

OIL MIST LUBRICATION

Oil mist lubrication is known and respected worldwide as an essential and major component of any process to improve machine reliability.

Oil mist is a centralized lubrication system that continuously and efficiently atomizes oil into small particles and then conveys and delivers the correct amount of the pressurized oil mist lubricant to bearings and metal surfaces.

Oil mist is generated by the introduction of liquid oil and air into the sonic velocities of a vortex throat. There, the oil experiences the mechanical phenomena of shear forces and unstable vibrations of the high angular velocities of the air. Working together, these combined actions ultimately form oil particles or droplets one to three microns with air.

This oil suspension in dry, instrument air, is a mixture of one part oil and 200,000 parts of air. It is a lean, fairly stable mixture and can be conveyed horizontally up to 600 feet in 2-inch galvanized screwed piping under a pressure of 20 inches of water column.

One of the primary failure mechanisms of rolling element bearings is fatigue. Much of the fatigue is caused by dirt and wear particles that approximate the thickness of the oil wedge, hence the clearance of the bearing elements. Obviously, particles thicker than this will not enter into the clearances to cause fatigue. On the other hand, particles smaller than the oil wedge are not likely to cause fatigue.

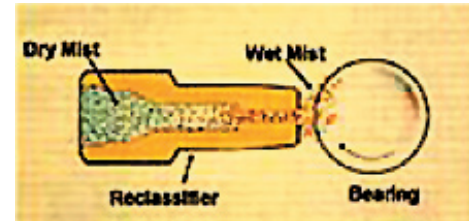
Because of the size of the oil mist droplets, one to three microns, the dirt or wear particles that can cause fatigue will not remain in suspension with the oil mist and will therefore drop out in the oil mist generator.

There is another important factor as to why oil mist works as well as it does. In some cases, pure oil mist deposits a wear resistant, carbonaceous, dry film on the wear surfaces of rolling element bearings. They did not find this layer to be on bearings in conventional splash lubrication service.

Oil mist can be applied in two formats: pure mist (dry sump oil mist) or purge mist (wet sump oil mist). With purge mist applications, the oil mist is applied to the vapor space above the liquid oil in primary gear boxes, oil reservoirs and journal (plain) bearings. This is done to exclude water and other contaminants. With pure mist applications, the mist replaces the liquid oil in rolling element bearing housings. There is no other lubricant going to the bearings.

Often, users mistakenly believe that purge mist is better because it combines the benefits of both forms. In fact, pure mist has substantial benefits over purge mist.

There are numerous direct benefits of oil mist. Oil mist reduces lubricant consumption by as much as 40 percent for once through systems. If a closed loop system is used, the oil consump-



Oil mist principle (photo courtesy Lubrication Systems Co.)

tion is reduced considerably more. Conservation happens because the oil is precisely metered to each bearing, the right amount at the right time. The reduction in oil consumption becomes critical when switching from mineral oil to synthetic oil.

Oil mist also requires 47 percent fewer man-hours to operate than conventional systems. And because there is no liquid oil level and liquid friction, operating temperatures are about 20°F cooler. Another related benefit is up to a three percent reduction in energy consumption. In virtually all hot oil pumps equipped with bearing cooling jackets, the cooling water can be deleted. Cooling water can actually decrease bearing life. Cooling water shrinks the outer race while the heat conducted down the shaft expands the inner race, making the bearing run hotter because of reduced clearances.

Adapted from a presentation by Douglas C. Branham, Lubrication Systems Company at the 14th International Colloquium Tribology, January 13-15, 2004, Stuttgart, Germany.