LIFE CYCLE INSTITUTE

Storeroom Preventive Maintenance (PM) Checklist

Primary inventory items for PM programs are the high-dollar components like electric motors, large transfer gearboxes and bearings. These items can be critical to the operating process and can also have extremely long purchasing lead-times.

Checklist for Storage of Motors and Transfer Gearboxes

Storage Conditions for Short-Term Storage (up to three months)

The following storage requirements should be followed:

- Keep components in their original containers or provide equivalent protection and store them in a warehouse free from extremes in temperature, humidity and corrosive atmosphere.
- Damage from vibration is a constant threat. Protect components from damage with vibration pads.
    - Vibration-dampening pads reduce the chance of false brinelling in these components and are available from most industrial suppliers.
- Make sure that all breathers and drains are operable while in storage and/or the moisture drain plugs are removed. The components must be stored so the drain is at the lowest point to ensure complete drainage of contaminants.

Storage Conditions for Mid-Term Storage (six months to 18 months)

The following preparations should be followed for Mid-term storage:

- Using a paint pen with high visibility paint, draw a line from the center of the shaft to the outer edge of the shaft. The line becomes a visual management tool to indicate the PM has been completed each quarter. (Motors: January the line is pointing up, April the line is pointing to the right, July it is pointing down and October the line is pointing to the left. Gearboxes: the line is pointing up in January and starting in July the line is pointing down.)
- Perform a scheduled PM of motors on a 90-day schedule that requires the component to be rotated at least 450 degrees in the direction of rotation.
- Perform a scheduled PM of large gearboxes on a six-month schedule that requires the component to be rotated at least 450 degrees in the direction of rotation.
    - Components in extended storage with bearings that require greasing must be greased followed by the component shaft being rotated a minimum of 15 rotations after greasing.
    - Frequency and amount of grease for these components should follow the specifications of the manufacturer.
    - Greaseless bearings with “Do Not Lubricate” nameplates should also be rotated 15 rotations to redistribute the grease within the bearing to prevent calcification of the grease.
- Remove the grease drain plug (if so equipped) opposite the grease fitting prior to lubricating the motor. Replace the grease plug after the bearing is greased.
- External machined surfaces need to be protected with an anti-corrosion material that can withstand extreme temperature ranges and exposure to harsh chemical environments.

- Minimize condensation in and around the component by using desiccants or other moisture-control methods.
- Motors equipped with low voltage motor heaters reduce the chance of moisture condensation during extended periods of storage and are usually common on large motors. Heat blankets can also be used to eliminate condensation while in storage.
- Test the electrical resistance annually with minimum specification readings using supplier guidelines for acceptable readings. Measure and record the electrical resistance of the component winding insulation with Megger test equipment or another insulation resistance meter. The minimum accepted Megaohm reading is the insulation kV rating of +1 Megaohm. Readings below this level require a determination to re-wind or replace the component.
- Some motors have a shipping block attached to the drive shaft to prevent damage during transportation. The shipping block should be removed to perform scheduled PMs, then reinstalled while in storage. The shipping block should be installed before any movement of the motor to prevent damage to the bearings during transport to the job site.
- When motors are installed on other components like pumps or gearboxes the same precautions of scheduled PMs should be taken for these components.

Storage Conditions for Long-Term Storage (greater than 18 months)

All requirements of general preparation for extended storage for motors and gearboxes for mid-term storage apply with the following additional requirements:

- The component should be enclosed in a plywood crate or similar container and secured to a wooden base with a vibration-dampening pad. The crate should be designed for easy access to perform scheduled Preventive Maintenance without destroying the crate.
- Components wrapped in plastic wrap for long term storage must have a couple of bags of desiccant inside the wrap to absorb moisture.
- The desiccant bag should be replaced annually to ensure moisture is adequately eliminated during storage.
- Long-term storage of these components should be in low-traffic storeroom locations that do not expose them to damage from lift trucks or movement of other items that could increase the chance of component damage.
- It is important to use vibration-dampening pads or some means to reduce exposure to vibration during long-term storage of these components. These pads might need to be replaced when used for storage of heavy components.

Bearings Storage While in the MRO Inventory

Preventive Maintenance for large bearings should follow the same schedule as bearings in motors and gearboxes. These bearings should be rotated at least 450 degrees to prevent damage due to vibration and environmental conditions.

An annual inspection PM of bearings held in the MRO inventory is important to ensure the items are in the original packaging and the grease has not dried out. If the bearing lubricant has become calcified the bearing will need to be repacked or disposed of and replaced. Bearings should be wrapped in oil paper or other suitable wrapper to protect the bearing and prevent the lubricant from drying out.

Steps to perform a bearing inspection;

- Identify bearings nearing shelf-life expiration (eight years) and move them to a quarantine area for evaluation and possible replacement.
- Carefully remove packaging and unwrap the bearing.
- Rotate the bearing while inspecting for calcified lubricant.
- Clean the bearing using approved solvents. Ensure that all old lubricant is removed. If calcified lubricant cannot be removed using solvents, process the bearing for disposal.
- Carefully dry the bearing to remove solvent from all components.
- Do not use compressed air to dry the bearing. This is a safety hazard and causes damage to the bearing.
- Lightly pack the bearing with new lubricant.
- Rotate the bearing to ensure proper spreading of lubricant. If the bearing does not rotate freely, process it for disposal.
- Re-wrap the bearing in approved material.
- Carefully replace the bearing in its original package or carton.
- Update the inspection records to indicate the next due date.

Rubber Hose Storage and Shelf Life

The shelf life of rubber material is difficult to quantify because many variables affect the rubber composition. Various types of rubber react differently to exposure to the environment. Improper storage of rubber items will reduce the service life of these items. O-rings and other rubber items stored in sealed packages can result in extended shelf life. Rubber items should not be exposed to direct sunlight, ultra-violet light, heat sources, dust or dirt. Any of these conditions will shorten the service life of rubber products.

Consider these guidelines for storing rubber hoses:

- Hose should be stored in a cool, dry area never exceeding +100°F (+38°C).
- If stored below freezing, pre-warming may be required prior to handling, testing and placing into service.
- Store hose in original container. Never stack hose as the weight can crush the hose at the bottom of the stack and reduce the volume of material traveling through the hose.
- Gates Rubber Corporation recommends hose in extended storage be wrapped in plastic wrap and visually inspected/tested prior to use.
- Hose judged marginal should be replaced to avoid potential failure, property damage or injury.
- Hose inventory should be managed on a first-in/ first-out basis.

Shelf Life of Seals and Other Rubber Products

As rubber items age, seals and molded products can undergo changes in physical properties and become unusable due to excessive hardening, softening, cracking, crazing, or other damage. These changes may be the result of one particular factor or a combination of factors such as the effect of oxygen, ozone, light, heat, humidity, oils, water or solvents. The detrimental effects of these factors, however, can be minimized by proper storage conditions of these inventory items.

Here are some guidelines that will help increase the shelf life of rubber products:

- The optimum temperature for the storage of rubber products is between 40°F and 80°F, and should never exceed 100°F. High temperatures accelerate the deterioration of rubber products.
- Rubber items should be stored away from heaters and other heat sources.
- The effects of low temperatures are not as damaging or permanent as high temperatures but rubber articles will become stiff and care should be taken to avoid distorting them at temperatures below 30°F.
- The relative humidity in the storage area should be below 75%. Extreme swings in humidity should be avoided to reduce the potential for condensation on rubber items.
- Rubber items should be stored in protective bags that shield these items from exposure to sunlight, strong artificial light and light with high ultraviolet content.
- Oxygen (O2) and Ozone (O3) are very damaging to rubber products, so wherever possible rubber items should be stored in airtight containers to protect them from the atmosphere.
- All O-rings inventoried and shipped by the supplier should be stored in either zip-lock or heat-sealed plastic bags, and have bar code labels which indicate the cure date, batch number and receipt date.

Unlike a Preventive Maintenance program for operating equipment the component maintenance care in the MRO storeroom inventory is designed to ensure the items are in service ready condition when they are installed on the operating equipment. Items in the storeroom inventory not under a scheduled Preventive Maintenance program still need to have to have managed care to ensure they are also in service ready condition when issued from the inventory for an equipment repair.

A Preventive Maintenance program for the storeroom inventory provides the basis for maintenance reliability in the operating equipment. When Maintenance Planners can trust that a component stored in the storeroom will perform as designed and for the expected service life, they can be more proactive in their planning to reduce the equipment failure and lost production.