US Petrolon Industrial

# SAMPLING PROCEDURES

## for the USPI Oil Analysis Program

# SAMPLING PROCEDURES



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US
PETROLON
INDUSTRIAL

IMPROVING MACHINERY LIFE
WITH
SPECIALTY LUBRICANTS
AND
FILTRATION

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# SAMPLING PROCEDURES

## Introduction: USPI Oil Sampling Program

US Petrolon advises each of its customers to develop and implement a sampling program. This sampling program establishes a proactive maintenance regimen of timely and accurate oil sampling and machinery monitoring. Regular oil samples help monitor the condition of equipment and oil. This monitoring allows proactive corrective actions to be taken before small problems grow and increase expenses through oil changes, equipment failures, equipment repairs and downtime.

An oil analysis program can begin when procedures are implemented to obtain an accurate oil sample and proper identification of the samples are documented for the lab. Independent labs process, analyze and report on the oil sample conditions. Finally, US Petrolon recommends actions toward proactive maintenance, which keep equipment and fluids in excellent condition.

## A Successful Oil Analysis Program

A successful oil analysis program will:

1. Monitor equipment wear, indicating possible problem areas (generally before they are otherwise noticed).
2. Accurately determine if the oil is suitable for further service, which avoids discarding usable oil. This nearly always results in significant oil savings.
3. Determine when to change USPI filter elements.

## The Importance of a Good Sample

A good oil sample accurately reflects the condition of all the oil in the system. Good sampling procedures must obtain a representative specimen of the fluid in the equipment or reservoir that reflects the following:

- Contaminants present in the equipment or reservoir
- Additives present in the fluid
- Oxidation and degradation of the fluid
- TAN and viscosity
- Wear metals present in the system
- Particle counts of contaminates
- Amount of moisture present in ppm (Karl Fisher)

## Proper Sampling Procedures

Proper sampling procedures depend on a number of factors, including:

1. **Sample point location**

When a sample is collected from an improper location, it often leads to inaccurate oil analysis results because the sample will not represent all the oil in the system.

2. **Sampling hardware**

Proper sampling hardware greatly increases accurate oil sampling; it is much more difficult for an operator to take an inaccurate sample using proper ports and procedures. Less time is required and sampling is easier when the appropriate sampling hardware is installed.

3. **Cleanliness of sample apparatus**

Cleanliness is important because wear and particle counts are extremely sensitive and easily skewed by an improper sampling process.

4. **Sampling method or procedure**

Proper sampling is essential for oil analysis lab testing to present an accurate analysis of these conditions.

5. **Recent maintenance**

Equipment maintenance may affect oil condition and should be accounted for when analyzing oil samples.

US Petrolon carries a variety of sampling ports to ensure an accurate sample can be pulled from a system and USPI has the expertise to recommend proper sampling locations for lubricated equipment.

| General Sampling Tips |
|---|
| Clean around the sampling area before taking a sample. |
| Keep the sample bottle closed to prevent it from getting contaminated with airborne contaminants. |
| Discard purged oil. |
| DO NOT pull a sample from the bottom of a reservoir or used filter. |
| Disposable sample tubing MUST be replaced for EACH sample being pulled by a vampire gun. |
| Tighten sample bottle lid firmly and IMMEDIATELY after taking fluid sample. |
| NH3 samples need to vent by loosely applying the cap BEFORE firmly tightening. |
| Carefully and accurately fill out labels and all paperwork (see further below). |

# SAMPLING PROCEDURES

## USPI Oil Analysis Program: Initial Phase

The beginning phase of the oil analysis program requires THREE oil sample kits for each piece of machinery fitted with a USPI filtration system. These kits should be used as follows:

### First Kit

Use the first oil analysis kit to sample the USED oil from the equipment or drum being filtered BEFORE the USPI filtration system is in operation.

### Second Kit

Use the second oil analysis kit to sample the NEW oil, if the oil is NOT a USPI supplied oil. The independent labs we use need a NEW oil sample in order to establish a baseline for future oil analysis; therefore, care should be taken that it is the exact type as that which is being filtered.

### Third Kit

Save the third oil analysis kit for a FINAL sample after a few weeks of USPI filtration. Pull this "filtered" sample directly from the sample probe/port provided on the USPI filtration system. Please drain off a small quantity of oil from the sampling probe/valve before pulling this sample in order to ensure that it is uncontaminated by particles which may have settled in the piping.

## USPI Oil Analysis Program: Ongoing Sampling

As the oil analysis program continues, more sample kits will need to be ordered/acquired (one each per piece of machinery) at determined intervals to continue to monitor equipment and fluid condition.

Equipment shall be sampled according to a preventative maintenance (PM) schedule to ensure that a homogeneous sample representative of the operating system is obtained for analysis. Routine sampling shall be as specified by individual equipment PM. Special samples may be requested whenever an abnormal condition is detected or immediately following an incident resulting from equipment malfunction. Consult USPI to determine a workable schedule for periodic oil analysis.

## Filling Out Paperwork

The last step of a successful oil sample is marking the lab forms so that analysis and trending will be done properly. The lab needs the label to match the company and equipment assets to the corresponding data. If the oil sample label is not completely and correctly filled out, other efforts to develop an oil analysis program will be ineffective.

Two items require particular attention.

1. On the FIRST sample kit, assign each piece of equipment a unique UNIT ID and use it consistently on all FUTURE oil samples. This will help the lab monitor the equipment.
2. Accurately record the number of hours on the oil (months or years will suffice if more specific data is not available) and the same on the equipment.

## Required Information

Following is a list of all the pertinent information on the sample form needed to properly create a machinery history. For subsequent samples (after the first), USPI will prelabel your kits -- only sample date and time on the oil will be needed.

| Form Info | Description |
|---|---|
| **Unit ID** | A unique identifying name or number for the equipment. |
| **Customer Name** | Enter company name; also fill in complete mailing address. |
| **Equipment Model & Application** | Enter type, model, and series of equipment being sampled. |
| **Equipment Serial#** | Enter complete serial number of equipment being sampled. |
| **Sample Date** | Enter numeric month/day/year (e.g. 04/06/15 for April 6, 2015). |
| **Oil Type** | Enter the oil supplier and name (e.g. USPI 1009-68SC). |
| **Time on Oil & Unit** | Enter hours since last oil change and unit rebuild. |
| **Remarks** | Use as needed. |

# SAMPLING PROCEDURES

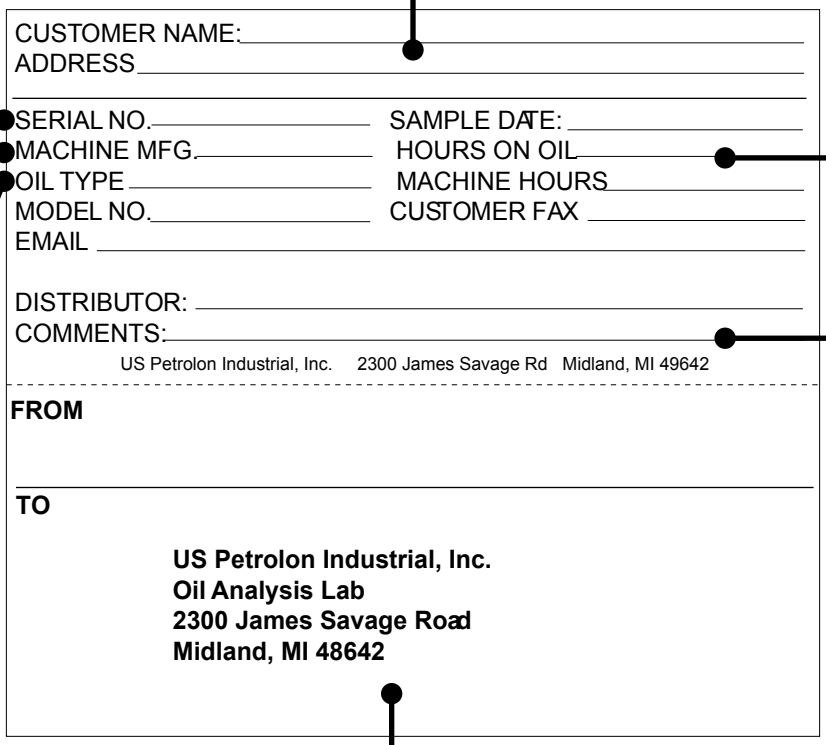
## Filling Out Paperwork: USPI Oil Analysis Form

Contact information is required to contact the correct personnel with the analysis results and recommendations.

**Serial No**: A valid Unit ID is requried to link the sample with historical data.

**Machine MFG & Model**: Specify the type of equipment the sample came from.

**Oil Type**: Write both oil brand and viscosity grade.




Include the date of the sample as well as the time on the oil and machine.

**Comments**: Note any significant comments about the oil sample, such as failure, repair description, any maintenance performed, abnormal noise, overheat conditions, etc.

IMPORTANT: Ship completed sample kits to the lab's address.

### ATTENTION

It is important that ALL information is filled out ACCURATELY and as completely as possible for the FIRST sample. US Petrolon will prelabel the sample kits with a self-adhesive label for FUTURE samples.

## Filling Out Paperwork: WearCheck Oil Analysis Form

Customer File Stub - Fill out and retain this top portion of the Sample Information Form (SIF). Information on this stub is required when contacting the lab to request information on this sample.

Contact information is required by the lab to contact the correct personnel with the analysis results and recommendations.

A valid Unit ID is required to link this sample to historical test results associated with this specific unit.

Fill out the sample information including date and time on unit, oil and filter. Indicate if time reported is in hours, days, months or years. Also be sure to note if the oil filter has been changed.

Sampling instructions - it is important that the proper procedures are followed when taking oil samples. The sample bottle must be filled completely in order to complete ALL the required testing.

CUSTOMER FILE STUB
UNIT OR VEHICLE NUMBER:
DATE MAILED:
INQUIRIES: (800) 237-1369 / (919) 379-4102

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WEAR CHECK USA
a Division of Liberty Analytical Corp.

501 Madison Avenue
Cary, NC 27513
1-800-237-1369
(919) 379-4102
Fax (919) 379-4050

I II III +PC

CUSTOMER CODE: _____ DISTRIBUTOR NAME: USPLIN
OR US PETROLON IDUSTRIAL
CUSTOMER NAME: _____ LINCOLN, NE
ADDRESS: _____
CITY/STATE: _____ ZIP _____
CONTACT: _____ AREA CODE ( ____ ) PHONE # _____
FAX ( ____ ) _____

NOTE: FAILURE TO COMPLETE INFORMATION MAY RESULT IN DIAGNOSTIC DELAYS.

UNIT ID: _____
SERIAL # _____
WORK ORDER # _____ FAX # _____
SAMPLE TAKEN FROM: (CIRCLE ONE)

COMPRESSOR
COMPRESSOR TYPE:
CENTRIFUGAL/RECIPROCATING/ROTARY
GAS TYPE: _____
REFRIGERANT FLUID: _____

HYDRAULIC
PUMP MAKE: _____
PRESSURE: _____
SYSTEM OPERATING TEMP: _____
FILTRATION: PRESSURE/RETURN/SUCTION

BEARING/REDUCTION GEAR / GEARBOX / PLANETARY / FINAL DRIVE / TRANSMISSION / TURBINE / FAN / BLOWER / PUMP / PAPER REFINER / CIRCULATING OIL / NEW UNUSED OIL / OTHER

UNIT MAKE: _____ SYSTEM OIL CAPACITY: _____
UNIT MODEL: _____ BRAND/TYPE OIL: _____
FILTER TYPE: ELEMENT / SCREEN / NONE VISCOSITY: _____
FILTER MICRON RATING: _____ ADD'L ADDITIVE USED: YES / NO TYPE: _____
COMMENTS: (STATE IF SAMPLE TAKEN AS RESULT OF FAILURE) _____

SAMPLE DATE: _____ MM / DD / YY
TIME UNITS: HOURS / DAYS / MONTHS / YEARS
TOTAL TIME ON UNIT: _____
TIME ON OIL: _____ CHANGED: YES / NO TOP UP AMOUNT: _____
TIME ON FILTER: _____ SERVICED: YES / NO

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SAMPLING INSTRUCTIONS AND PRECAUTIONS

For best results, we suggest the following precautions when taking oil samples:
Take the sample (if possible) from the reservoir, while the system is in operation or just after shutdown.
If reservoir or main line has a test point, the fluid sample may be drawn from there, but enough fluid should be allowed to escape, to clear the test connection, before the actual sample is collected.
For sampling through a reservoir filler cap, breather or dip stick tube, use a clean syringe, that has been thoroughly flushed with fluid from the reservoir, before collecting the actual sample.
Keep sample bottle clean and do not remove cap until you are ready to take sample. Recap bottle immediately after filling.
Take care not to confuse samples from different units.
Never take samples by loosening pipes or hose couplings.

ENCLOSE ORIGINAL FORM-AVOID EXTRA BILLING

Stub Number - Oil sample reference used for tracking the sample.

Test Kit Level purchased determines what testing is performed on the oil sample. If the kit was purchased through US Petrolon it will be an Industrial II - Routine.

Specify the type of equipment from where the sample was taken - such as a compressor or hydraulic system. Please complete the additional information.

Information on oil being sampled. Ensure both oil brand and viscosity grade information is included.

Comments - note any significant comments about the oil sample, such as failure, repair description, any maintenance performed, abnormal noise, overheat conditions, etc.

Use an original Sample Information Form to submit sample. Each stub number is unique and is used to guarantee payment of sample.

### ATTENTION

It is important that ALL information is filled out ACCURATELY and as completely as possible for the FIRST sample. US Petrolon will prelabel the sample kits with a self-adhesive label for FUTURE samples.

# SAMPLING PROCEDURES

## Sample Oil Analysis Report

**Unit Information**

Basic identifying info for company & unit.

**Recommendations**

Summary and any corrective actions.

**Contamination**

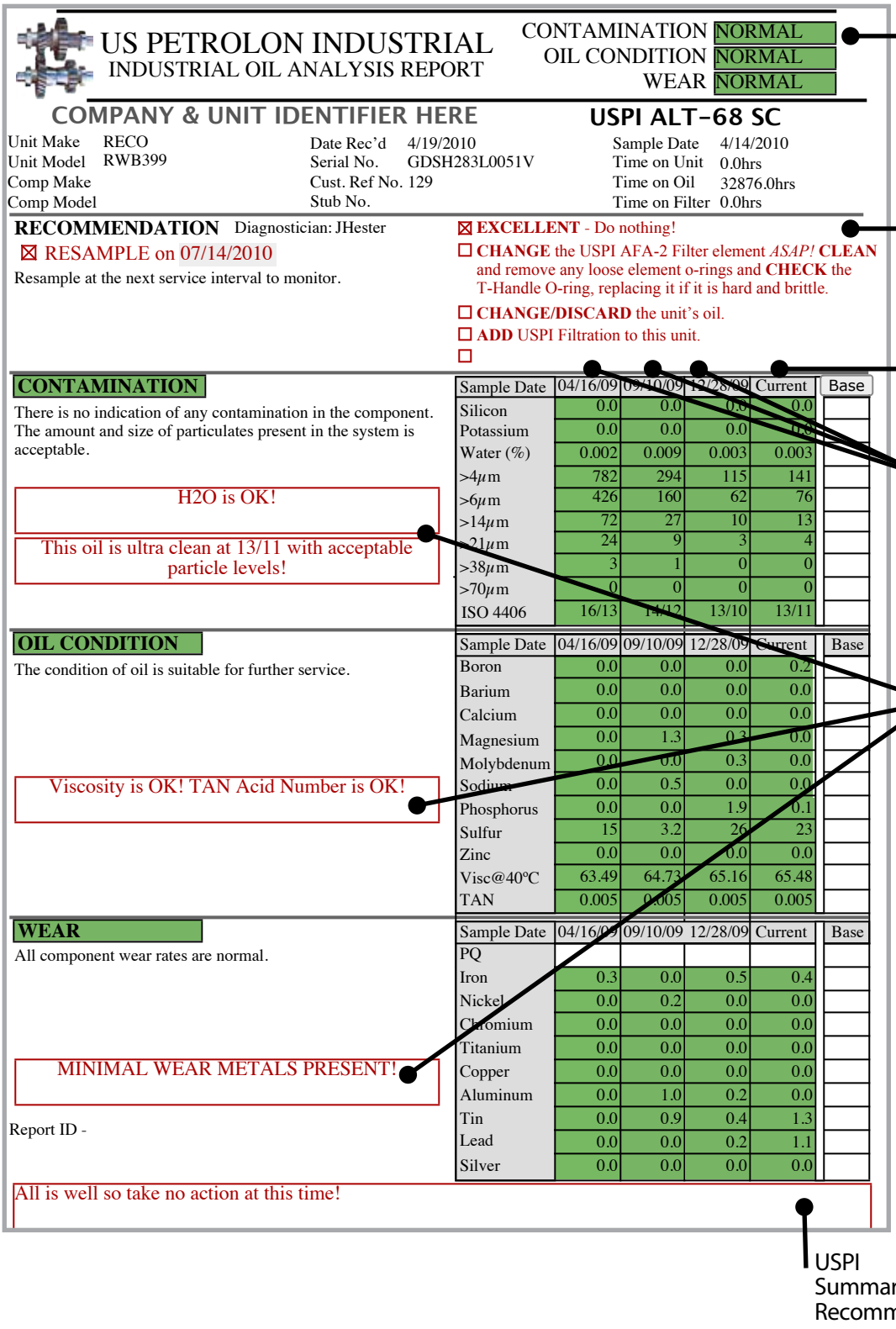
Identifies any abnormal contaminants present in the oil.

**Oil Condition**

Determines if oil is suitable for continued use.

**Wear**

Determines if equipment is wearing abnormally.



US PETROLON INDUSTRIAL
INDUSTRIAL OIL ANALYSIS REPORT

CONTAMINATION NORMAL
OIL CONDITION NORMAL
WEAR NORMAL

Overall Status

COMPANY & UNIT IDENTIFIER HERE

USPI ALT-68 SC

| | | | | | |
|---|---|---|---|---|---|
| Unit Make | RECO | Date Rec'd | 4/19/2010 | Sample Date | 4/14/2010 |
| Unit Model | RWB399 | Serial No. | GDSH283L0051V | Time on Unit | 0.0hrs |
| Comp Make | | Cust. Ref No. | 129 | Time on Oil | 32876.0hrs |
| Comp Model | | Stub No. | | Time on Filter | 0.0hrs |

**RECOMMENDATION** Diagnostician: JHester

☒ RESAMPLE on 07/14/2010

Resample at the next service interval to monitor.

☒ **EXCELLENT** - Do nothing!
☐ **CHANGE** the USPI AFA-2 Filter element *ASAP!* **CLEAN** and remove any loose element o-rings and **CHECK** the T-Handle O-ring, replacing it if it is hard and brittle.
☐ **CHANGE/DISCARD** the unit's oil.
☐ **ADD** USPI Filtration to this unit.
☐

Quick Action Summary

**CONTAMINATION**

There is no indication of any contamination in the component. The amount and size of particulates present in the system is acceptable.

H2O is OK!

This oil is ultra clean at 13/11 with acceptable particle levels!

| Sample Date | 04/16/09 | 09/10/09 | 12/28/09 | Current | Base |
|---|---|---|---|---|---|
| Silicon | 0.0 | 0.0 | 0.0 | 0.0 | |
| Potassium | 0.0 | 0.0 | 0.0 | 0.0 | |
| Water (%) | 0.002 | 0.009 | 0.003 | 0.003 | |
| >4µm | 782 | 294 | 115 | 141 | |
| >6µm | 426 | 160 | 62 | 76 | |
| >14µm | 72 | 27 | 10 | 13 | |
| >21µm | 24 | 9 | 3 | 4 | |
| >38µm | 3 | 1 | 0 | 0 | |
| >70µm | 0 | 0 | 0 | 0 | |
| ISO 4406 | 16/13 | 14/12 | 13/10 | 13/11 | |

Current Sample Data

Historical Sample Data

**OIL CONDITION**

The condition of oil is suitable for further service.

Viscosity is OK! TAN Acid Number is OK!

| Sample Date | 04/16/09 | 09/10/09 | 12/28/09 | Current | Base |
|---|---|---|---|---|---|
| Boron | 0.0 | 0.0 | 0.0 | 0.2 | |
| Barium | 0.0 | 0.0 | 0.0 | 0.0 | |
| Calcium | 0.0 | 0.0 | 0.0 | 0.0 | |
| Magnesium | 0.0 | 1.3 | 0.3 | 0.0 | |
| Molybdenum | 0.0 | 0.0 | 0.3 | 0.0 | |
| Sodium | 0.0 | 0.5 | 0.0 | 0.0 | |
| Phosphorus | 0.0 | 0.0 | 1.9 | 0.1 | |
| Sulfur | 15 | 3.2 | 26 | 23 | |
| Zinc | 0.0 | 0.0 | 0.0 | 0.0 | |
| Visc@40°C | 63.49 | 64.73 | 65.16 | 65.48 | |
| TAN | 0.005 | 0.005 | 0.005 | 0.005 | |

USPI Analysis

**WEAR**

All component wear rates are normal.

MINIMAL WEAR METALS PRESENT!

| Sample Date | 04/16/09 | 09/10/09 | 12/28/09 | Current | Base |
|---|---|---|---|---|---|
| PQ | | | | | |
| Iron | 0.3 | 0.0 | 0.5 | 0.4 | |
| Nickel | 0.0 | 0.2 | 0.0 | 0.0 | |
| Chromium | 0.0 | 0.0 | 0.0 | 0.0 | |
| Titanium | 0.0 | 0.0 | 0.0 | 0.0 | |
| Copper | 0.0 | 0.0 | 0.0 | 0.0 | |
| Aluminum | 0.0 | 1.0 | 0.2 | 0.0 | |
| Tin | 0.0 | 0.9 | 0.4 | 1.3 | |
| Lead | 0.0 | 0.0 | 0.2 | 1.1 | |
| Silver | 0.0 | 0.0 | 0.0 | 0.0 | |

Report ID -

All is well so take no action at this time!

USPI Summary & Recommendations