



PRODUCT BULLETIN

Introducing Oil Analysis Program

Australia

2009



FluidMasters Oil Analysis Program

The Importance of Oil Analysis

In order to provide adequate lubrication, engine oil is required to perform many functions. Ideally the most important function is to keep the engine or drive train environment clean and free from contaminants. It must provide adequate cooling and film strength to keep component parts, such as bearing surfaces, apart and forms a "Buffer" that keeps metal to metal contact to a minimum, thereby reducing friction and wear.

These however are the very basic functions required from a lubricant. It is the particular demands of a given application that largely determines the numerous additional functions that oil must perform. It must act not only as a coolant and protector, but as a sealant and lubricant as well. The selection of the correct lubricating oil for your engines, be they diesel or petrol, should be based on engine performance requirements, the application, and very importantly the quality of the oil and fuel in use.

Diesel engines operate at lower speeds but at much higher temperatures than do petrol engines, making conditions exceptionally conducive to oil oxidation and corrosion of bearing metals. Under these conditions the oil is expected to function in an expanded capacity and thus makes severe demands on the additive packages contained within it. You would expect that most operators of automotive equipment would know the condition of their oil in their engines and therefore the condition of their engine at any given stage of its life, but the statistics say that 87% don't.

To enable the operator to be aware of not only the condition of these additives, but the condition of the entire engine-drive train etc, oil analysis is not only essential, **but mandatory** because of its ability to **forewarn against impending damage**.

Plant maintenance being so important in today's ever increasing cost environment has prompted the need for oil analysis. Several companies have taken the initiative in this field and offer oil analysis so precise that it over shadows even a blood test on the human body in comparison. These devoted laboratories are the link that could mean the difference between business growth and doom for many machinery operators in today's tough climate.

Preventative maintenance through oil analysis is the catch cry of all machinery owners and operators who understand the necessity to protect valuable machinery from the ravages of fuel dilution, water invasion, dirt ingress, fuel sulphur and wear metal contamination. Oil analysis is the ultimate in protecting your valuable plant and if you are not using a controlled oil analysis program on your machinery then you are well behind the eight ball in terms of maximising your investment.

Taking an oil sample is a simple operation, and must be carried out with the help of a "withdrawal gun". The test bottle is screwed into the end of the test gun and the oil is removed from the engine at operating temperature by a tube that is inserted down the dipstick hole. The oil is then drawn into the bottle by pumping the gun. When the correct amount is gathered, the bottle is removed from the gun and sealed tightly so it does not to

leak. Because these samples are posted to the Laboratory, to have the sample bottle leak into the post bag would cause extreme embarrassment for the sender. After the sample is acquired, the operator fills in the question sheet and seals the bottle in the mailing tube supplied. The mailer is then sealed with a sticker supplied with the name and address of the laboratory on it, and is mailed. Generally, the sample container is post paid.

The results are generally sent back within five days or sooner, depending on the location relevant to the laboratory the sample is sent to. Sampling should be carried out at every oil change. Oil analysis is a real money saver, and the best insurance available for your valuable machinery. Look at it this way:-

You may not have many fires, but I bet your home and buildings are insured.

The resulting levels from the oil testing are correlated to the hours since the last oil change as well as any additional oil consumption. This is generally compared to the make and model of the machine from which the sample was taken. In this way an established wear pattern is determined. Degrees of wear are indicated by "Normal" "Above Normal" and "Severe" on the report sheet. A list is normally shown of the components that generally yield these metals, as a guide to where excessive wear may be occurring.

The laboratory will retain samples for one month after analysis and will then dispose of them in an environmentally responsible way unless instructed in writing differently.

FluidMasters will report back to you on the analytical results with our interpretation of the trend analyses by telephone, fax or email once the customer is in receipt of his copy from the oil analysis company. In Western Australia FluidMasters use third party companies to carry out the client's oil analysis. **They are totally independent companies.** The report from FluidMasters will flag any results that should be brought to the customer's attention and will include suggested remedial actions. This report will allow for adjustments to the machinery concerned to suit individual customer requirements.

All transmission, diffs, final drives, engines, and indeed any situation which uses lubricating oil in a sump or container should be tested.

The use of an Engine Flush is imperative if an oil analysis program is to be undertaken and paves the way by decontaminating the sump area and cleaning away all metals, sulphurous pastes, sludge, lacquers and varnishes that cause engine failure. The hours that the lubricant does is recorded so that if the operator wishes to maximise the of their oil an analysis can be taken every 250 hours up until the analysis reports that the oil is reaching its useful life, which could be between 800 hours and 3000 hours depending on the lubricant used.

Any adverse findings such as metals and or contaminants found during this monitored period will have appeared since the flushing operation, and this provides the analytical chemist with invaluable information as to the condition of not only the unit, but the lubricant in use.

When oil analysis is used for the first time on a unit, the unit is then "Flushed" and the hours that the lubricant does is recorded so that if the operator wishes to utilise the maximum use of his oil, an analysis can be taken every 250 hours up until the oil has had its useful life, this could be between 800 hours and 3000 hours depending on the lubricant used.

Low density polyethylene (LOPE) is not suitable for sample bottles. Only use the sample bottles supplied.

All oil sampling programmes in Australia use sample bottles with a 38mm screw neck. This allows the use of the Viper and Patmar sample vacuum pump.

Factors Affecting Oil Analysis

Before describing oil analysis and its benefits, it is necessary to understand some basic facts;

There are many contaminants that deplete the “protective” elements of lube oil, and if these are not “removed” by draining the oil, then we must use additional measures to prevent this contamination from taking place.

All that must be done is to fit by-pass filters to your engines and transmissions that will remove debris from the oil down to one micron in size and undertake a scheduled oil analysis (SOS) on your machinery. It is that simple. And as well you will save yourself literally thousands of your hard earned dollars each year in maintenance, downtime as well as lost or “thrown away” profits.

Here are the most common elements that cause damage to your machinery.

1. Soot

Soot is a result of incomplete combustion and is always present. It passes from the combustion chambers into the lubricating system by “squeezing” between the cylinder wall and the compression rings. As soot levels increase, the oil thickens, and lubricating qualities decrease to almost zero resulting in oil related failure of bearings etc.

Soot and its effects are influenced by,

- 1) Rack setting and Fuel nozzle operation
- 2) Turbocharger and air cleaner operation
- 3) Crankcase blow-by
- 4) Engine operation, i.e. rapid acceleration and engine “lugging”.
- 5) The ability of oil ADDITIVES (dispersants) to keep these soot particles in suspension.

Remedy.

The fitting of a bypass oil lube filter that will remove debris down to one (1) Micron in size.

2. Oxidation

Oxidation is a chemical reaction between oil and oxygen. Just as rust is a chemical reaction between iron and oxygen. This causes the oil to thicken and become sticky which causes accelerated wear. This results in ring sticking and piston deposits.

It is interesting to note that oil companies insist that lubricating oils (No matter where the application) be changed **every three months**, whether the unit has been **used or not**.

This makes for expensive oil changes especially in the farming sector as most machinery lies idle for many months without use. A vehicle that is sitting in the shed, like a main tractor,

used only at seeding time sits for over 10 months idle. The oil oxidises over that period, even if it was changed before it was stored, and **must** be changed before further operation.

This is a very expensive operation in terms of oil changes but not as expensive as the engine wear the unit is subjected to by running on oxidised lube oil!

Oxidation and its effects are influenced by~

- 1) High temperature.
- 2) Exposure to air
- 3) Catalysts, such as Ethelene Glycol and Copper.
- 4) Length of time that the lubricant has been in use, or in the component in storage
- 5) The ability of additives (detergents) to cope with these problems by completing the chemical reaction.

Remedy

Use of the correct lube oil for the machine combined with ultra filtration of harmful oxidation causing materials and the use of an ultra high use oil or oil additive. As well, flushing the component is **absolutely essential**.

3. Sulphur Products

Sulphur is the by product of combustion and is in **all** diesel fuel. Sulphur in the fuel reacts during combustion to form gases. Some of these gases are not always expelled through the exhaust, but when combined with water sucked in to the combustion chamber within the air they form sulphurous acids.

The oil then becomes acidic, and corrosion of metal parts within the confines of the engine takes place.

Sulphur products and their effects are influenced by

- 1) Sulphur content of the fuel
- 2) Crank case blow—by
- 3) Water present in the Crank—case
- 4) Operating conditions,
- 5) The ability of oil additives (Buffers and TBN (alkaline) to neutralize the acids.

4. Ethelene Glycol

Water is a major factor and can condense or leak into the system. It neutralizes additives, and forms emulsions. These emulsions cause sledges which cause engine failure and also cause rusting of component parts. Up to 5% water can normally be tolerated in an engine at operating temperature.

However, it is not so much the water but what the water contains. Antifreeze will cause catastrophic problems in engines if its active ingredient is Ethelene Glycol. This chemical is used for “cheap” coolant treatment and its invasion into the lubricating system will cause complete and rapid oxidation of the oil.

There is no set limit for the amount of ethylene glycol an engine can tolerate, and in practice any oil contamination by ethylene glycol is considered disastrous to the engine.

Facts About Oil Analysis

Infra red oil analysis and spectroscopic oil analysis is a method for monitoring and evaluating oil and unit condition. This process is primarily used to help equipment owners determine the maximum safe oil change period for engine sump, differential, transmissions and final drive components compartments.

Oil change “recommended” periods have traditionally been conservative by all leading engine manufacturers to ensure adequate protection for a wide variety of operating conditions

Recent international political and economic disruptions however have seriously affected the availability price and quality of petroleum products. Rapidly increasing prices are now a way of life and the ever increasing costs of lubricating oils and associated products places intolerable demands on the agricultural, mining, transport and the marine industries as a whole.

These sectors are feeling this demand and as a consequence products that are produced today to keep pace with an ever increasing demand from an oil driven world sees the quality of oil products slip away to where today we are unable to be sure we are getting the correct balance of additives in these products. This is why we **MUST** maintain a constant oil analysis program on our machinery to maintain the quality our machinery needs in order to operate.

High sulphur fuels are becoming more and more common despite what the fuel companies tell us. Corrosion from fuels containing 1.5% sulphur can be four times higher than fuel with only 0.5% sulphur.

This means that lubricating oils have demands placed upon them to neutralize these sulphur by product acids because of the inability of 90% of oils on the market to carry out this task during normal manufacturers hour age and or miles/kilometres. All engines both petrol and diesel are subjected to massive sulphur attack causing irreparable damage to components within this area. Owners can expect this factor to be present even within a two third time factor of manufacturers prescribed change period.

Remedy

This problem can be overcome with the simple introduction of an oil analysis program to the equipment and is an infallible process to determine not only the condition of the lubricant in use but also gives the owner an in depth indication as to the general condition of the components within the unit.

Additives

New oils contain many additives. Each of which perform a specific function. As the oil is used, these additives are depleted. The loss of additives, under these conditions is seldom a reason for oil change. But as they are consumed, the conditions and problems previously discussed occur. Following are the most important additives and their roles.

Detergents

These react chemically with oxidation products and complete the chemical reaction, preventing the formation of insoluble compounds which would normally be deposited on engine parts.

Dispersants

These react to keep contaminants (particularly soot) in suspension instead of dropping out to form sludge.

Oxidation Inhibitors

These combine with oil to exclude oxygen, others contain metal compounds which are oxidized in preference to the oil in use.

TBN Buffers (Alkalines)

These make oil slightly alkaline which neutralizes acids. Anti wear additives function by forming a film of extremely low shear strength on metal surfaces.

Anti Foam Additives

These promote the breakdown of small bubbles into large bubbles which separate more rapidly.

Viscosity Index Improvers

These are long chain polymers which uncoil at high temperatures to prevent the oil from becoming too thin.

The above items are but a few of the many additives in oil. Please consult the book "GOOD Oil" to read about the rest.

Conclusion

It has been the intention in this document to highlight to the owner/operator the importance of Oil Analysis as a means of detecting problems such as the invasion of harmful acids and soot, dust and fuel dilution and the use of sub grade lubricants. It is also intended to promote the range of products that will solve the problems detailed for the owner/operators of expensive equipment through the use of our machinery fluid maintenance products.

These issues will become a thing of the past and the owner/operator can be assured of trouble free operation by using advanced lubricants, fuel conditioners, motor flushes, superior filtration and cooling system inhibitors in their machinery in conjunction with a carefully controlled Oil Analysis program,

FluidMasters promote advanced lubricants and associated products to the farming, mining, transport and marine industries of Australia to advance and maximise equipment performance and life as well as providing significant savings to the owner/operator and helping the environment.

Please Note:

We believe that the information contained herein is reliable, but we shall not be liable for any inaccuracy in the information or for any loss, injury or damage whatsoever or howsoever arising which may result from the information provided here.