STORAGE AND HANDLING OF LUBRICANTS

As delivered, our lubricant is the end product of much careful research, refining and testing. They are as good for their intended purpose as our company can make them. During storage after delivery, however, several things can happen to impair quality. Careless handling, contamination, exposure to abnormal temperatures, confusion of stocks all these factors can result in wastage, damage to machinery, deterioration of lubricants, higher maintenance cost and loss of production.

SITING THE LUBRICANTS STORE

Ideally lubricants should be stored under cover of a reasonably constant, moderate temperature. In practice, this may not be possible and the lubricants store may have to be at least partly outdoors. However, whether it is outdoors or under cover, the store should be sited so as to provide:

- Good access for delivery vehicles
- Plenty of vehicle unloading room
- Properly equipped unloading dock with direct access to the oil store
- Clean dust free conditions for unsealing and dispensing
- Easy distribution to the principal points of use
- Simple inventory control, and at-a-glance check on the conditions of containers
- Space for empty barrels and returnable containers

OUTDOOR STORAGE

Outdoor storage should be avoided if possible. Weathering can obliterate the labels on containers, leading to possible mistakes in selecting lubricants for specific applications.
Furthermore, widely varying outdoor temperatures, with consequent expansion and contraction of steams, may lead to leakage and wastage. The likelihood of contamination is also increased. Water can leak into even tightly closed drums by being sucked in past the bung as the drum and its contents expand and contract.

Extremely cold or hot weather can also change the nature of some pounded oils and emulsions, making them useless.

Ideally lubricants should be stored under cover of a reasonably constant, moderate temperature. In practice, this may not be possible and the lubricants store may have to be at least partly outdoors. If protected from extremes of temperature and from ingress of water, most lubricants are unaffected by climatic conditions and may be stored outdoors for limited periods.

However, if temperatures below 0°C are anticipated, protection should be given to lubricants which are sensitive to the effects of frost (e.g. oil/water emulsions or water extendible fluids).

The following products should never be stored in the open:

- Insulating oils
- Refrigerator oils
- White and medicinal oils
- Aviation oils and compounds
- Insulating oils
- Refrigerator oils
- White and medicinal oils
- Aviation oils and compounds
- Neat cutting oils continuing fatty oils or compounds which can solidify and separate when very cold
- Greases

When containers must be stored outside or undercover, the following precautions are advised:

- Keep bungs tight.
- Lay drums on their sides. Position the drums so that the bungs are at 9 and 3 o'clock. This will ensure that they
are covered by the drum contents. Thus minimizing moisture migration and drying out of the seals.

When lubricants are decanted or dispensed outdoors condensation or water ingress is more likely when a barrel is only part-full.

Oil barrels standing in the open suffer variations in temperature, and corresponding variations in internal pressure. This leads to "breathing".

- Be used to keep them clear of the ground and to prevent rusting of the undersides. In every case, barrels should be stored off the ground on still ages or in racks, well clear of surface water. They should never be stocked directly on surface containing clinker, which is particularly corrosive to metal. The drums at each end of a stack must be securely wedged to prevent movement. Regular inspection should be carried out with a view to the detection of leaks and to make sure that Identification markings remain clear and legible.
If, for any reason, drums have to be stored on their ends, they should be raised off the ground and stored upside down (i.e. With the bungs at the bottom). Failing this, they should be tilted so that rain water cannot collect round and submerge the bungs. Water contamination is undesirable, whatever the grade of lubricant, and it is not always realized that moisture can enter a drum through what appears to be a perfectly sound bung.

Once the seals have been broken and packages have been opened, there is always a danger that, unless the packages are kept properly closed when not in use, impurities such as dust, sand and fibre may enter them. Such contaminants, eventually finding their way into machinery, can cause damage or abrasion or, by blocking oil ways, can result in a complete breakdown due to lack of lubrication.

If drums are placed upright without weather protection, heat of the day and of course, cools down again at night. This results in expansion and contraction of the effect that the air in space above the oil level is subjected, during the day, to slightly higher than atmospheric pressure and, at night, to slight vacuum. These changes in pressure may be sufficiently great to cause a pumping action, known as breathing, in which air is forced out the drum during the day and drawn into at night. If, therefore, the bungs through which this breathing takes place are surrounded by water, some of this water may be sucked into the drum and in the course of time quite considerable quantities may accumulate.

An oil drum, or other package, should never be opened by cutting a large hole in it or by completely removing one end, since, even if the hole is kept covered by, for example, a wooden or metal lid, the chances of contamination are greatly increased. Similarly, it is a bad practice to dip on open container into the oil since, not only does this allow dust to enter, but the outside of the dipper itself may be dirty. Drums of oil should, therefore be placed on their sides on wooden cradles of convenient height and the oil dispensed by means
of a tap under which a drip try is placed. Alternatively, a drum may be stood on its end and the oil withdrawn by means of a hand pump, the pump intake being inserted into the large bung-hole.

- Before removing the bungs, dry the drum heads and wipe them clean of any contaminant which might get into the lubricant later. The importance of keeping grit and sand out of oil used in expensive bearings must be kept in mind.

- When oil is stored in bulk, it is probable that water or condensation will accumulate and fine dust find its way into the tanks with the result that, eventually, a layer of sludge-like material builds up at the bottom of the tanks and leads, in time, to contamination of the oil. Consequently, it is advisable to have storage tanks fitted with dished or sloping bottom provided with drain cocks, which will enable dregs to be drawn off periodically. Where practicable, bulk storage tank should periodically be cleaned out.

- Extremes of temperature are not good for lubricants. They should not be stored in any unduly warm place, equally, it is not wise to leave them for long periods in conditions of extreme cold.

**INDOOR STORAGE**

Indoor storage is always preferable. However, if space is limited, it should be reserved for small packages, for lubricants which can be affected by frost, for opened packages, and for the special categories listed earlier under outdoor storage. Rarely will indoor temperatures fall so low as to affect a lubricant adversely. However, excessive local heat from steam pipes, furnaces etc. should be avoided to prevent thermal degradation or volatilization of solvent containing grades. (N.B.: In many cases, insurance requirements or local fire regulations necessitate separate storage facilities for volatile products). If one part of the store is warm, it should be reserved for high viscosity (thick) oils to make dispensing easier. The
lubricants store should be kept dry at all times, to prevent the Corrosion of containers which would occur in damp conditions.

The oil house should be located away from such possible sources of industrial contamination as coke dust, cement dust, textile mill fly, and similar forms of grit or soot. It should be clean at all times, with regular cleaning schedules being maintained.

This applies above all to the dispersing equipment, which must never be allowed to become fouled, since these results in contamination and poor functioning.

Contamination and confusion of brands are the 2 main things to be avoided in the handling of partially emptied containers and dispersing equipment. Thus orderliness is essential. Dispersing equipment should bear a label that matches the container from which it was filled. Labels on all equipment and containers should be kept legible at all times. Drying oils, such as linseed oil, should not be stored in the in the oil house. If they get into lubrication system, the result, of course, is faulty lubrication and stoppage.

Never use the same dispersing equipment for both detergent engine oils and R&O turbine and hydraulic oils. Contamination of rust and oxidation inhibited industrial oils substantially impairs the quality of the industrial oils . Trace amounts of the detergent and the other alkaline contaminants can react with the acidic rust inhibitor and cause operational problems like foaming, filter plugging and emulsion formation.

Galvanized containers should never be used for transporting oil. Many of industrial oils used today contain additives that would react with the zinc of the galvanizing to form metal soaps, which would then clog small oil passage, wicks, etc.

Also unopened lubricating grease containers should be stored indoors, out of direct sunlight, and in an upright position. Drums, kegs, and pails should be covered, if possible, to prevent the accumulation of dust, dirt, water, etc. on the lid. The lid should be blown off with compressed air (if available) and wiped free of contaminants before being removed. Drums and kegs of grease should never be stored horizontally. Smaller containers (cans or tubs) should be stored away from heat and out of direct sunlight. Tubes of grease should be stored upright, with the removable cap at the top, away from heat or direct sunlight.
BULK STORAGE

Bulk lubricants storage tanks should be sited indoors, but they can be in the open if protected from driving rain and snow and from extremes of temperature. All tanks fill pipes and off take pipes must be labeled with the full grade name of the product they contain, to avoid crossovers when delivering or dispensing.

Mild steel tanks require special adaptation for certain types of product. Tanks for electrical refrigerator oils are generally lined with epoxy resin and their air vents protected with silica-gel breathers to remove moisture.

White oils may require epoxy resin treated or stainless steel tank age to maintain quality and good color. Tanks without silica-gel breathers can slowly accumulate water as atmospheric moisture condensate on relatively cold tank walls, even when sited indoors. Water should be periodically drained from a stop-cock positioned so that it is the lowest point on the tank. Normally tanks are erected such that a 1-in-10 slope towards the drain cock reduces the risk of contaminated oil being dispensed. With some grades, excessive water ingress can result in full or partial emulsification of the product.
STACKING BARRELS

If space is insufficient to allow barrels to be stored on horizontal still ages, they may be vertically stacked on pallets or stored in horizontal or sloping racks. Whichever method is adopted it should allow individual packages to be readily accessible with the minimum of disturbance to those not immediately required.

A system of stock rotation must be devised, to avoid the accumulation of old stock. "First-in, first-out" is a good principle to establish.

When other packages are free stacked on top of one another, the safe height varies according to the stability of the stack and the weight which the lower packages can support. The use of pallets or slatted frames stabilizes the stack and helps prevent damage to the lower layers.

Steel racks offer greater convenience for loading, retrieval, inventory control and stock rotation. The sloping rack with one side for loading and the other (lower) side for retrieval is an effective means of ensuring "first-in, first-out" barrel stock movement. Barrels containing soft grease should be stood upright. The standard 180 kg grease barrel has a large opening, the seal of which is readily damaged by careless handling. This may lead to the leaking of soft grease from a horizontal stored barrel.

HANDLING BARRELS

The standard 208 liter barrel weighs about 185 kg when filled with oil. It is strong, being designed to be re-used several times, but is readily damaged by bad handling. The barrels must never be dropped when being unloaded or moved. The impact can burst the seams, causing subsequent leaking or contamination of the contents.

There are many suitable methods of handling barrels, but the most widely accepted are:
- Forklift truck (either horizontally on the standard fork, or vertically with a single or four-barrel handling attachment)
- Two-wheel hand truck
- Triangular drum dolly
- Manual elevator
- Manual side-delivery stacker
- Chain hoist and trolley on 'I-Beam' bridge
- Rolling (by two workers)

GOOD STOREKEEPING

- New packages should be wiped clean around the bungs, the labelling checked, and any marked variation from the product's normal color, smell or consistency reported. If there is any reason to doubt the good condition of a lubricant, the tank or packages concerned should be quarantined to isolate the problem and market engineering services consulted for specialized advice.
- Lubricants must only be dispensed from clean, dedicated containers. Never be tempted to use ad-hoc oil measures.
Covered receptacles’ should be provided for clean lint-free wipers and for dirty wipers.

- A drip tray should be positioned beneath each barrel tap. Split oil can cause accidents and should be cleaned up without delay. Sawdust is effective, but represents a fire hazard and should be removed as soon as it becomes oily. Crystalline materials are available as a substitute for sawdust, but leave gritty debris on the floor which, while usefully anti-slip, may provide a source of contamination.

- Measuring cans with easy pour spouts allow the issue of oil to be recorded. Records should be accurate and complete, with the full type and grade of each lubricant noted.

- Abnormalities in the amounts of a particular lubricant issued should be investigated.

- Insofar as greases are concerned, the drums must, of necessity, have a large opening and, to avoid as far as possible the entry of dirt and water, it is important that the lid or cover should always be replaced firmly and securely as soon as requirements have been taken.

- Grease guns should be filled cleanly and carefully, for grease acts as an abrasive when mixed with grease or dirt. It is acceptable to leave unused grease in a grease gun. It is recommended to release the pressure from the grease by drawing the handle back and locking the spring in the retracted/compressed position. Otherwise, oil may separate from the grease over time in storage due to the increased pressure applied by the grease gun spring.

- When greasing, the grease fitting should be cleaned before connecting the grease gun. This will prevent the introduction of dirt into the bearing with the grease.

- The remaining unused lubricating grease can be stored for future use. The surface of the grease should be left smooth (without depressions) by smoothing it with a clean implement such as a spatula or putty knife. The container should then be gently banged on a hard surface to remove any entrained air bubbles and re-smoothed. This is to minimize the separation of oil from the grease during storage. The lid or cover should be placed on the container and secured as well as possible, and the container should be stored indoors out of direct sunlight and away from any heat sources.

- When empty, lubricant containers should have their bungs or lids securely replaced to prevent contamination.

- Never re-use empty lubricants packages. Cases have been known of waste oil, other lubricants, chemicals, fuels and even water being stored in empty lubricants packages and
being inadvertently used in place of the service lubricant. Results can be dangerous, and sometimes catastrophic.

- Empty barrels should not be used for road barriers or for supporting scaffold poles or trestles. It is especially important not to use barrels for brazing or welding trestles, or to cut them up with oxy-acetylene equipment, because of the risk of explosion.

**SAMPLING**

Samples of lubricants are sometimes required for analysis. After the barrel has been rolled to agitate the contents, a metal or glass sampling tube, or 'thief', is used to withdraw a sample. It is essential that both the 'thief' and the container into which the lubricant sample is poured are absolutely clean, dry and odor free.

**CONTAMINATION IN USE**

Lubricants and cutting oils must periodically be drained from the machine and replaced by fresh oils or coolant.

Some used oils, particularly in less arduous applications, can be reclaimed for future use by settling, centrifuging, water washing or filtration. Your fluid Manager will advise on the appropriate treatment.

Cutting oils are especially liable to contamination in use. For example, oil films on the surface of an emulsion may indicate from a leaking gearbox or hydraulic system.

When soluble oil is prepared for use, the oil must be added to the water in the recommended amount, with consistent stirring to form a stable added to the oil, as an unstable emulsion may result. The water must be clean, and mixing should take place in a clean separate tank rather than in the machine sump.

It should be noted that a new emulsion rapidly deteriorates if added to one already contaminated, bacteria-infected or unstable. Unpleasant odors or rusting are indicators of bacteriological or chemical degradation. Clean coolant must be used in a clean sump for efficient operation.
About greases, if you open a container of unused lubricating grease and observe dirt or water, what should you do? Can the grease still be used? If it is a new container of the product, contact the supplier. If the package is being reopened, and a small amount of free water is present, then remove the water with a clean paper towel or similar absorbent material and dispose of it properly. Gross contamination with water may render the grease unsuitable for use. Small amounts of particulate matter (dirt/dust) can be removed from the grease surface with a clean spatula or putty knife and the removed material disposed of properly. It may be necessary to remove the entire top layer of the grease. For this reason, it is important to keep the lid securely on partially used containers of grease.

FIRE PRECAUTIONS

Packaged lubricating oil and grease does not represent a serious fire hazard. However, most lubricants have the potential for combustion and explosion in certain circumstances. The hazard is related to the flash point of the product. Lubricants with a flash point less than 55°C should be stored in closed containers away from heat in a well ventilated place. When the product is used in an open tank, the latter should be well hooded, well ventilated, and earthed to prevent static sparks.

When not in use, the tank should be tightly covered.

Products with a flash point of 55°C or greater require no special fire precautions, but should be stored away from heat whenever possible.

Lubricating oil is potentially dangerous in conjunction with more flammable materials. Oil-soaked sawdust, rags or cleaning paper must not be allowed to accumulate. If soaked with fatty oils they can ignite simply by, for example, coming into contact with a high temperature steam pipe.

About greases, most grease will burn, but they are generally not considered to be fire hazards. Most lubricating greases contain petroleum-derived mineral oil or hydrocarbon-based synthetic
fluid as the lubricating fluid. Those materials are generally considered to be combustible (flash point at or above 38 °C (100 °F). In very few cases, the lubricating fluid in grease would be considered to be flammable (flash point below 38 °C (100 °F). Consult the Safety Data Sheet (SDS) for firefighting information for any specific product.

Oil stores must be equipped with CO2, dry chemical or foam type extinguishers, and with sand filled fire buckets.

Water should not be used for suppressing fires, as the burning lubricant may float on the surface and spread the fire. The lubricants store should be designated a 'No Smoking' area.

**WASTE LUBRICANT DISPOSAL**

Waste oils are subject to re-use or destruction largely according to economic factors. Re-use may follow re-finining, laundering (e.g. by filtering or centrifuging) or downgrading (e.g. for use as a bitumen flux oil); or maybe as a fuel oil. Advice on these alternatives is available from your fluid Manager.

When waste oil is too heavily contaminated to allow re-use, the only courses are incineration after suitable pre-treatment or disposal by controlled dumping on an approved site in accordance with environmental legislation.

Used cutting oils, both neat and soluble, are affected by additional disposal factors, and special procedures should be followed after consultation with marketing technical services.

Unused lubricating grease should be disposed of in accordance with all federal, state and local environmental regulations. In some cases, used oil recyclers will accept unused grease. Some municipalities or industries hold household chemical disposal drives at which grease may be accepted.

Used lubricating grease should be disposed of in accordance with national and local environmental regulations. In some cases, used oil recyclers will accept used grease. Some municipalities or industries hold household chemical disposal drives at which grease may be accepted. Depending on the service the grease has been in and contaminants to which it may have been exposed, used grease may be contaminated and considered to be a hazardous waste and may require special handling for disposal. Used grease should not be re-used.
HEALTH & SAFETY

Lubricating oils and greases are a relatively harmless class of material. Lubricants present little or no health hazard provided they are used as recommended and reasonable care is taken to keep them off the skin and away from the eyes, and to avoid ingestion or inhalation of vapors or mists. Frequent and prolonged contact with mineral oils can give rise to skin ailments, and operatives are advised to follow the basic general health & safety precautions listed below:

- Wear working overalls, impermeable aprons and gloves, etc. to eliminate unnecessary contact with oil.
- Avoid using dirty rags to wipe skin; to seek first-aid treatment immediately for any injury, however slight; to report any skin complaint without delay.
- Know where to obtain first-aid advice and medical attention.
- Do not use gasoline, naphtha, turpentine, or similar solvents to remove oil and grease from the skin.
- Wash regularly and use non-hazardous waterless hand cleaner or mild soap with warm water and a soft brush and after it conditioning creams.
- Change and dry-clean work clothes regularly.
- Use, if possible, separate lockers for outdoor and working clothes.
- Avoid breathing oil mist or solvent vapours.
- Ensure the arrangements for the extraction of fine mists and sprays are in proper working order.
- Ensure that metal particles and swarf are removed from machines with suitable implements rather than by hand.
- Ensure machine splash guards and machine protection devices are properly adjusted.
- Ensure that the hazardous substance markings on packages which identify toxic, harmful or flammable products are understood and obeyed when storing, transporting or using the product.
- Observe all safety, hygiene and 'good housekeeping' rules at all times.
LUBRICATION SCHEDULING
Scheduled lubrication plays an important part in preventive maintenance and in control of lubrication costs. Once a basic line of lubricants has been selected, a program should be organized to see that the right lubricant is applied to the right place, on the right machine, in the right amount, at the right time, and that no point requiring lubrication is missed.

SHELF LIFE OF LUBRICANTS
The performance properties of liquid lubricants (oils) will remain intact for many years provided they have been in protected storage and not exposed to severe high/low temperature cycles. Generally, the simpler the oil formulation, the longer the oil will remain satisfactory. A product in an unopened container, which is beyond the estimated shelf life, may still be suitable for service. The product should be tested and evaluated against the original product specifications. Thoroughly mix the container to ensure a uniform, representative sample is taken for testing. If the product’s test results fall within the original specifications, it should be suitable for use. Following testing, if the product is not consumed within a year, the product should be marked for reclamation or disposal. As a final note, the user should validate the product’s performance claims against the equipment manufacturer’s recent specifications. Equipment designs and specifications can change over time, making an old product obsolete for use with new equipment. Call your local supplier if there are questions concerning specification obsolescence. Also for your estimate, consider following bellow lubricants:

HYDRAULIC FOOD GRADE/COMPRESSOR/TURBINE AND GENERAL PURPOSE LUBRICATING OILS
These oils contain low but very effective additive treatments. They may be stored for 3 years under protected conditions without any significant deterioration in performance.

ENGINE/MOTOR OILS AND TRANSMISSION OILS
Although these oils contain high additive contents, they are extremely stable. They may be stored for 5 years under protected conditions without any significant deterioration in performance. However, as the industry is always developing new specifications these oils may be out of date by the time they are fully used.
INDUSTRIAL AND AUTOMOTIVE GEAR OILS

These highly additive formulations can occasionally exhibit some long term instability. Under protected conditions they should only be stored for 3 years.

NEAT (NON-EMULSIFIABLE) METAL WORKING FLUIDS/WAY LUBRICANTS (eg HONING OIL)

These formulations are often quite delicately balanced. Hence, under protected conditions they should only be stored for 2 years.

SOLUBLE OIL

Should only be stored for 1 year. Storage under unprotected conditions can result in water ingress which causes the oil to become ‘milky’ or form a ‘mayonnaise’ and can also cause rust formation/corrosion in metal containers.

GREASE

Unused lubricating grease can “go bad” if it is stored for an excessively long period of time, or under poor storage conditions. Most manufacturers place a date of manufacture on their product labels and publish shelf-life information for their products. The grease manufacturer’s shelf life guidelines should be followed. Grease can have a shorter than stated shelf life if it is stored improperly. Grease containers that are stored outside can accumulate dirt, dust, and water on the lid, which can enter the container during the natural “breathing” that the container does upon heating and cooling. In addition, as oil tends to separate from grease over time, it can separate excessively if stored for a long time, to the point that the oil cannot be remixed into the grease. Solid additives can also separate from grease, resulting in grease that is not suitable for use. Both the oil and solids separation phenomena can be aggravated by the improper storage of the grease container in direct sunlight or near a heat source.

The shelf life of any grease is affected by the type and amount of thickener used, consistency of the grease, manufacturing method employed and the formulation complexity. Generally straight Lithium, Lithium Complex and Calcium Complex greases remain stable for a long time. Aluminum Complex greases tend to set and harden, but remain stable. Benton and Barium greases tend to soften on aging.
One important subject about greases is oil naturally tends to separate from lubricating grease over time in storage. Storage conditions such as a warm environment can accelerate this separation. Some grease may have a greater tendency to separate oil that others. Contact your grease supplier for guidance on whether to mix separated oil back into grease or to pour it off the product, and if you have any questions about the suitability of grease for service.

### Estimated shelf life of base oils, lubricating oils, and greases

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<th>Product</th>
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<td>Base Oils</td>
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<tr>
<td>Lubricating Oils (mineral or synthetic)</td>
<td>5</td>
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<tr>
<td>Greases (mineral or synthetic)</td>
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<tr>
<td>Coolants (general)</td>
<td>5</td>
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**Known Exceptions:**

<table>
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<th>Product</th>
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<tr>
<td>Rust Preventatives</td>
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<tr>
<td>Open Gear Lubricants</td>
<td>2</td>
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