Why Maintain Oil Cleanliness?

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Why is there such a big emphasis on oil cleanliness? The question has been asked numerous times over the years by maintenance technicians and managers alike. “Our oil is clean and we have no problems to speak of” is an all-too-familiar response. In this age of evolving ideas and technological trends, reliability has become the answer as an increasing number of companies make the paradigm shift to a new accountability and better asset performance. This article discusses oil cleanliness and a proven methodology to accomplish this important task.

Purpose of Cleanliness

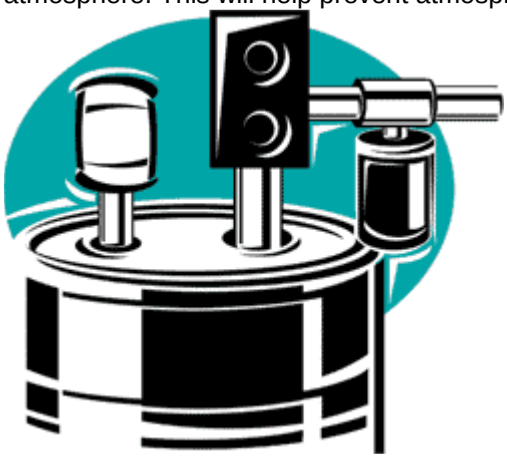
Why is it important to improve the cleanliness of circulating oil systems? Circulating oil systems include bearing lube systems, hydraulic systems and gearbox lube systems. For years, oil cleanliness has been somewhat of a neglected subject, often thought of as “out of sight, out of mind.” In this age of competitive markets and small profit margins, the competitive edge is derived from the ability to produce the highest quality product at the lowest cost. This is driven by consumer demand and implemented through the concept of reliability. This is not a new concept, just one that is now taking on a new importance. Reliability is about being able to rely on equipment to produce what it is scheduled to produce, when it is scheduled to produce it, for as long as it is scheduled to produce it with no interruptions.

Oil is used for the purposes of lubrication, power transmission, surface protection, heat transfer and surface cleansing. In order for a surface to degrade, there must be something to abrade it (hard particles), adhere to it (break the lubrication boundary), or attack it (corrosion) in some way. The primary method of defense against degrading forces is the lubricant film. Oil characteristically collects dust, dirt and other contaminants unless it is purposely prevented from doing so. Therefore, it is the responsibility of every individual who comes in contact with the lubricant to prevent its contamination through rigorous application of clearly defined clean-handling practices.

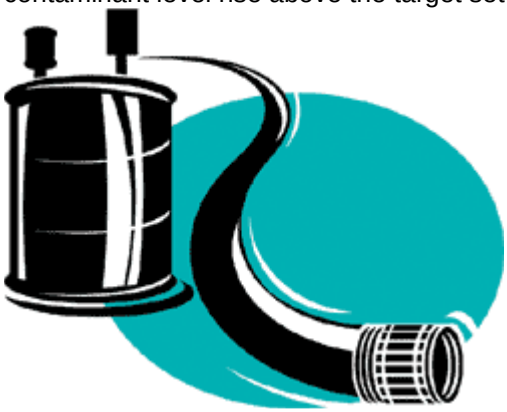
The bare minimum requirements for contamination control include:

1. New oil filtration. The first step in providing clean oil is to have a good filter in place to catch contaminants that reside in the oil when first delivered to the plants, whether in drums, pails or bulk deliveries. A filter system or cart must be employed at the first intrusion into the oil container and at each lubricant transfer thereafter.

2. Effective headspace control. If oil is circulating in a reservoir or churning around the inside of the housing, then air is sure to enter, replacing the changing volume of oil, as the air level changes. In that instance, the air must be filtered to remove all of the fine particulates that suspend continually in the atmosphere. This will help prevent atmospheric ingression of contaminants.



3. Effective transfer and periodic filtration capability. Quick-connects should be installed on transfer hoses to prevent contamination of the transfer hose from the immediate environment and to provide leak-free connections to tanks or reservoirs. Quick-connects also provide a means for off-line filtration should a contaminant level rise above the target set for the machine.



System Control and Feedback

There must be a mechanism to measure the initial condition and measure for effectiveness of any applied effort. Oil analysis particle counting is the preferred method, and can become a powerful tool when conducted with precision. Sample port location is of vital importance to the acquisition of good data.

Correctly installed sample ports on a machine are required to get a consistent and representative sample of oil. Without representative data, the decision-making process is compromised. The proper location of a sample port is upstream of a return-line filter on the oil return to the reservoir. Locating a sample port downstream of a filter is useless for general system monitoring, due to the effect of the filter trapping most of the particulate contamination, but can provide insight on filter element effectiveness. The purpose of a correctly installed sample port is to monitor the complete system to determine the condition and cleanliness levels of the oil.

Value of Knowledge

The most important factor contributing to oil cleanliness is the human element. The importance of a qualified, well-trained lubrication technician cannot be stressed enough. The responsibility of providing clean oil to the equipment falls squarely upon the shoulders of the lubrication technician, or whomever is responsible for maintaining oil levels.

He or she must be dedicated to the craft and knowledgeable about contamination control. The lubrication technician must implement all of the proper procedures to minimize the risk of contaminant ingression and to remove the contaminants in the supplied product. The technician must also follow proper procedures for extracting samples to minimize the effects of contaminants introduced when drawing the sample. The technician is the key to the success of a well-designed and well-implemented lubrication program.

It is a proven fact that surfaces degrade through the process of abrasion, adhesion and corrosion. Seventy percent of all surface degradation (machine wear) is attributed to these three factors.[1]

Contamination control is a systematic process that addresses these issues. It is a complex technology that has a direct correlation with reliability.

Value of Reliability

Regarding reliability, it stands to reason that if there are fewer particles in the oil, there will be less abrasion, adhesion and corrosion. If there is less abrasion, adhesion and corrosion, the equipment will last longer. If the equipment lasts longer, it will perform its designed function over a longer period of time and the equipment will be more reliable.

In the final analysis, clean oil decreases the lifetime operating expense on the equipment, which maximizes the lifetime usefulness, which produces a greater return on investment. Improved reliability will put a company at the top of the ladder of preferred manufacturers or suppliers with the highest quality product at the lowest cost. In the end, this allows for a higher profit margin and an increase in the shareholders' return.

Reference

1. Professor Earnest Rabinowicz, Massachusetts Institute of Technology.