Additives that Improve Lubrication Oils

By Thomas Yoon

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Mechanical machines need lubrication. No machines can run for long without lubrication of its moving parts. At best, the moving parts may wear out faster. At worst, entire machines can seize up and develop cracks. In severe conditions, the heat built up can even cause explosions and loss of lives.

So lubrication is no small matter in machine operation.

Lubrication oil can last for a very long time in normal machine operation. By determining the properties of lubrication oil, many machine operators will be able to know whether the oil can still be used.

Some of the important properties to watch for when buying or replacing lubrication oil is as follows:

Viscosity
Viscosity Index
Pour Point
Oxidation Resistance
Flash Point, Fire Point
Alkalinity
Additives

Some of the additives that are put into the lubrication oil include the following:

Anti Oxidant − Amines, Phenols
Corrosion Inhibitor

Detergent and Dispersant − Ca, Ba, Compounds, Soaps
Alkalinity − Ca, Ba Hydroxides
Anti Bacterial − Biocides
Oiliness or Wetting Agents − fatty oils, chlorinated wax
Extreme Pressure Agents − organic compounds of Cl, S, P (for hydraulic, gear oil)
Pour Point Depressant − Organic polymers (alkyl naphthalene) (for steering gear, refrigerator)
Anti foam − Silicones
Viscosity Index Improvers − organic polymers
Emulsifying Agent − Polar Compounds (emulsifying but do not lose lubricating property)

With large machines that use large amounts of lubrication oil the engineer has to determine when to change the oil. This is because the change can be a very expensive affair.

The correct thing to do is to determine whether the oil can still be used without changing. The engineer must know exactly when to change the oil. He will take measurements of various parameters to help him decide.

That could be a subject for another coming facworld ezine article.

The contents of this page are part of a page from my e−book "General Engineering Knowledge Notes" that will help candidates prepare for the Marine Certificate of Competency Examinations. This e−book is available for FREE downloading at

Many years of working experience in Marine, Facilities, Construction has given the author material for writing e−books and articles related to engineering, and management.

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Oil or Grease Lubrication?

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A lubricating grease is usually a mixture of 85 to 90 percent mineral oil or synthetic oil together with a thickener. In a majority of all greases, the thickener is a metallic soap. One example is lithium stearate for lithium soap.

The function of the thickener, the metallic soap, is to hold the lubricating oil in a semi−liquid state for easier handling.

When there is rise in temperature, the oil bleeds out from the thickener and functions as a lubricating agent. When the temperature drops again, the thickener soaks up the oil again to become semi−solid once more.

The type of grease chosen for a particular bearing lubrication application must therefore be chosen very carefully. High temperature grease used in low temperature applications may cause the bearings to seize due to lack of lubrication because the oil does not bleed out. The common types of grease in use for rolling contact bearings are the calcium, sodium and lithium greases.

Calcium Soap Greases

These do not dissolve in water. They are recommended for installations exposed to water at temperatures below 60 degree C. They offer good protection against salt water in marine environments.

Sodium Soap Greases

Also called soda greases, they may be utilized over a wide range of temperatures up to 120 degree C. However, if too much water penetrates into the bearings, there is a risk that the grease will be washed out and the lubricating properties become deteriorated.

Lithium Soap Greases

These have excellent resistance to high temperatures. They can also be used over a wider range of temperatures from −50 to 150 degree C. They are not water soluble.

Additives are also added to some greases to improve their

properties. Some examples of these additives are anti−rust, anti−oxidants, extreme pressure additives, and stabilizers.

Although it is very convenient to use grease for lubrication of rolling contact bearings, where some bearings come pre−packed with grease ready for use, grease lubrication becomes unsuitable if the operating temperature becomes high.

The high temperature may be because of high ambient temperature environment, or because the heat evolved in the bearing due to friction from high speed or heavy loading. Sometimes the use of oil becomes more logical if the lubricating intervals for grease lubrication becomes too short, perhaps due to leakage from seals.

In oil lubrication, the heat generated from the bearings are able to be transfered to a larger volume of oil which in turn can be pumped through heat exchangers for cooling. In this way, the oil functions both as a lubricating agent as well as a cooling agent.

Oils can also have additives to improve their properties. Some examples are anti−oxidants, corrosion protection additives, anti−foaming additives, surface tension additives, wetting agents, and extreme pressure additives. These additives are put in according to the application of the oil.

Compared to greases, oils can enable bearings to be operated at a wider range of temperatures. However, there are limits to this, especially at higher temperatures. At high temperatures of 90 degree C and above, mineral oils oxidize rapidly and they lose their properties to lubricate. Synthetic oils are increasingly being used for higher temperature applications.

Which to use? Oil or grease? The choice is yours!

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