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OIL – AN ASSET, NOT A CONSUMABLE

By John Evans B.Sc.

John Evans is diagnostic manager for WearCheck

Introduction

The days of 'oil is oil' have long gone. It is vitally important that in this day and age, oil needs to be considered as an asset rather than just a consumable, and as an asset, it needs to be managed. This brief paper will take a look at how oils are selected and then managed throughout the plant as a valuable asset like any other piece of industrial equipment.

The importance of best practice will be considered in terms of handling, storage, dispensing and disposal which, if done correctly, can have a major impact on an organisation's bottom line.

Lubricant surveys

Before embarking on any form of maintenance and management programme for oils, a lubricant survey needs to be carried out. All major oil companies should be able to carry one of these out, free of charge, as the survey generally locks the user into using that supplier's products. Although the actual details of such a survey are quite complex, they can be greatly simplified by looking at each step in terms of inputs and outputs.

STEP 1

Step one would be to do a plant survey to create a list of components that require oil and lubrication. A complete list of all relevant equipment needs to be obtained where the plant is logically and consistently identified.

Inputs:

- Process flow diagrams
- Piping and instrumentation diagrams
- Plant maintenance files
- CMMS (Computerised Maintenance Management System) input
- Physical survey of the relevant equipment

Outputs:
- Plant or asset number
- Process description

STEP 2

Step two will be to conduct the actual survey which will involve a detailed study of all equipment with regard to oil requirements and current practices.

Inputs:
- Process flow diagrams
- OEM manuals
- Plant maintenance files
- Physical survey of the equipment

Outputs:
- List of manufacturers and models
- Equipment location
- Bearing type (for fixed plant)
- Oil type (oil/grease)
- Method of oil introduction/circulation (splash, drip, pump, etc.)
- Normal temperature operating range
- Horsepower
- RPM
- Sump capacity
- Any other special considerations
- A copy of the OEM 'Lube-and-Maintenance' guide

STEP 3

Step three involves the selection of products that will be used. The information gathered thus will be reviewed between the customer and the oil supplier. Suitable oils will be recommended along with acceptable alternatives and lubrication frequencies.

Inputs:
- Master lubrication schedule (thus far prepared)
- OEM manuals

Outputs:
- Lubricant name
- Acceptable alternative
- Lubricant specification sheets
- Lubricant MSDSs
- Usage frequency

STEP 4

In step four, the oils and lubricants selected in step three can now be consolidated into a master lubrication schedule. The benefit of doing this is that it reduces the number of products that need to be purchased and the number of products that need to be stored. It also reduces the chance of the wrong product being used, and reduces the number of items that need to be tracked with MSDSs and the amount of ISO 14001 documentation. The benefits are:

- Reduced number of lubricants that need to be purchased
- Reduced number of lubricants that need to be stored
- Reduced chance of the wrong lubricant being used
- Reduced amount of paperwork

Inputs:
- Updated master lubrication schedule

Outputs:
- Schedule with fewer items

STEP 5

Step five involves the creation of the lubrication manual. This requires a lot of information from many different sources and it is a good idea, at this point, to consolidate all the information into a reference manual that all relevant personnel can use.

Inputs:
- Master lubrication schedule
- Copies of 'Lube-and-Maintenance' guides
- Product data sheets
- MSDSs

Outputs:
- Consolidated lubrication manual

STEP 6

Step six requires the purchase of all the relevant equipment for storage and dispensing of oils along with general hygiene, handling and disposal (and do not forget the taking of oil samples).

Inputs:
- Consolidated lubrication manual

Outputs:
- Bulk storage facilities
- Supply lines
- Drum handling equipment
- Drum storage facilities
- Hygiene considerations
- Top up containers
- Equipment for complete oil changes
- Used oil disposal considerations
- ...and of course, oil sampling equipment

STEP 7

Finally, the last step, step seven, involves the setting of maintenance tasks and frequencies which must be entered into the CMMS along with all the other information gathered thus far.

Inputs:
- The consolidated lubrication manual
- Lubrication programme and planned maintenance task list
- OEM manuals
- Lubricant supplier's recommendations

Outputs:
- A completed master lubrication manual that will now cover all requirements.

The success of a maintenance programme can ultimately determine whether the bottom line is written in black or red ink and the production of a lubrication manual is the first and vital step. The manual must be a living document that is available to all relevant staff and needs to be continually reviewed and improved upon.

Now let us look at the handling, storage, dispensing and disposal of lubricants in a little more detail.

Oil storage

Before oils are stored they have to be supplied and received. It is important that the person who receives these products checks that the product ordered is the product supplied. It is also important to check that the product inside is just what it says on the tin; this can be confirmed with an oil sample sent to an oil analysis laboratory. Some plants have rudimentary oil laboratories on site that can check things such as viscosity which is a good indicator of the product in the drum. If service contracts exist between the user and the supplier, such as for desired cleanliness levels, then more rigorous testing may be required.

Perhaps one of the most important tenets for oils and lubricants is 'Keep it dry, keep it clean'. Dirt and moisture are the two most detrimental contaminants of oils and lubricants. Approximately 75% of all premature hydraulic system failures are due to particulate contamination of the lubricant. In the case of insulation oils, as little as 20 ppm (0.002%) moisture can make the oil unsuitable for

use. Because of this, some customers enter into service performance contracts where maximum acceptable moisture and contamination levels on incoming product are stipulated and, of course, need to be tested.

Avoid outside storage

Outside storage of lubricants should be avoided as weathering can lead to the obliteration of labels, temperature variation can lead to expansion and contraction, while extremes of temperature can be directly damaging to the oil. Outside storage also leads to an increased potential for contamination with dirt and water as drums and bulk storage tanks 'breathe' with changes in temperature.

If drums do have to be stored outside, make sure that they are well sealed and that they are laid on their sides with the bungs in the three and nine o'clock positions to reduce the potential of contamination with dirt and water. If the drums have to be stored upright then tilt the drums slightly using a chock of wood, parallel to the three and nine o'clock positions; this will also reduce the contamination risk.

Ideally, the drums should be stored upside down but this is rarely practical. Also try to protect the drums from the elements by storing them under cover or by using a tarpaulin. Ensure that the area around the bungs is clean and dry when dispensing oil. If the oils are stored in very cold climates and the oil needs to be heated before use, make sure the oils are heated gradually.

Inside storage of lubricants is a much better plan but care still needs to be taken. Ensure that the oils are stored at close to ambient temperature and that this temperature does not vary too much. Ensure that the oil store is away from sources of contamination and the store itself is kept dry and clean, ideally with a formalised policy. Special attention needs to be paid to dispensing equipment which should be kept clean at all times. Drums should be clearly marked, galvanised containers should not be used and stock should be rotated – first in, first out (FIFO).

Bulk storage

Bulk storage needs to be a consideration as it makes better use of floor space; bulk containers generally have half the footprint of drums and pails. There is greater flexibility of distribution with strategic location of stores and the use of supply lines. Residual waste is also reduced as clingage can be as much as 5%. Bulk tanks can be fitted with dessicant breathers and are easier to maintain and keep clean. There is nearly constant availability of product, simplification of inventory control and bulk purchasing is cheaper.

Handling of oils

Remember, a 220 litre drum weighs nearly ¼ of a ton – improper handling could lead to damage to product, plant, property or personnel. The loss of product is a direct cost; the cost of cleaning up a spill could be astronomical.

Pushing a drum off the back of a truck does not constitute good handling practice. Ideally a forklift should be used with jaws that grip the drums under their hoops. If a forklift is not available then use a truck with a hydraulic loading platform or a hand winch or hoist. Failing any of these then skids must be used.

Lubricants are relatively safe materials and are only mild irritants to the intact skin, provided that contact is not over a prolonged period of time. Frequent and prolonged contact, however,

should be avoided as this could result in irritation to the skin. The observance of good working practices and high standards of personal hygiene can virtually eliminate any risks associated with the handling of lubricants.

Safety should be paramount. Avoid unnecessary contact and use protective equipment when required, promptly remove oil from unprotected skin but do not use solvents to clean the skin; use non-aqueous cleansers or mild hand soaps.

Do not store dirty or oily rags. Remove contaminated clothing as quickly as possible, use gloves, but if this is not possible use protective hand creams and moisturisers, wash hands after contact and before eating or drinking and seek medical attention in the case of cuts and scratches.

Avoid inhaling mists and vapours, keep work areas clean, clean up spillages immediately and avoid contamination of waterways at all costs. Consult medical staff and first aiders on all potential health hazards and ensure all relevant MSDSs are close at hand.

Dispensing of oils

Following on from the good hygiene and safety practices mentioned in the previous two sections, the dispensing of oils should be done in a scrupulously clean manner. It has already been noted that dirt and water are the two biggest problems that oils encounter and poor dispensing practices offer many potential routes for contamination.

A centralised supply system is always best, but may not always be practical. This ensures one supply of oil with dedicated supply lines that can be fitted with pre-filtration to remove dirt, and tanks can be fitted with dessicant breathers to remove moisture. These dedicated supply lines also mean that oil cross-contamination can be eliminated.

If a central supply is not feasible and oils need to be dispensed from drums, totes or pails then ensure that drums are free from dirt and water before use. Pumps and portable lines need to be stored in a clean environment where high levels of cleanliness are maintained.

It is a good idea to have a written oil dispensing policy that is available to all staff so they know what to do. Education is paramount as staff members need to know what to do and why they are doing it.

If the costs and the effect of contamination are made known, as well as its effect on the bottom line, then you will get buy-in and the correct procedures will be followed. As Benjamin Franklin once said: 'If you think education is expensive, try ignorance.'

Different lines and different pumps need to be used for different products. If topping up is required then try and avoid doing this in exposed areas. Top up containers must be kept clean and not left exposed to the atmosphere. Do not use the same containers for different oils and try to avoid the use of funnels at all costs, as these act as very efficient dirt and water magnets. If funnels must be used, think about using wax coated disposable funnels or funnels with sealable lids, and make sure that they are wiped down with a lint-free cloth. Use quick couplers wherever possible and consider specially-designed top up containers as there is a plentiful range of products on the market with cleanliness in mind.

The use of filter carts is slowly changing from a nice-to-have to a necessity. This is a handy way of dispensing oils and ensures that the oils are pre-filtered before being put into service.

Oil disposal

Finally, the disposal of used oils needs to be considered. The ROSE foundation states that one litre of used oil is enough to contaminate and pollute one million litres of fresh water. Two and a half litres of oil would be enough to contaminate an Olympic sized swimming pool.

Keeping oils dry and clean helps to dramatically extend the lifetime of the product, so the management of this asset needs to be effective. Extending the life of an oil obviously means that the cost of disposal is reduced too.

It is quite possible that, with some circulating oils, the disposal cost may be as much as the new oil. There are a number of oil re-refiners that can remediate oils and lubricants for re-use and the companies will pay a nominal fee per litre for used oil. Other companies turn used lubricants into furnace oils that can be used as fuels.

In the case of transformer oils, there are companies that can regenerate the oils by cleaning and dehydrating them such that they are suitable for re-use.

Whether the oil is to be disposed of in an environmentally sound manner, re-refined, remediated or turned into another product with monetary value, the used product needs to be stored safely until it can be removed from site. Spills and leakages must not be allowed to enter the environment or water supply. The costs and penalties for pollution can be astronomical. In the case of leaks, they represent assets being wasted, and remember – if oil can get out, dirt and water can get in.

This has been a very short introduction to the concept of treating oils and lubricants as assets rather than consumables. If these assets are well maintained and managed effectively, then huge strides will have been made towards ensuring long lubricant life, reducing disposal costs and contamination threats. It will also be instrumental in minimising plant operating costs and guaranteeing a long and trouble-free life for mechanical systems.

All of this amounts to a reduction in total cost of ownership, increased profits and a healthy bottom line. Count the cost of lubrication, not the cost of the lubricant.

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Head Office KwaZulu-Natal
9 Le Mans Place,
Westmead, KZN, 3610
PO Box 15108,
Westmead, KZN, 3608
t +27 (0) 31 700 5460
f +27 (0) 31 700 5471
e support@wearcheck.co.za
w www.wearcheck.co.za

WEAR® CHECK
The Leaders in Oil & Fuel Analysis

Branches

Johannesburg	+27 (0) 11 392 6322
Cape Town	+27 (0) 21 981 8810
Port Elizabeth	+27 (0) 41 360 1535
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Rustenburg	+27 (0) 14 597 5706
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Zambia: Kitwe	+260 (0) 212 210161
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