

## How Clean Is The New Oil In Your Equipment?

Written by Ray Thilbault, CLS, OMA I and II and Mark Graham, CLS, CLGS, O'Rourke Petroleum  
Monday, 01 September 2008 00:00

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The key link in the chain of fluid cleanliness is the distributor (who also is referred to as a "marketer" by some companies). Most lubricants today are delivered to the end user from distributors. With the growing awareness of the importance of fluid cleanliness to equipment reliability, more progressive distributors are using fluid cleanliness as a marketing tool. Here, we examine several distributors and how they ensure delivery of clean fluids to their customers.

### The Second Link



As noted in previous installments of this series (which began in the May/June 2008 issue of *LUBRICATION MANAGEMENT & TECHNOLOGY*), the complex oil cleanliness chain typically begins with the lubricant blender, goes through the distributor/marketer and terminates with the end user. In Part III, the authors put the spotlight on the second link in this chain: distribution.

Amazingly, a large number of distributors don't have any idea as to the cleanliness of the lubricants they receive from their suppliers—nor do they have any idea as to the cleanliness of the fluids they deliver to the end user! It has been demonstrated, however, that clean fluids extend equipment life. That's crucial to companies anytime, but even more so in tough economic times. End users, therefore, should no longer accept dirty fluids, especially when critical applications are involved. (Fig. 1 illustrates the distributor's process in handling and delivering lubricants.)

Larger distributors receive their high-volume lubricants in bulk from tank trucks. These are stored in various size tanks. Larger volume items, such as hydraulic, turbine and engine oils, are usually stored in large tanks. These largervolume items also are packaged by the distributor into smaller sizes, such as drums and pails.

### Many potential trouble spots

There are many possible sources of contamination in the transfer of lubricants to the end user, including:

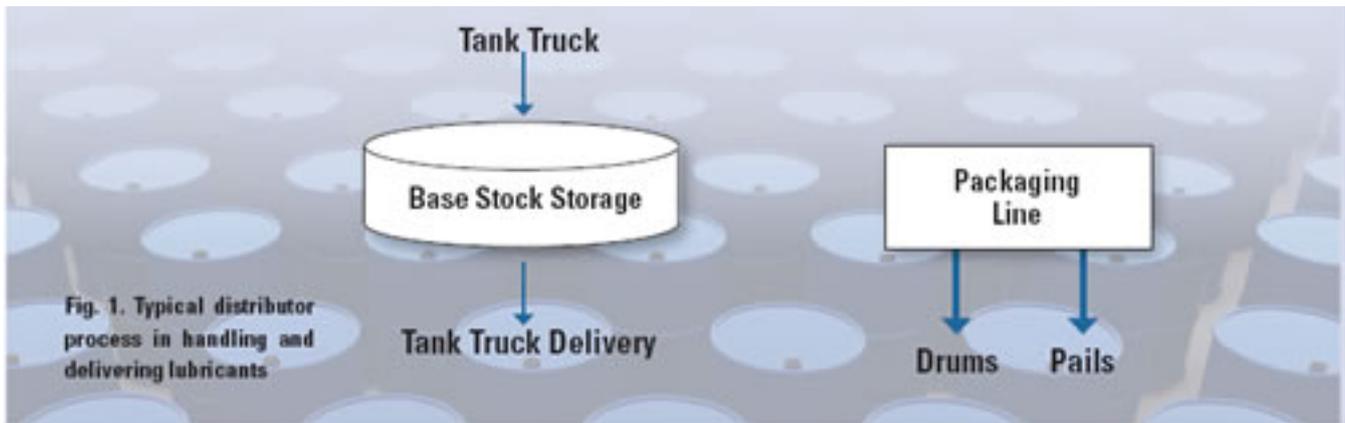
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### Cleanliness of incoming fluid from lubricant supplier

- Cleanliness in loading on truck
- Cleanliness of truck
- Condition and cleanliness of hoses and fittings when offloading into distributor bulk tank



### Condition of bulk tank

- Last time cleaned
- Open spaces promoting rust
- Gooseneck breathers

### Packaging of lubricants

- Cleanliness of reconditioned drum
- Storage of empty drum
- Filling of drum
- Storage and filling of new pails

### Bulk deliveries to end user

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- Cleanliness condition of truck
- Loading procedures
- Cleanliness of hoses and fittings
- Cleanliness of end user tank

The process is marked by one challenge after another. With so many points where contaminants could be introduced, what can a distributor do to ensure that clean fluids are being delivered?

### Taking the right steps

The first step a distributor should take is to evaluate the cleanliness of incoming fluids. Very few distributors monitor the fluids they receive from their lubricants supplier. One exception, a large Western distributor, has developed a program where retains are collected when the lubricant is loaded on their bulk truck and samples then taken during offloading. These samples are sent to an independent oil analysis laboratory for particle counts and water. It is interesting to note that this distributor operation goes through this process with all of its high-volume fluids, including engine oils. Table I reflects the average cleanliness of the fluids offloaded to the distributor's tank truck from the lubricant supplier. Since this is a new procedure, the sample population is low, but it still provided useful information.

**Table I.**

**Average Cleanliness Of Fluids Offloaded To Distributor Tank Truck From Lube Supplier**

<b>LUBRICANT TYPE</b>	<b>ISO 4406 PARTICLE COUNT</b>
<b>AW 32</b>	<b>16/14/11 to 19/17/14</b>
<b>AW 46</b>	<b>18/15/13 to 19/17/13</b>
<b>AW 68</b>	<b>18/16/13 to 21/19/15</b>
<b>15W-40 Diesel Engine Oil</b>	<b>21/18/13</b>
<b>85W-90 Gear Oil</b>	<b>20/18/13</b>
<b>5W-30 Automotive Engine Oil</b>	<b>20/17/14</b>
<b>T0-4 30</b>	<b>20/17/13</b>
<b>T0-4 10</b>	<b>18/16/12</b>

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**Table II. Data In Development Of A Plan To Maximize Clean Fluid Deliveries**

<b>LOCATION</b>	<b>LUBRICANT</b>	<b>ISO 4406 CLEANLINESS CODE</b>
<b>Three Incoming Tank Truck Deliveries</b>	<b>R&amp;O 32 Turbine Oil</b>	<b>17/14/11, 17/15/10, 17/14/10</b>
<b>Bulk Tank A</b>	<b>R&amp;O 32 Turbine Oil</b>	<b>18/15/12</b>
<b>Bulk Tank B</b>	<b>R&amp;O 32 Turbine Oil</b>	<b>18/15/11</b>
<b>Bulk Tank D</b>	<b>AW 68 Hydraulic Oil</b>	<b>17/14/09</b>
<b>Inventory 5 Gallon Pail</b>	<b>AW 46 Hydraulic Oil</b>	<b>17/14/08</b>
<b>Inventory 5 Gallon Pail</b>	<b>AW 32 Hydraulic Oil</b>	<b>23/21/18</b>
<b>Inventory 5 Gallon Pail</b>	<b>AW 46 Hydraulic Oil</b>	<b>22/21/17</b>
<b>Inventory Drum</b>	<b>R&amp;O 32 Turbine Oil</b>	<b>18/15/11</b>
<b>Inventory Drum</b>	<b>AW 68 Hydraulic Oil</b>	<b>18/15/09</b>
<b>Inventory Drum</b>	<b>EP 220 Gear Oil</b>	<b>20/15/10</b>

Particle counts were run on the fluid being offloaded in the distributor's tanks. In some cases the fluid offloaded was two or more ISO codes higher than the fluid loaded at the blend plant. This could be caused by contaminants in the tank truck and/or by the procedures during offloading. This was truer for the hydraulic fluids than for the engine oils. The distributor has the data and is in the process of correcting the problem.

This distributor has installed desiccant breathers on all of its tanks to help control particles and moisture. The operation also is beginning to monitor the cleanliness of the fluids in the tanks.

Some of the more progressive distributors know the cleanliness of their incoming and outgoing fluids especially for turbine and hydraulic fluids. This allows the fluids to meet their customers' cleanliness standards in the most economical way and in some cases without having to provide a final filtration at the customer site. Some distributors provide final filtration at the customer site but don't verify the cleanliness of the fluids with a particle count. Anyone paying a fee for clean fluids should demand a cleanliness code rating for the delivered fluid.

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### Developing a plan

A large distributor in the Southwest is developing a new program to monitor and provide clean fluids to its customers. Evaluation of the data collected in Table II resulted in the planning and implementation of a program to deliver very clean hydraulic and turbine oils to their customers.

Note that several fluid samples obtained from the bulk tanks were not listed because particles could be seen on the bottom of the sample bottle. Analytical ferrography indicated the presence of rust, dirt, fibers and hose material. Based on these results, the distributor cleaned those tanks at the earliest opportunity. (It also should be noted that sampling at different levels in the tank will lead to different results. Therefore, it is important for a distributor to sample at the bottom of the tank to determine if cleaning is needed.) In the meantime, should your distributor(s) be required to clean their tanks? See the accompanying sidebar below.

### To Clean Or Not To Clean A Tank?

In discussions with various distributors, some indicated that they never clean their tanks. That's because when clean fluids are put in clean tanks—and kept clean through use of desiccant breathers and offline filtration—tank cleaning is not required. Unfortunately, this is not the case with most distributors.

...R.T and M.G.

### Implementation of the plan...

The following details are part of the Southwestern distributor's aggressive program to assure very clean and dry fluids for its customers:

- Bulk tanks will be examined and cleaned if necessary.
- Desiccant breathers will be installed on all bulk tanks.
- Particle counts and water measurement will be run on all incoming hydraulic and turbine oils.
- Filtration systems will be installed for turbine and hydraulic fluids. Both incoming and outgoing fluids from bulk tanks will undergo fine filtration. The target is to achieve a minimum cleanliness of 15/13/10, with a goal of achieving 13/10/08.
- All bulk trucks will have a cleaning procedure to meet the above standards.

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- All hoses and fittings will be kept clean.
- Drum and pail packaging operations will be redesigned to maintain the cleanliness standards.

### The packaging process

Many distributors do their own packaging both in 55-gallon drums and 5-gallon pails. Typically reconditioned, these units can be a source of contamination. Consequently, they need to be carefully examined before filling.

Most distributors put a mirror with a light at the bottom of a drum to look for rust and debris. The empty drums should also be stored properly without any openings to the environment. The drums evaluated as listed in Table II were relatively clean for general use—*but not for critical hydraulic applications.*

(It should be noted that the gear oil in the table was in a new drum from the lubricant supplier.)

**Table III. Cleanliness Of New Oils Packaged In 5-Gallon Pails**

LUBRICANT	4406 ISO CLEANLINESS CODE	WATER (Karl Fischer)
ISO 32 Turbine Oil Distr. A	16/14/11	31 ppm
ISO 32 Turbine Oil Distr. A	19/15/10	37 ppm
ISO 32 Turbine Oil Distr. A	18/15/10	28 ppm
AW 46 Hydraulic Oil Distr. A	16/14/10	56 ppm
AW 46 Hydraulic Oil Distr. B	20/17/12	230 ppm
AW 46 Hydraulic Oil Distr. C	17/13/10	97 ppm

Most small-volume lubricants in drums are packaged by the lubricant blender and delivered by the distributor. New drums usually can be identified by their bright glossy finish. The 5-gallon pails (in Table II) showed a large variance in cleanliness. This was probably caused by how the pails were stored and the way they were filled.

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The previous installment of this series (pgs. 16-21, Lubrication Management & Technology, July-August 2008) evaluated new oils in 5-gallon pails filled by different distributors. The results for the turbine and hydraulic oils are shown in Table III.

As shown in Table III, there is substantial variance among the three distributors. Distributor A had both the cleanest and driest fluids. Based on knowledge of their operation, it is not surprising.

### **Midwestern lubricant blender/distributor successes**

The road to supplying clean fluids began several years ago when one of this Midwestern distributor's major customers—a *large steel producer*—demanded 17/15/12 cleanliness for a high-volume ashless hydraulic oil. In response, the distributor installed an offline filtration system in its hydraulic fluid bulk tank. Over a two-year period, the operation has achieved this goal for its customer 100% of the time.

Data reviewed over a five-month period showed a low cleanliness rating of 14/13/10 to a high of 15/14/12. This was achieved with the help of both the offline filtration system and better lubricant-handling procedures.

Clean fluid can be contaminated quickly if it is not loaded properly in dirty trucks. Accordingly, a cleaning and loading procedure minimizing particle ingress was implemented to maintain the cleanliness goals during transport. The results were documented through the running particle counts during loading and offloading. In most cases cleanliness requirements are for turbine and hydraulic oils. In some cases, though, customers demand other types of clean fluids.

A large public utility required a 18/16/13 cleanliness code for an ISO 460 gear oil for a coal pulverizer. This was achieved by the distributor introducing a portable filtration system into the process. The incoming fluid was 22/20/14 and the goal was exceeded after six hours. Filtration was continued for one day and a 15/13/09 was achieved. This is remarkable for gear oil.

### **Conclusion**

The distributor is the key link in the cleanliness chain, yet many have no idea as to the cleanliness of the fluids they are receiving and delivering.

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Supplying clean oils does not have to be expensive—*but it can lead to significant benefits for the end user*. No wonder that the delivery of clean oil is becoming more of a factor as a marketing tool for distributors.

Clean fluids definitely are achievable—*as demonstrated by many of the more progressive distributors*. There are two ways in which a distributor can ensure the delivery of clean fluids:

When a distributor doesn't know the cleanliness of the fluids it is receiving from a lube blender (and loading on a tank truck and filling drums and pails with) cleanliness can be achieved by filtering the product at the end user site. Filtering dirty fluids, however, is expensive and time consuming.

Another method—*and a more efficient one*—is to implement a program to clean fluids on site and keep them clean up to the point of delivery. This approach, which also leads to the delivery of cleaner packaged lubricants, is being utilized by some of the market's more progressive distributors.

### Acknowledgments

The authors offer special thanks to the following individuals who supplied information for this article:

1. Mike Skuratovich, VP sales & marketing, Eastern Oil Company
2. Jim Ferrell, lubricant sales manager, Western Energetix
3. Mike Boyd, Fluid Solutions

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### Coming Up

The next article will involve analysis of the third link in the cleanliness chain: the end user. Very clean fluids can be delivered but they need to be maintained to achieve equipment reliability benefits. Several large manufacturing facilities will be examined and fluids will be evaluated on cleanliness and best practices recommended.