us as an organization to extend oil drain intervals for a cost savings and to schedule a better work flow. And if you do have an issue, oil analysis can find mechanical problems before they cause a failure.”
Large City Fleet: Major Rocky Mountain City

- 500 heavy duty trucks
- Goal to go from mileage-based oil change to a condition-based oil change
- Oil drain interval increased from 2,500mi to 8,000mi

Cost Savings
$400 oil change costs
x 11 eliminated oil changes/yr
x 500 fleet vehicles
= **$2.2M per year**

Oil Reduction
Approx. 10 gal/oil change
x 11 eliminated oil changes/yr
x 500 fleet vehicles
= **55,000 gal per year**
### Who Uses the MicroLab?

<table>
<thead>
<tr>
<th>Fleet</th>
<th>OEMs</th>
<th>Service Providers</th>
</tr>
</thead>
</table>

- Boston Public Works
- City of Orlando
- City of Sacramento
- City of Long Beach Public Works
- Kitsap Transit
- All-Star Transportation
- The Port Authority of New York & New Jersey

- RTA
- Peterbilt
- Housby
- Sapp Bros.

- Massachusetts Bay Transportation Authority
- John Deere
- Kenworth
- Bal Line
- Speedco
- Wheatley

- LYNX
- Volvo
- Cummins
- ExxonMobil
- Total
- Shell

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Thank You!

MicroLab®
All-In-One, Automated Lubricant Analysis System

Fleet Solutions from Spectro Scientific
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