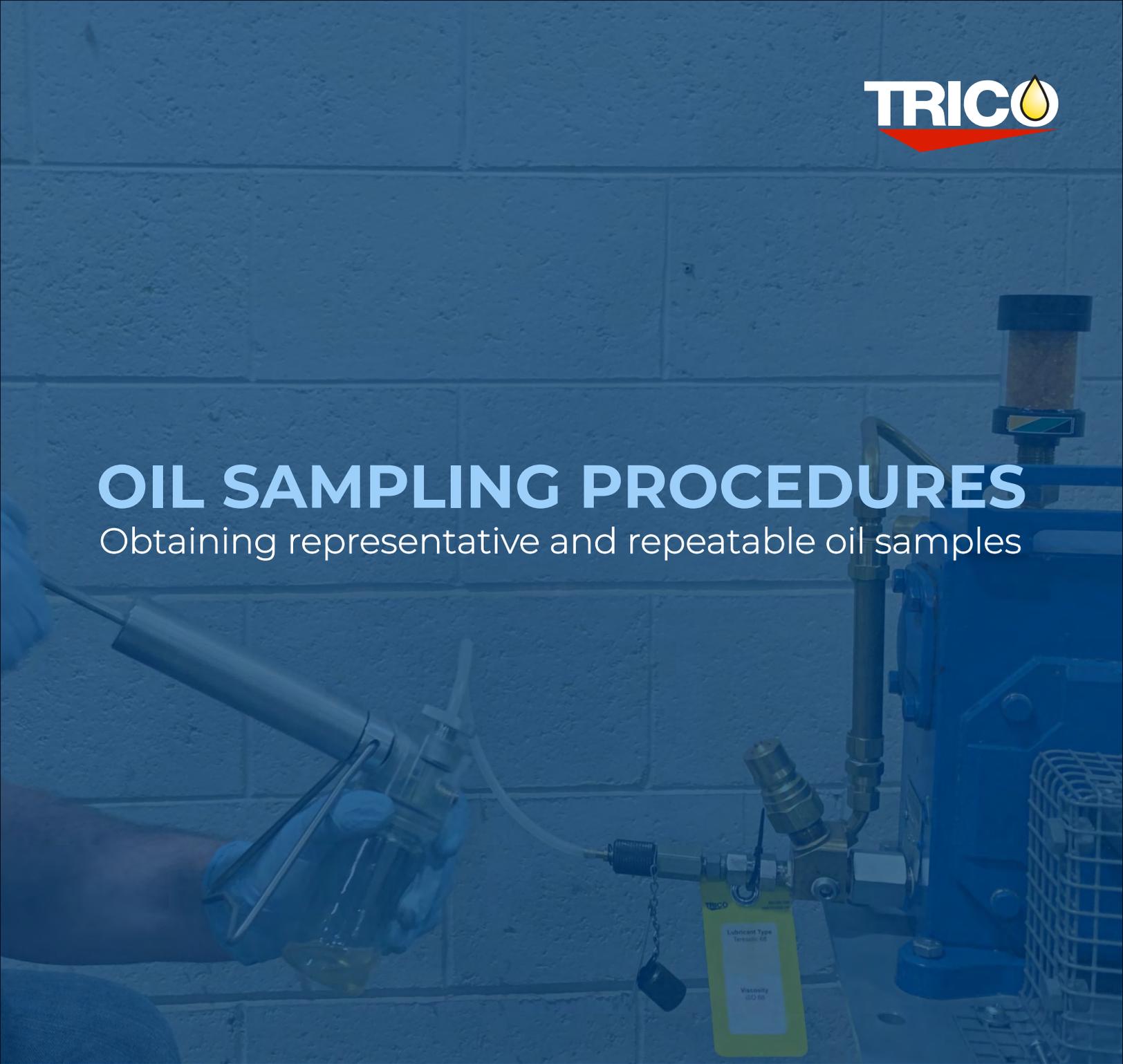




OIL SAMPLING PROCEDURES

Obtaining representative and repeatable oil samples



 ORBITAL

Orbital combines the concept of the Journey of the Lubricant, oil sampling data, peripheral equipment, and environmental information to provide you with the most comprehensive oil analysis program. Orbital allows you to compare, combine, analyze, and report on all data points surrounding the health of your equipment and lubricant. Welcome to the new era of oil analysis...**Oil Intelligence.**

PURPOSE

To obtain representative oil samples from specific equipment for the following purposes:

- Physical and Chemical testing
- Analysis in determining oil quality, contamination present and equipment condition

SAMPLING PROCEDURES CONTENT

- Oil Sampling from Pressurized System using Sample Valves
- Oil Sampling from Non-Pressurized System using Sample Valves
- Sampling Oil from Small Reservoirs (Bearing Housings)
- Sampling Oil in a Drum or Reservoir without Sample Valves

CONVENTIONAL HAZARDS AND SAFETY GUIDELINES

Conventional Safety

- Care must be taken around operating equipment
- Review and understand safety procedures
- Inform supervisor of your intentions
- Inform operator of the equipment to be tested of your presence

Toxicological Information

- Most lubricating oils or hydraulic fluids are not Workplace Hazardous Material Information System (WHMIS) controlled items. They are not a primary skin irritant for short time exposures.
- Safety Data Sheet (SDS) information must be read for oil or solvent being used at the time.
- Inhalation of oil mist or vapors from hot oil can cause irritation of upper respiratory tract.

TEST EQUIPMENT, TOOLS AND CONSUMABLES

Tools

- Vacuum Pump (hand operated)
- Test Port Adaptor
- Flushing Bottle

Consumables

- Sample bottles with labels
- ¼ inch diameter plastic tube, which is a minimum of 12 inches long
- Lint-free cloth
- Oil-impervious latex gloves (or other suitable material)

DEVELOPMENTAL REFERENCES

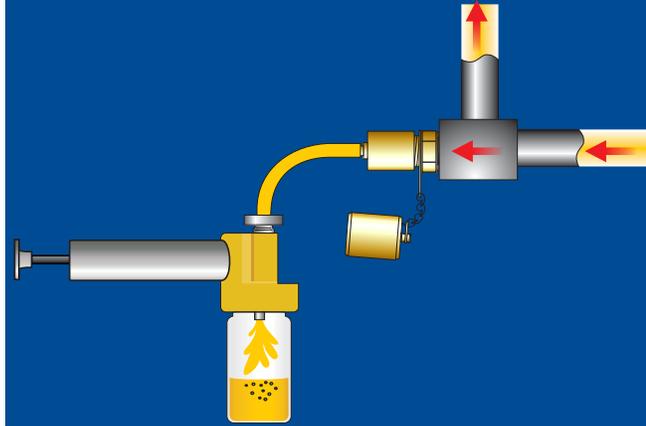
Manuals

- **ASTM D 4057** – Standard Practice for Manual Sampling of Petroleum and Petroleum Products
- **ASTM D 4177** – Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
- **ASTM D 4306** – Standard Practice for Sampling Aviation Fuel for Tests affected by Trace Contamination
- **ANSI 93.19** – American National Standard Method for Extracting Fluid Samples from the lines of an Operating Hydraulic Power System (for Particulate Contamination Analysis)



A high level of cleanliness must be maintained on sampling equipment and sample containers to prevent contamination of oil samples. To prevent unnecessary contamination of the bottle and sample oil, sample bottles must remain closed until ready for use. Equipment must have been in normal operation for at least one hour prior to collecting oil sample.

1. Obtain a sample bottle with a label that corresponds to the sample ID tag on the equipment test port.
2. Ensure new sample hose is installed on the sample-port adaptor.
3. CLEAN the sample point or orifice with a lint free-cloth.
4. REMOVE the sample port protective cap.
5. INSTALL sample port and flushing hose onto high pressure sampling pump.
6. Install flushing bottle on the high-pressure pump.
7. Screw the sample port adaptor onto the sample port until fluid flows and the port and associated fittings are thoroughly flushed (see flushing requirements).
8. Remove the sample port adaptor.
9. Replace the flushing bottle with the sample bottle ensuring that the sample bottle cap does not get contaminated.
10. Reinstall the sample port adaptor and extract fluid to fill sample bottle to top shoulder, just below the neck (4 oz sample bottle).
11. REMOVE the sample adaptor from sample port.
12. Remove and carefully cap sample bottle.
13. Re-install protective cap on the test port.
14. Clean up any spilled lubricant.
15. Dispose of the sample tube.



GENERAL TIPS

Oil Condition

Perform Visual Inspection and report to Oil Analysis Program Coordinator

0		Normal
1		Acceptable
2		Caution
3		Concern

Labels Require the Following Information

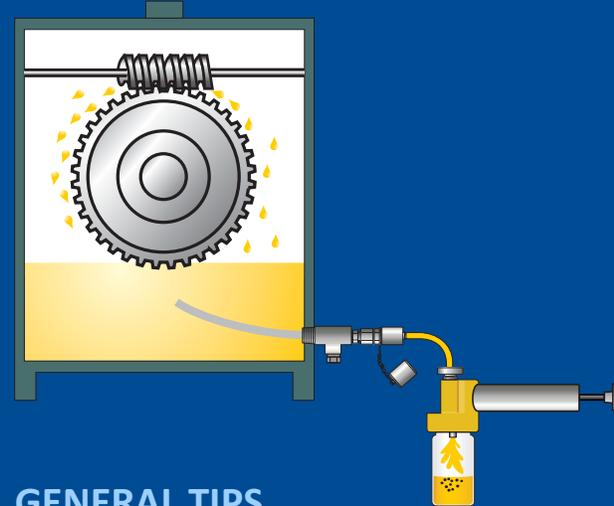
- ✓ Date the sample was taken
- ✓ Date of last filtration
- ✓ Date of last oil change
- ✓ Lube hours
- ✓ Machine hours
- ✓ Additional comments

VISUAL INSPECTION

SEVERITY CODE	CLOUDINESS APPEARANCE	FREE WATER APPEARANCE	SEDIMENT APPEARANCE	ODOR APPEARANCE	COLOR CHANGE APPEARANCE
0	Normal	None	None	Normal	Normal
1	Hazy	Slight	Few Specs	Abnormal	Slight Darkening
2	Cloudy	Pudding	Layer	Pungent	Darkening
3	Heavy Clouding	Layer	Heavy Layer	Foul	Abnormal

A high level of cleanliness must be maintained on sampling equipment and sample containers to prevent contamination of oil samples. To prevent unnecessary contamination of the bottle and sample oil, sample bottles must remain closed until ready for use. Equipment must have been in normal operation for at least one hour prior to collecting oil sample.

1. Obtain a sample bottle with a label that corresponds to the sample ID tag on the equipment test port.
2. Ensure new sample hose is installed on the sample-port adaptor.
3. CLEAN the sample point or orifice with a lint free-cloth.
4. REMOVE the sample port protective cap.
5. INSTALL sample port and flushing hose onto high pressure sampling pump.
6. Install flushing bottle on the high-pressure pump.
7. Screw the sample port adaptor onto the sample port until fluid flows and the port and associated fittings are thoroughly flushed (see flushing requirements).
8. Remove the sample port adaptor.
9. Replace the flushing bottle with the sample bottle ensuring that the sample bottle cap does not get contaminated.
10. Reinstall the sample port adaptor and extract fluid to fill sample bottle to top shoulder, just below the neck (4 oz sample bottle).
11. REMOVE the sample adaptor from sample port.
12. Remove and carefully cap sample bottle.
13. Re-install protective cap on the test port.
14. Clean up any spilled lubricant.
15. Dispose of the sample tube.



GENERAL TIPS

Oil Condition

Perform Visual Inspection and report to Oil Analysis Program Coordinator

0	Green	Normal
1	Light Green	Acceptable
2	Yellow	Caution
3	Red	Concern

Labels Require the Following Information

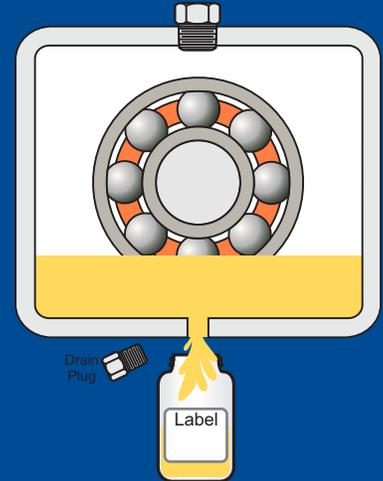
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VISUAL INSPECTION

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A high level of cleanliness must be maintained on sampling equipment and sample containers to prevent contamination of oil samples. To prevent unnecessary contamination of the bottle and sample oil, sample bottles must remain closed until ready for use. Equipment must have been in normal operation for at least one hour prior to collecting oil sample.

1. Bring a flush bottle to catch oil in the flushing process. (Depending on size of reservoir - a pint or two is usually sufficient or about one half the capacity of the sump).
2. Bring a 4 oz sample bottle to the reservoir or bearing housing with label attached that corresponds to the ID tag on the equipment.
3. Bring clean oil for refilling the reservoir or bearing housing.
4. Clean drain plug with a lint-free cloth.
5. Remove flush bottle cap.
6. Remove sample bottle cap ensuring the sample bottle cap does not get contaminated.
7. Remove the drain plug, or open the drain valve.
8. Allow sample amount of oil to flush through the sump drain hole into the flush bottle. (Depending on the size of the reservoir - a pint or two is usually sufficient or about one half the capacity of the sump).
9. Quickly switch bottles and fill sample bottle to the top shoulder, just below the neck.
10. Carefully cap sample bottle.
11. Clean up any spilled lubricant.
12. Replace drain plug, close drain valve, and refill bearing.



GENERAL TIPS

Oil Condition

Perform Visual Inspection and report to Oil Analysis Program Coordinator

0		Normal
1		Acceptable
2		Caution
3		Concern

Labels Require the Following Information

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- ✓ Lube hours
- ✓ Machine hours
- ✓ Additional comments

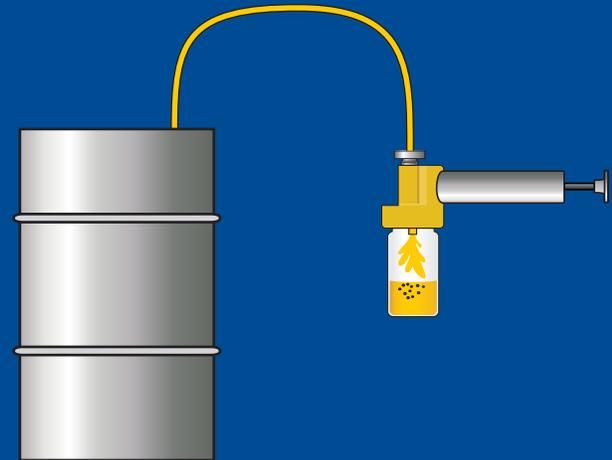
VISUAL INSPECTION

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Drum or Reservoir without a Sample Port

A high level of cleanliness must be maintained on sampling equipment and sample containers to prevent contamination of oil samples. To prevent unnecessary contamination of the bottle and sample oil, sample bottles must remain closed until ready for use. Equipment must have been in normal operation for at least one hour prior to collecting oil sample.

1. Clean area around bung of oil drum or the cap of the reservoir with acceptable solvent and WIPE clean with lint free cloth.
2. Ensure new sample hose is installed into the vacuum pump (enough hose to sample halfway from the top and bottom of the reservoir/drum).
3. Install flushing bottle onto the assembly
5. UNSCREW bung/cap and PLACE the bung/cap in a new plastic bag.
6. INSERT hose into opening being careful not to contaminate or contact sides.
7. Flush hose and associated fittings (see flushing requirements) using the vacuum pump.
8. Replace flushing bottle with the sample bottle ensuring the sample bottle cap does not get contaminated.
9. Extract fluid to fill sample bottle to top shoulder, just below the neck (4 oz sample bottle).
10. REMOVE hose from the drum/reservoir and carefully cap sample bottle.
11. Replace bung/cap.



GENERAL TIPS

Oil Condition

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2	Yellow	Caution
3	Red	Concern

Labels Require the Following Information

- ✓ Date the sample was taken
- ✓ Date of last filtration
- ✓ Date of last oil change
- ✓ Lube hours
- ✓ Machine hours
- ✓ Additional comments

VISUAL INSPECTION

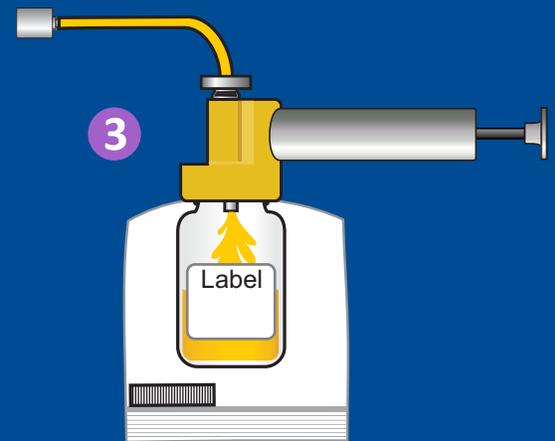
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A high level of cleanliness must be maintained on sampling equipment and sample containers to prevent contamination of oil samples. To prevent unnecessary contamination of the bottle and sample oil, sample bottles must remain closed until ready for use. Equipment must have been in normal operation for at least one hour prior to collecting oil sample.

1. Properly label bottle with sample ID, oil type equipment, date, location of sample, etc.
2. Insert capped bottle into a clean zip-lock bag and seal.
3. For multiple sampling locations, place individually sealed bottles in a larger zip-lock bag along with vacuum pump and any adaptors.
4. Prior to sampling, remove the cap and thread the bottle onto the vacuum pump without opening the bag.
5. With the bottle upright, thread the tubing into the vacuum pump and into the bottle, puncturing the bag in the process.
6. Remove bottle from bag and send immediately to a laboratory.

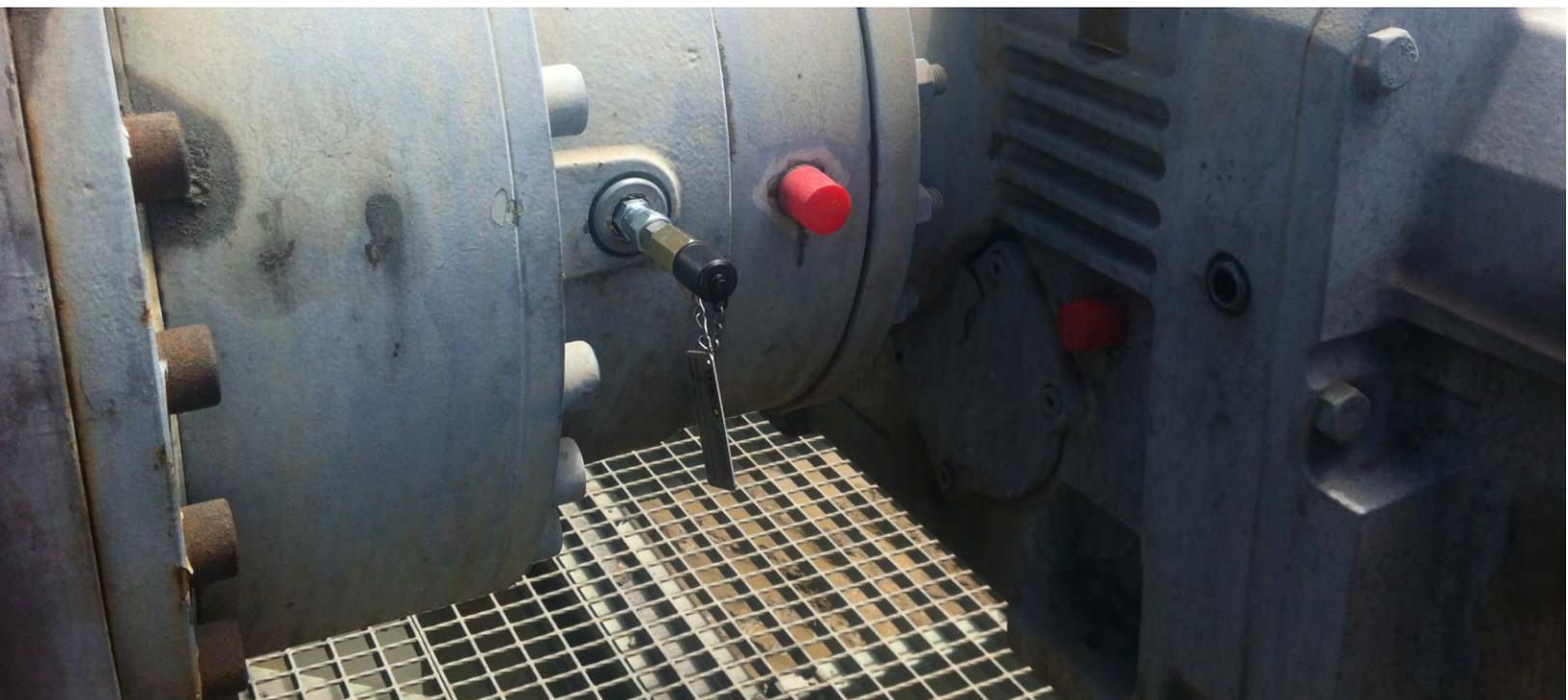
VACUUM PUMP

A vacuum pump is used to extract samples from no-pressurized and drum sampling. Care must be taken to ensure the internals of the pump do not get contaminated with oil, dirt, water, etc. and must be kept in good repair.



FOR CLEARING PITOT TUBES AND DROP TUBES

PIPE	ID (INCHES)	SUGGESTED FLUSH VOLUMES IN OUNCES PER LENGTH						
		1 INCH	2 INCHES	3 INCHES	4 INCHES	5 INCHES	6 INCHES	12 INCHES
1/2" Schedule 40	0.622	1.7	3.4	5.1	6.8	8.5	10.2	20.3
3/8" Schedule 40	0.493	1.1	2.2	3.3	4.4	5.5	6.5	13
1/4" Schedule 40	0.364	.6	1.1	1.6	2.2	2.7	3.3	6.5
1/8" Schedule 40	0.269	.3	.6	.9	1.2	1.5	1.8	3.7
STEEL TUBE								
1/2" .49 Wall	0.402	.7	1.4	2.1	2.8	3.6	4.3	8.5
3/8" .49 Wall	0.277	.3	.7	1	1.4	1.7	2	4.1
5/16" .49 Wall	0.215	.2	.4	.6	.8	1	1.2	2.4
1/4" .49 Wall	0.152	.1	.2	.3	.4	.5	.6	1.2
3/16" .49 Wall	0.124	.1	.1	.2	.3	.3	.4	.8
1/8" .49 Wall	0.061	.1	.1	.1	.1	.2	.2	.4
MICROBORE HOSE								
2 mm Bore	0.0786	.1	.1	.1	.1	.2	.2	.4
SAMPLE HOSE								
1/2" .062 Wall	0.376	.6	1.2	1.8	2.4	3	3.7	7.3
5/16" .037 Wall	0.2385	.2	.5	.7	1	1.2	1.4	2.8
1/4" .037 Wall	0.176	.1	.3	.4	.5	.7	.8	1.6
3/16" .025 Wall	0.1375	.1	.1	.2	.3	.3	.4	.8





ORBITAL

BRINGING OIL INTELLIGENCE TO LIFE

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