

Part V... How Clean is the New Oil in Your Equipment? Key Take-Aways & Best Practices

Written by Ray Thibault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum
Thursday, 01 January 2009 00:00

Regardless of where contaminants enter the distribution chain, the cleanliness of the lubricants in your facility is ultimately in your hands.

The last four articles involved an investigation into oil cleanliness from the perspective of the three major links in the cleanliness chain:



Oil cleanliness data was collected from each of the major links in the chain and analyzed by an accredited oil analysis laboratory. Each of these links has a responsibility to assure that the oil it provides to the next link in the chain is clean enough for your equipment. Although the focus in these articles was primarily on hydraulic and turbine oils—which have the most stringent cleanliness standards—cleanliness principles should be practiced on all lubricants. This concluding installment recaps the findings of this study and recommends Best Practices for reliability-focused end users.

Key take-aways

- Oil cleanliness is a key factor in equipment reliability. Ten years ago, a large Gulf Coast refiner implemented a stringent oil cleanliness program that required an ISO Cleanliness of 15/13/11 and <50 ppm water on all delivered low viscosity oils for compressors and pumps. Since the program's inception, Mean Time Between Failures (MTBF) for pump bearings has increased an average of four times.
- Most end users don't realize the importance of clean and dry oil and are not aware of the cleanliness of the lubricants they purchase. As more information is made available more end users are starting to recognize the importance of clean oil.
- Controlling low moisture levels is easier than controlling particles. Most of the lubricants evaluated from the manufacturer to the end user, even those with a high ISO Cleanliness number, were low in moisture.
- Turbine, hydraulic and low-viscosity circulating oils supplied by major lubricant manufacturers in bulk were cleaner than expected. As an example, two suppliers, one on the West Coast and one in the Southwest, provided the following lubricants to their distributors in bulk:

Part V... How Clean is the New Oil in Your Equipment? Key Take-Aways & Best Practices

Written by Ray Thibault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum
Thursday, 01 January 2009 00:00

Table I.

Lubricant Manufacturer	Lubricant	ISO Cleanliness Code
A	AW 46	16/14/10, 15/13/10 16/13/9
B	R&O 32	17/14/11, 17/15/10 17/14/10

Both the turbine and hydraulic oils listed in Table I are clean enough for an end user. Handling and storage by distributors will probably introduce contaminants and lead to a higher ISO Cleanliness Code without implementation of a contamination control program.

Generally, packaged goods supplied by the lubricant manufacturer are cleaner than those supplied by a distributor because of less handling and the use of new versus reconditioned drums. There can be as much as a two- to three-number increase in ISO Cleanliness when packaged by a distributor. This, of course, is dependent on the contamination control practices of the distributor.

- Oil cleanliness is a group effort—meaning that the manufacturer, distributor and end user share in the responsibility for cleanliness. Each entity has to do its part for a program to be economical and effective. Some programs only include final filtration into an end-user tank without any monitoring of the oil cleanliness through the chain from manufacturer to distributor to end user. This, in fact, is typical of what is occurring in the marketplace. In some cases, the final fluid is not measured for cleanliness. Rather, it is just assumed (incorrectly) to be clean because it has been filtered and that's what filtration is all about.

- The most critical link in the cleanliness chain is the distributor. Most distributors/marketers have no idea of the cleanliness of the lubricants they receive from their supplier nor do they know the cleanliness of the lubricants they supply to the end user.

- Growing numbers of end users are coming to the realization that the level of fluid cleanliness can significantly impact the reliability of their equipment. In turn, more manufacturers and distributors are using their ability to provide clean oil as an effective marketing tool.

Part V... How Clean is the New Oil in Your Equipment? Key Take-Aways & Best Practices

Written by Ray Thibault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum
Thursday, 01 January 2009 00:00

- Most distributors that filter oil into the end-user tank charge for this service. However, some of the more innovative distributors that monitor cleanliness in their facility provide clean oil to their customers—oil that meets those customers' cleanliness standards without requiring final filtration—at no extra charge.

- Providing clean turbine and hydraulic oils, once the proper equipment has been installed, can be economical if done properly and only requires one filtration step.

- One Midwestern distributor supplies hydraulic oil that consistently exceeds customer requirements of 17/15/12 by installing offline filtration in the storage tank. This distributor also uses clean, dedicated trucks to deliver the fluid without need for additional filtration, directly to the customer site, which saves time and money.
- A Gulf Coast distributor is installing a system to filter all turbine and hydraulic oils to a cleanliness level of 15/13/10. In most cases, though, it will supply cleaner oil than this. Doing so involves filtration into the tank and from the tank to the bulk truck and packaging line. The distributor expects this system to be very economical and that it will be able to provide the clean oil at no additional charge.
- Oil cleanliness needs to be monitored frequently by the manufacturer, distributor and end user with the assistance of an outside oil analysis laboratory and onsite particle counters.

- Good sampling techniques—which are consistent and representative—are vital in monitoring oil cleanliness. Remember, bad data is worse than no data. Portable particle counters can be installed where the sample is collected directly from the system, without collecting a bottle sample. This will minimize outside particle ingress.
- Portable particle counters can be purchased from a number of suppliers for a cost of \$13,000 to \$20,000. In this study, looking at different types of counters and correlating the results with outside laboratory data showed that results were usually within one to two ISO codes. In most cases, the portable counter numbers were higher than the oil analysis numbers when bottle samples were evaluated by both methods.

Best practices for the lubricant manufacturer

- Target to supply turbine and hydraulic oil at a minimum ISO Cleanliness Code of 19/17/15, monitor all shipments leaving the manufacturing facility and report the cleanliness number to the distributor.

Part V... How Clean is the New Oil in Your Equipment? Key Take-Aways & Best Practices

Written by Ray Thibault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum
Thursday, 01 January 2009 00:00

Best practices for the distributor/marketer

- Develop a plan with specific written procedures to implement a comprehensive oil cleanliness program.
 - Measure particle counts on all incoming turbine and hydraulic bulk deliveries.
 - Utilize a portable particle counter and correlate results with an outside oil analysis laboratory.
 - Install desiccant breathers on all bulk tanks that maintain low moisture levels and filter ingressed particles down to 2 μ .
 - Periodically monitor tank cleanliness at various levels. Drain and clean when required. A well-developed cleanliness program will minimize tank cleaning.
 - Based on customer requirements, develop a minimum cleanliness standard for all turbine and hydraulic oil bulk deliveries. Work with a filter company to install a system to achieve the target cleanliness levels.
 - Develop truck-cleaning procedures along with proper hose storing and capping guidelines.
- Monitor bulk delivery cleanliness by measuring particle counts into and out of truck. Large discrepancies will necessitate reevaluation of truck-cleaning and hose-handling procedures.
- Collect two 4-ounce retains of the delivered oil; leave one with the customer and keep the other for an agreed period.
 - Assist the end user in developing a plan to maintain delivered oil cleanliness.
 - Evaluate procedures for improving oil cleanliness — particularly for turbine and hydraulic oils and goods packaged in drums and pails—by evaluating filling and storage practices.
 - Measure cleanliness of reconditioned drums by collecting samples of oil in and out of them and measuring particle counts. Work with drum supplier to improve process if drums are significantly affecting oil cleanliness.
 - Continuously look to improve overall program.

Best practices for the end user

- Develop ISO Cleanliness Code standards for your bulk turbine and hydraulic oils.
- Work with your lubricant supplier in implementing best-practice procedures.
- Develop written procedures for your cleanliness program.
- Evaluate your bulk shipments for oil cleanliness by conducting particle counts and maintain retain samples.
 - Minimize your drum usage by utilizing tote tanks and five-gallon pails.
 - Utilize plastic versus steel tanks, if possible.
 - Install desiccant breathers on all of your bulk tanks.
 - Use sealed plastic containers for adding oil to small sumps.

Part V... How Clean is the New Oil in Your Equipment? Key Take-Aways & Best Practices

Written by Ray Thibault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum
Thursday, 01 January 2009 00:00

- Minimize oil handling and transfer as much as possible by locating bulk tanks near equipment and pumping directly to reservoirs.
- Install proper filtration for equipment, when required, and utilize filter carts to maintain oil cleanliness standards. Using clean oil will minimize filtration replacement cost.
- Properly train your personnel on the importance of clean oil and best practices for storage and handling.
- Monitor your program closely and look for continuous improvement.

This concludes the five-part series on oil cleanliness. From this study, we verified that increasing numbers of companies are realizing that oil cleanliness provides a high return on investment relating to equipment reliability. If your company is one of these, remember that an effective cleanliness program is a team effort, with lubricant manufacturers, distributors and the end users all working together. Whether you've been at it for a long time or just getting started, application of the principles discussed in these articles will be a good way to move your operations a long way toward enhanced equipment reliability. **LMT**

Acknowledgements

The authors wish to thank the many people and organizations that provided valuable, real-world information for these articles, including: MRT Laboratories, John Gobert, Mark Kavanaugh, Jimmy Thomson, Bill Tummins and Russell Aucoin.

Contributing Editor Ray Thibault is based in Cypress (Houston), TX. An STLE-Certified Lubrication Specialist and Oil Monitoring Analyst, he conducts extensive training in a number of industries. Telephone: (281) 257-1526; e-mail: rthibault@msn.com

Mark Graham is technical services manager for O'Rourke Petroleum in Houston, TX. Telephone (713) 672-4500; e-mail: mgraham@orpp.com

For more info, enter 1 at www.LMTfreeinfo.com