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Machinery Lubrication

Oil Flushing Tips to Address the Fish Bowl Effect

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Tags: oil flushing

I've learned that many people are skittish about flushing practices and even periodic oil changes. This fear seems to be driven, in some cases, by an unsavory past experience or alarming anecdotes passed on by others. The story usually begins with a seemingly healthy machine. As a preventive maintenance measure, the machine is scheduled for an oil change or flush. Immediately afterward, the machine fails. The quick conclusion reached is: Flushes and oil changes cause sudden-death mechanical failure.

Sound familiar? Is this a case of false perception or sobering reality? Perhaps this old aphorism applies: "If it ain't broke, don't fix it"? Does human intervention shorten or extend the service life of machinery? You may recall a column I wrote a while back about the hot stove effect. I recounted that Mark Twain observed that if a cat happens to jump on a hot stove, he will never jump on a hot stove again. This, of course, is a good thing. However, not so good is the fact that he will not jump on a cold stove, either, or perhaps anything that bears the slightest resemblance to a stove.

For the cat, all stoves are hot. As intelligent people, we should not fall prey to the same twisted logic. But, just as stoves are occasionally hot (and caution is advised), so too there is a modicum of reality that flushing and oil changes can induce failure. Let's take a look at some of the reasons why they might indeed be related to failure.

Stirring the Fish Bowl

Those of us who have had tropical fish know that the slightest agitation of an unchanged fish bowl causes the water to murk-up with sediment, uneaten food and excrement. In short order, most of these solids will resettle but not exactly in the same way as before - i.e., they move to new resting sites. The water will look clearer but will still suspend fine particle for a considerable time. Disturbing the sediment in oil lubrication systems can produce similar "fish bowl" effects.

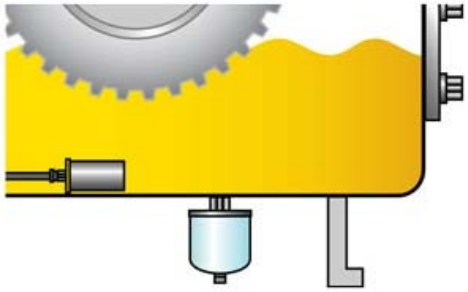

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Figure 1. Use a BS&W bowl to monitor and periodically time the purge.

Sumps and reservoirs serve as settling tanks to aid in the removal of sludge, dead additives, dirt, wear debris, water and other heavier-than-oil contaminants. These low-lying impurities are collectively referred to as bottom sediment and water (BS&W). In the same sense that we wouldn't want a loaded oil filter to burst, sending a dense debris field downstream, we also wouldn't want to agitate the BS&W in our sumps and reservoirs. Imagine this sequence of events relating to an oil change:

1. The drain port of a reservoir is removed and the aged oil flows out by gravity into a waste oil container.
2. Some of the BS&W is purged with the oil, but much of it stays clinging to the reservoir floor.
3. During the drain, oil flowed toward the tank by gravity through piping, valves, pumps and filter housings, carrying suspended particles that were previously trapped in nooks and crannies. Some of these backwashed particles resettle in various locations, presenting the risk that they will be re-entrained into the oil on machine restart.
4. When fresh new oil comes plunging into the reservoir, the BS&W is stirred up into a murky mass.
5. On machine restart, the suspended reservoir muck and the displaced particles in the lines and machine components become mobilized by the flowing fluid and travel throughout the system.
6. Some of these suspended particles induce accelerated wear in frictional load zones (bearings, gears, pumps, etc.), while others get trapped in narrow glands, oilways and orifices, causing restricted oil flow (starvation conditions).
7. The dense concentration of particles and impaired oil flow start a chain of events that ends in machine failure.

How to Prevent This from Happening

In the ideal world, we wouldn't allow BS&W to accumulate, and oil changes wouldn't be necessary. Nobody lives in the ideal world. While the real world can't eradicate BS&W, we can control its accumulation and later resuspension. Here are some suggestions:

- Use a BS&W bowl (see Figure 1) to monitor and periodically time the purge of BS&W "on condition". This will prevent hazardous accumulations and help track the source and rate of generation.
- After a needed oil drain, use a discharge wand from a filter cart to rinse out remaining BS&W from tank and sump bottoms before refilling with new fluid (see Figure 2). Confirm that the rinse was successful by inspection.
- After new oil has been added, circulate the fluid at the highest flow rate possible through a filter before the machine is started and put under load. Use a filter cart, if necessary. Allow total oil volume to turn over no less than five times. Do a simple patch test or particle count to confirm cleanliness, especially for critical equipment.

Suggestions for Skilled, Precision-based Flushing

Flushes offer numerous benefits with few side effects when done with skill and precision. Conversely, poorly planned and executed flushes can spell trouble for even the most reliable machines. Without question, a flush is an intrusive intervention of an operating machine and should never be performed unless a pressing need exists. Its purpose is to dislodge the machine's internal surfaces from varnish, sludge and other harmful deposits.

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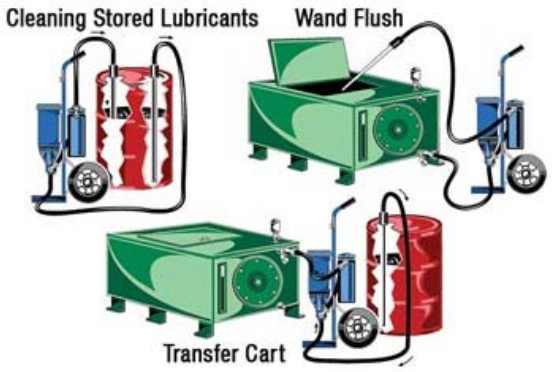

Figure 2. Proper utilization of a filter cart plays an important role in the process.

The risks of not performing a needed flush include oil starvation from line restrictions and motion impediment of critical machine parts. And, postponing a needed flush can make the matters substantially worse.

Therefore, before planning and performing a flush, know the pitfalls and countermeasures. Here are some suggestions related specifically to flushing and the fish bowl effect:

- As previously mentioned, monitor and periodically time the purge of BS&W "on condition". You don't have to flush what doesn't accumulate.
- Partition sensitive machine components from flushing fluids by using blocking valves and bypass lines.
- Flush at higher flow rates than normal operating flows to improve turbulence.
- Flush in both directions to dig dirt out from hidden crevices.
- Flush at elevated oil temperature (say 170 degrees Fahrenheit) to improve varnish scouring efficiency.
- Use an ample supply of chase fluid to displace the contaminant-laden flush fluids from all system zones.
- Special care should be taken to insure that low zones and quiescent zones have no accumulations and that flushing fluids have been fully displaced.
- Use oil analysis to confirm that the oil is sufficiently clean and suitable for machine operation.

Remember the law of unintended consequences. At minimum, do your homework and be proactive. And, when it comes to flushes of larger oil circulating systems, give serious consideration to hiring a professional contract flushing service.

Remember, BS&W and the fish bowl effect is a serious lurking danger. Don't let your guard down.

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Jim Fitch, a founder and president of Noria Corporation, has a wealth of experience in lubrication, oil analysis, and machinery failure investigations. He has advised hundreds of companies on ... Read More

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