EFFECTS OF AERATION ON INDUSTRIAL LUBRICATION EQUIPMENT

Focus on Constant Level Oilers

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Almost all lubricating oil systems contain some air. Air is found in four phases: free air, dissolved air, entrained air and foam. Free air is normally found trapped in a system, such as an air pocket in a dead leg of a piping system, and may have minimal contact with the fluid. It can be a contributing factor to other air problems when lines are not bled properly during equipment start-up and free air is drawn into circulating oils. Free air can become entrained or dissolved through direct contact with oil being agitated.

Dissolved air is not easily drawn out of solution. It can be a problem when temperatures rise quickly or pressures drop. Petroleum oils can contain as much as 12 percent dissolved air. When a system starts up or when it overheats, this air changes from a dissolved phase into small bubbles. If the bubbles are less than 1 mm in diameter, they remain suspended in the liquid phase of the oil, particularly in high viscosity oils, causing air entrainment, which is characterized as a small amount of air in the form of extremely small bubbles dispersed throughout the bulk of the oil.

Air can also be temporarily entrained into oil through bearing agitation. This can occur in healthy oil, but is more common in oil containing high amounts of moisture, as well as oil having other forms of contaminants. Air entrained in oil sumps of rotating equipment tends to rise out and re-enter the headspace over time. This can be fast in healthy and low viscosity oil, or take much longer in contaminated and high viscosity oil. Air entrainment is treated differently than foam, and is most often a completely separate problem. Some of the potential effects of air entrainment include:

- pump cavitation,
- spongy, erratic operation of hydraulics,
- loss of precision control; vibrations,
- equipment shut down when low oil pressure switches trip,
- micro-dieseling due to the ignition of the bubble sheath at the high temperatures generated by compressed air bubbles,
- safety problems in turbines if over speed devices do not react quickly enough and
- loss of head in centrifugal pumps.

Focusing on Lubrication oil used in industrial rotating equipment we see the following effects:

- oil oxidation,
- component wear due to reduced lubricant viscosity,
- **Constant Level Oiler mis-feeding**

It is this last effect this article will focus on.

Constant level oilers have been used on industrial rotating equipment for more than 50 years. Trico Mfg. Corp. introduced the Opto-matic oiler in the 1930s. As our understanding of rotating equipment grew, the need for different types of constant level oilers has grown as well. There are essentially three different styles of constant level oilers used today:

Traditional vented oilers

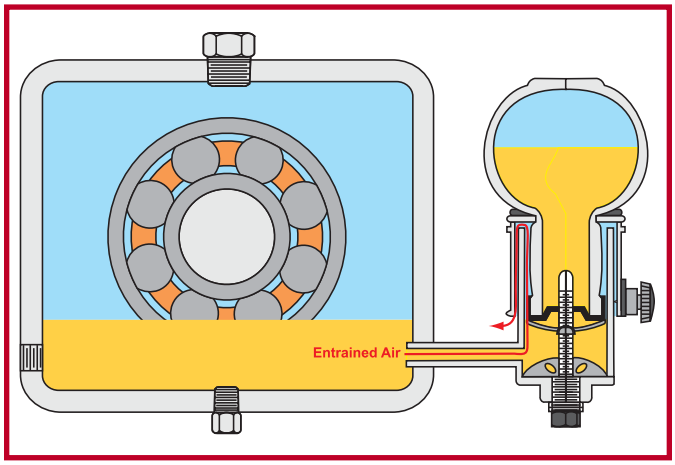
Non-vented (Watchdog) oiler

Closed system

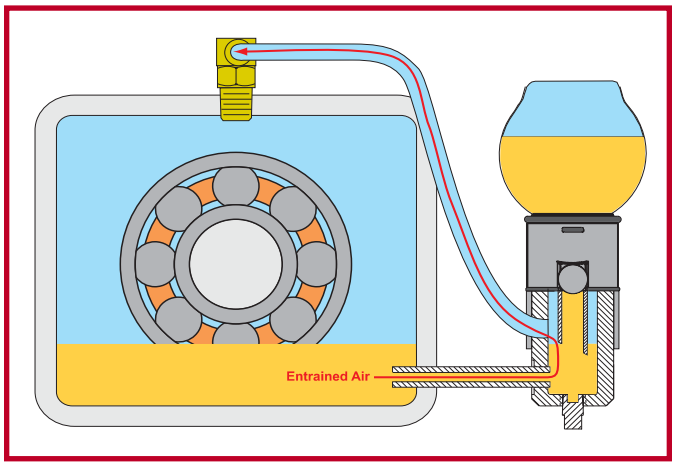
How does entrained air affect oilers? In most cases, aeration occurs in the area nearest the bearings, and rises to the top of the oil sump where it escapes back into the headspace. However some pump designs can push the entrained air toward the constant level oiler. The rate at which entrained air can escape from oil depends on the oil's ability to release entrained air, and the health or condition of the oil. If you know you

have a problem with entrained air, your oil supplier may be able to recommend additives which can deter entrainment.

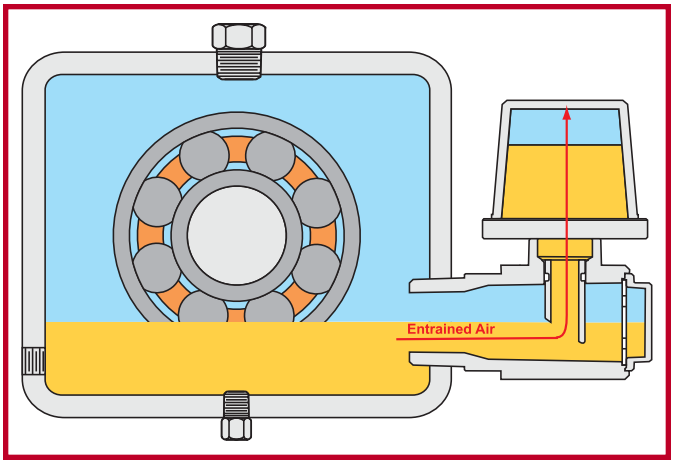
Once entrained air migrates to a constant level oiler, the effect depends on the design of the constant level oiler. In the case of the traditional vented oiler, the aeration will rise to the top of oil and escape into the air, and be vented back out into it's surroundings.



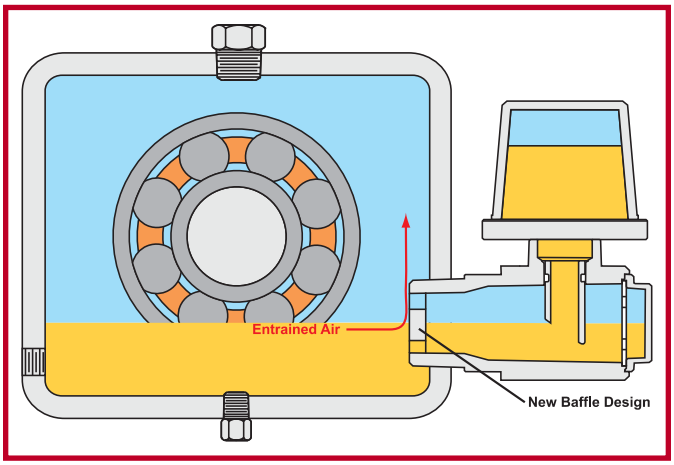
A closed-system oiler will have a similar effect as the vented oiler; the aeration, upon reaching the top of the constant level oiler will return to the air volume shared by the constant level oiler and oil sump's headspace.



A non-vented, (Watchdog) constant level oiler can be affected more by entrained air. As the entrained air enters the constant level oiler it rises to the top of the oil reservoir, similar to our previous two examples, but has no place to go. The air, instead of escaping, or returning to the headspace could displace the oil, causing overfeeding of the oil, and increase the oil level in the oil sump. This process normally would occur on the order of 1 oz/ 28cc per 100 hours of operation. This rate is only an approximation, and each circumstance will be different.



While this condition is very rare, (reported on less than 0.1% installations) and can normally be prevent by good oil management practices, Trico Mfg. Corp. is making a change to it's line of non-vented (Watchdog) constant level oilers. A baffle is being added to the end of the oiler. This baffle will block the migration of entrained air from entering the body of the constant level oiler without interfering with normal operation of the oiler. This baffle exists at the top of the oil level where most aeration is found. Aeration is **NOT** caused by constant level oilers.



Severe aeration condition may still result in some air entering the oiler. If these severe aeration conditions exist, it is important that they be recognized and addressed to ensure proper life of your rotating equipment. Trico Mfg. Corp. will replace existing bodies with a new body only if a misfeeding problem is determined to be caused by aeration.

How do I know if an oiler misfeed is caused by aeration?

1) Is the constant level oiler misfeeding when the rotating equipment is not operating?

Entrained air will only enter a constant level oiler when rotating equipment is in operation. If a full oil reservoir is placed on the oiler body and the oiler is

misfeeding while the equipment is not operating, this is NOT an aeration issue. You may have a damaged oil reservoir.

2) Does the oil sump hold proper level without a constant level oiler?

If your oil sump does not hold proper level of oil with a bullseye sight glass or the port plugged, the oiler overfeed is not caused by aeration. It is likely your oil sump is leaking.

3) If you remove the oil reservoir, and fill it with oil, then place in a small bowl with oil, so the reservoir spout is just beneath the level of oil, and the reservoir empties, you do NOT have an aeration issue. (It's likely the reservoir has a crack)

4) If none of the above conditions are true, and you see a slow and constant feeding of your oil, that results in your oil level rising above where it should be, place a light next to your oil reservoir and look for a very small column of air in the center. THIS IS AN AERATION PROBLEM.

Now that you have discovered you have an aeration problem, what should do you?

Take an oil sample, and consult with your supplier,

- If the oil is healthy your supplier may suggest an additive to prevent aeration.
- If the oil is not in good condition, it's time to find out why.
- If your oil is in good condition, and you simply have a minor aeration issue, Trico Mfg. Corp. will replace the original body with a new design which incorporates the baffle. Trico Mfg. Corp. always recommends that you try to eliminate your aeration issue, or at least identify the source.