

Fluid Analysis Services

Clean Oil For Predictive Maintenance



Oil analysis is a condition monitoring tool designed to monitor:

- Fluid properties, or the condition of the oil and the additives
- Fluid contamination
- Machine wear

What is the purpose of taking oil samples?

Oil samples can provide insight into the fluid and machine condition at a given point in time. Proper sampling is important in the process of taking bottle samples. The sample taken needs to be representative of the fluid in the system as it is only a small sample of the total oil volume present. Proper sampling of system is dependent upon the following factors:

- Sampling point location
- Sampling equipment used to take the sample
- Sampling method
- Frequency of sampling
- Recent maintenance completed on the system

DO's and DON'T's for Oil Sampling

✓ **DO** sample from running machines.

✗ **DO NOT** sample “cold” systems.

- Best time to sample a system is when the system is under normal working load and normal conditions.

✓ **DO** sample upstream of filters and downstream of machine components.

- Taking a sample before and after a filter for a simple particle count will allow you to see how well the filter is currently operating.

✓ **DO** create specific written procedures for each system sampled.

- Identify the sample location
- Amount of flush volume
- Frequency of sampling
- Timing within a cycle to sample
- Indicate what tools and accessories to use on that specific sample point based on lubricant type, pressure and amount of fluid required.

✓ **DO** ensure that sampling valves and sampling devices are thoroughly flushed prior to taking the sample.

✗ **DO NOT** use dirty sampling equipment or reuse sample tubing.

- Cross-contamination has always been a problem in oil sampling. Failure to flush the sample location properly will produce a sample with a high degree of noise.

✓ **DO** ensure that samples are taken at proper frequencies.

✗ **DO NOT** sample “as time permits”.

- Setting up the appropriate sampling frequency and adhering to it will allow for precise analysis and sound maintenance decisions.

✓ **DO** forward samples immediately to the oil analysis lab after sampling

- If a problem is detected in a system, the earlier it is detected, the less catastrophic potential it may have.



Oil Sampling Location and Cleanliness

- In addition to using a clean oil sample bottle, any sampling equipment must also be clean.
- A new microbore hose should be used with each sample that is taken to avoid cross contamination of the sample.
- The sample needs to be taken from an area of turbulent flow rather than a stagnant location. Turbulent flow ensures that the sample taken is representative of the fluid in the reservoir.

Sample or Test Point Procedure

Samples can be taken from a Sampling or Test Point that can be accessed with a sampling probe or a hand-held vacuum pump. The test point should be one that has been permanently installed at a location where such turbulent flow exits. The test point should be flushed prior to filling the sample bottle per the outlined method.

- Take sample directly from the hydraulic reservoir using a sampling tube.
- The sample should be taken at midpoint of the reservoir to ensure a representative sample is taken.
- Samples taken from the top of the reservoir will be significantly cleaner while samples from the bottom of the reservoir will contain significantly higher amounts of contamination.

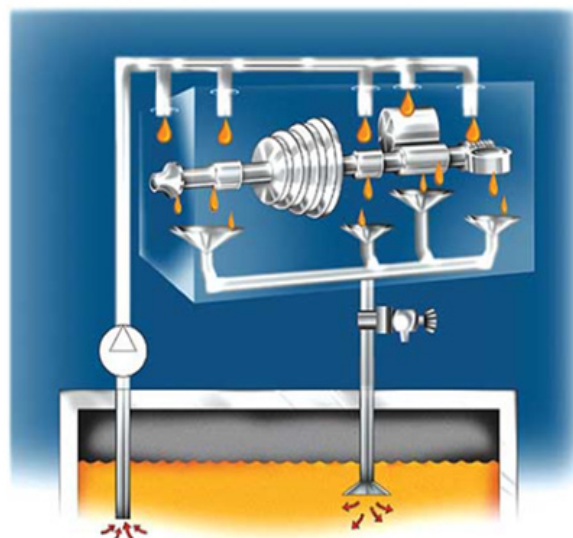
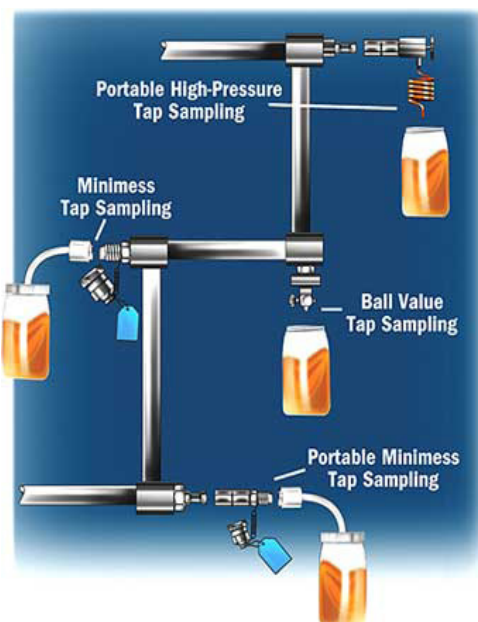
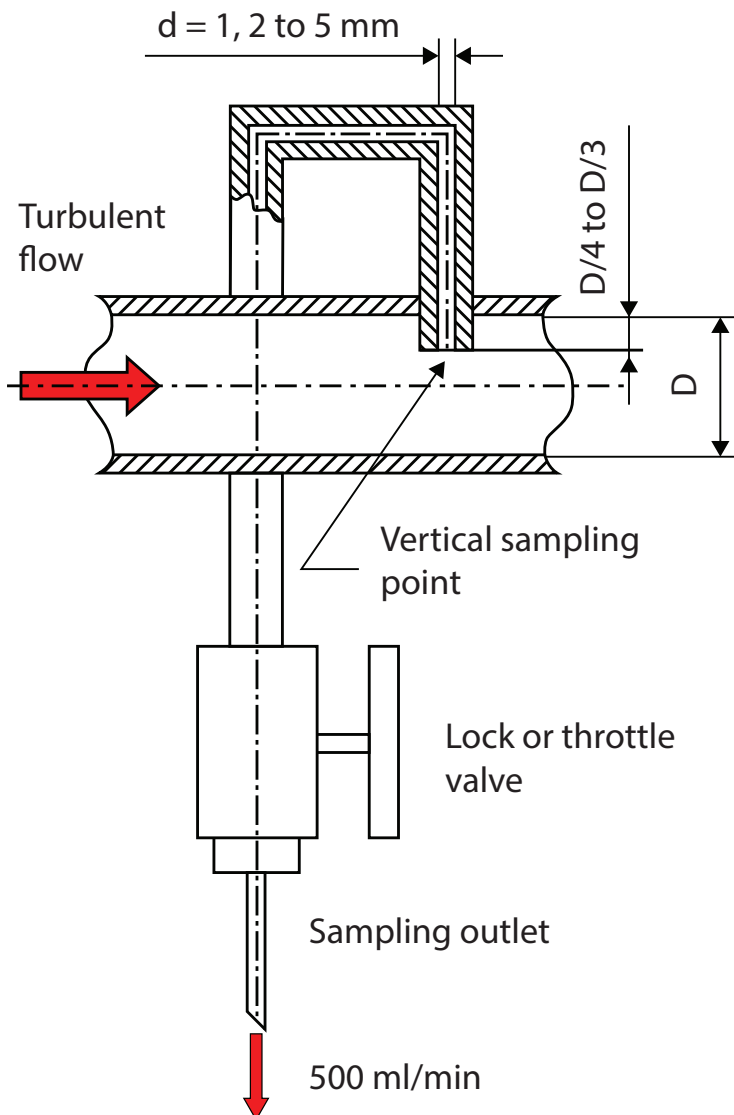


Figure 2. Return or Drain Line

Oil Sampling Procedure – ISO4021

- Clean all surfaces of sampling point thoroughly
- Operate system for minimum 30 minutes
- Open lock or throttle valve, adjust a flow of about 500 ml/min, flush sampling point with minimum 1 litre (capture oil in a waste reservoir)
- Open lid of sampling bottle now, hold bottle downwards until sampling, fill bottle to 75% level, close lid immediately after sampling. Do not touch sampling outlet in the meantime!
- Close lock or throttle valve
- Label bottle (date, number, fluid type, fluid temperature, machine type, operating time with fluid, sampling point)



Your Introduction to Fluid Analysis Services

Clean fluids are the key to long equipment life, precision operation, lower maintenance costs and decreased downtime. Schroeder Industries' Fluid Analysis Services can unlock the door to increased savings by detecting potential problems early, so that service/downtime can be scheduled and catastrophic failures/costs can be avoided.

Schroeder Industries' Fluid Analysis Services provide users of industrial and mobile equipment with a complete analytical report including:

- System status (rated as Normal, Caution or Critical).
- Graphs of sample and limit data for easy detection of abnormal results.
- Comments and recommendations (where applicable).
- Photo of the contamination contained in the current oil sample. Kits including patch photo are available.
- An oil analysis report will be sent via email to the address provided on the component registration form or is readily available on-line
- Early warning limits based on industry standards, provided targets or a provided baseline.
- Current sample data displayed with up to 10 previous sample results.

A Typical Fluid Analysis Program

Schroeder Industries' Fluid Analysis Services can be used to implement a preventative maintenance program for each critical piece of equipment. The program should begin with a complete examination of the equipment by the customer to determine system criticality and sensitivity, as well as collecting a baseline sample to compare against.

New Oil/Baseline Samples

A sample of new oil should be sent to the lab for analysis. This sample will act as a baseline for comparison with subsequent sample results. New oil/Baseline samples should be taken from the tote after filtering, this will provide the most accurate representation of the oil properties before it is used.

Below is a listing of commonly cited sampling frequencies. These are given as a starting point only. Sampling frequency should be increased as environment severity and system criticality increases.

Sampling Frequency

Equipment Type	Hours
Hydraulics - Industrial	700
Hydraulics - Mobile	200
Hydraulics - Aviation	150
Steam Turbines	500
Transmissions	300
Air/Gas Compressors	500
Chillers	500
Gear Boxes - High Speed/Duty	300
Gear Boxes - Low Speed/Duty	1000
Bearings - Journal and Rolling Element	500
Diesel Fuel - Bulk Storage	Quarterly
Diesel Fuel - Day Tanks	Quarterly

Sampling Information

The Fluid Analysis Sample Form must be filled out as completely and accurately as possible. Accurate laboratory assessment of your sample depends on it. The most important information is: Your Company

- Your Name
- Your Email / Contact Information
- Unit ID / Name
- Date of Sample
- Type of oil (*Manufacturer & Brand*), or fuel, should be included for most accurate information about your oil sample

Schroeder Industries' Fluid Analysis Services offer our customers a valuable means of extending equipment life, lowering maintenance costs, and decreasing downtime by improving overall system performance using preventative maintenance strategies. To choose the correct program for you please contact your Schroeder Industries distributor or Schroeder Industries directly.



Schroeder Industries Sample Kits and Laboratory Reports

Prepaid Sample Kits

Our Fluid Analysis Service includes testing for mineral oil based fluids, water glycol fluids, grease testing, MPC varnish potential testing, and diesel fuel test kits. Each kit is supplied with a clean sample bottle with mailer bottle, component registration form and prepaid Fluid Analysis Service.



Fluid Analysis Laboratory Reports

For each sample submitted to the lab, our customers will receive complete analytical lab reports including system status and recommendations.

Understanding Your Fluid Analysis Laboratory Report Status and Recommendations

Corrective actions are recommended when applicable. The status of the sample is rated in three categories:

- **Normal**

- System is operating within the parameters established by provided limits and/or baseline data.
- System requires no immediate action.

- **Caution**

- System is operating outside of caution limits in one or more areas.
- System requires scheduled maintenance.

- **Critical**

- System is operating outside of critical limits in one or more areas.
- System requires immediate attention.

Fluid Laboratory Tests

Using a 100 mL minimum sample, the following tests can be performed:

Particle Count

Particle contamination is responsible for most of the wear that causes mechanical failure. The amount of damage inflicted depends largely upon particle size. Contamination must be controlled in any system deemed critical to operation or expensive to repair. Accurate particle count trends provided by Schroeder Industries are an effective means of monitoring contamination and wear.

The level of contamination is determined automatically by a laser particle counter. The results are shown as the cumulative counts per milliliter of fluid according to ISO 4406. (For water glycol fluids the patch test photo is used to estimate the ISO code). The current sample ISO code is displayed along with the number of particles present in each micron level. The results are also graphed for easy detection of increased particle contamination. The accompanying chart lists components and target ISO cleanliness levels. When the target ISO code is exceeded, improvement of the system filtration, elimination of the source of ingress or installation of auxiliary off-line filtration may be required. (eg. By using Schroeder Industries quality filters, oil care and diagnostic systems)

Fuel Laboratory Tests

Using a 250 mL plastic jar the following tests can be performed:

Particle Count

ISO CODE representing the number of particles of solid contamination present in a given sample.

- **Water Content**

- Determination of the amount of water present in a given sample; reported as ppm or percent

- **Bottom Solids and Water**

- Volume of free water and sediment in a given fuel sample

- **Clear and Bright Visual Inspection**

- Visual inspection for haze or lack of clarity, indicating the presence of water

- **Bacteria, Fungi, and Mold**

- Presence and severity of microbial growth

Using a 1L metal jar, the following tests can be performed:

same tests as above, in addition to:

- **Cold Filter Plugging Point**

- Lowest temperature (°C) at which a given volume of fuel still passes through a standardized device under cold conditions

- **Pour Point**

- Temperature (°C) where fuel loses its flow characteristics

- **Cloud Point**

- Temperature (°C) where fuel begins to take on a cloudy appearance

- **Distillation**

- Assessing the boiling temperature range of the sample fuel



ISO 4406

Most Sensitive System Component	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions*)		Very High Pressure 3000 psi and over (high pressure with severe conditions*)	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3**
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3**
Servo Valve	16/14/11	3**	16/14/11	3**	15/13/10	3**
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3**	15/13/10	3**
Test Stands	15/13/10	3**	15/13/10	3**	15/13/10	3**
Bearings						
Journal Bearings	17/15/12	3	—	—	—	—
Industrial Gearboxes	17/15/12	3	—	—	—	—
Ball Bearings	15/13/10	3**	—	—	—	—
Roller Bearings	16/14/11	3**	—	—	—	—
Fuels						
Bulk Storage	18/16/13	—	—	—	—	—
Dispensing Nozzle	15/13/10	—	—	—	—	—
Equipment Fuel Tank	15/13/10	—	—	—	—	—
Fuel Systems***	<12/9/6	—	—	—	—	—

* Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water.

** Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

***Engine manufacturer requirements vary and may require fuel cleaner than the recommendation in the table above.

Micron Ratings: Contact factory for recommendations for your application.



Fluid Analysis Sets

The Fluid Analysis Set from Schroeder Industries provides the necessary tools to determine levels of solid particulate contamination present in a particular fluid sample. Using the vacuum pump contained in the kit, the fluid sample is drawn through a membrane patch. The residual dirt left on the patch is viewed under a microscope and compared to photos of known contamination levels in the Schroeder Industries Contamination.

Kit Type	Part Number
Fluid Analysis Kit	7630322



Schroeder's Fluid Analysis Services provide users of industrial and mobile hydraulic equipment with a complete analytical report available on our Fluid Care Portal. All Kits offered are prepaid sample kits to meet your different testing requirements.

Analysis of Hydraulic Fluids:

🔥 **BASIC OIL ANALYSIS KIT, BOX 10** – p/n 7651336

💧 **ADVANCED OIL ANALYSIS KIT, BOX 10** - p/n 7651338

💧💧💧 **PREMIUM OIL ANALYSIS KIT, BOX 10** – p/n 7651337

🔥	💧	💧💧💧		
			Appearance	Bottle Photo
			ISO Particle Count	Performed by ISO 11500, reported ISO 4406
			Filter Patch	Photo of filter patch
			Karl Fischer Water %	ASTM D6304C
			Viscosity at 40C	ASTM D445
			Viscosity at 100C	ASTM D445
			Viscosity Index	ASTM D2270
			ICP Spectrometry	ASTM D5185
			Total Acid Number (TAN)	ASTM D664
			Varnish Potential (MPC)	ASTM D7843

Analysis of Grease:

🔥 **BASIC GREASE TEST PACKAGE, SI - Each** – p/n 7651491

💧💧 **ADVANCED GREASE TEST PACKAGE, SI - Each** - p/n 7651492

🔥	💧💧		
		Color	Visual Color
		Total Magnetic Iron (TMI)	Ferrous Screening
		FTIR Oxidation	Direct Trend Method
		ICP Spectrometry	25 Element ASTM D5185-05
		Karl Fischer	% Water ASTM D6304
		RULER	Remaining Useful Life
		Penetration Test	Quarter Cup
		Ferrography	Photographic Report

Analysis of Coolants:

The Basic and Advanced Oil Analysis Kits can also be used for testing coolants. Simply indicate on the **Component Registration Form** that the hydraulic fluid is a coolant and include coolant manufacturer and brand name.

🔥	💧💧		
		Appearance	Color, Clarity, Odor, Precipitates
		pH	
		Conductivity - Coolants	
		Refractive Index	Freeze Point, Boiling Point, % Glycol
		Nitrates by Titration	
		Sediment Patch	Photo of Filter Patch



Analysis of Diesel Fuel:

- 🔥 CLEANLINESS FUEL ANALYSIS KIT - Each – p/n 7651753
- 💧 CONTAMINATION FUEL ANALYSIS KIT - Each - p/n 7651754
- 🔥🔥 FILTER PLUGGING FUEL ANALYSIS KIT - Each - p/n 7651755
- 💧💧💧 WINTER FUEL ANALYSIS KIT - Each - p/n 7651756

				ISO Particle Count	ASTM 11500, reported by ASTM 4406
				Karl Fischer Water %	ASTM D6304B
				Bottom Solids and Water	ASTM D2709
				Clear and Bright Visual Inspection	ASTM D4176
				Bacteria, Fungi, and Mold	In House Method
				Cold Filter Plugging Point	ASTM D6371
				Pour Point	ASTM D97
				Cloud Point	ASTM D5773
				Distillation	ASTM D86

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580 West Park Road | Leetsdale, PA 15056, USA
724.318.1100 phone | 724.318.1200 fax
sisales@schroederindustries.com

