Long-term storage: Some points to keep in mind

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Editor's Note: PDFs of this article are available in English and Spanish in the "Resource Library" of **www.easa.com**.

It is common knowledge to those involved in the electric motor storage business that maintenance philosophies and procedures vary. Thorough reviews of available information on the topic of long-term storage from EASA and seven different motor manufacturers revealed some interesting similarities and differences in the information available from each source.

Several sources share common elements such as environment, moisture protection, bearing maintenance, and insulation resistance. The purpose of our discussion here is to describe some of the differences and hopefully give some points to consider when creating a long-term storage process for end users.

Environment

A very important consideration in storage planning is the environment. There is consensus across all reviewed sources on this requirement. Electric motors should be stored in a clean, dry and vibration-free area. One of the most important recommendations for proper storage is that motors should be stored in an environment where the air is ventilated, clean and free from dust with additional care and planning for protection against the infiltration of a motor by insects and vermin while in long-term storage.

Specific recommendations for environment across several sources address maintaining specific temperature and humidity levels and limiting exposure to vibration. The temperature recommendations vary from 40-140° F (5-60° C) with a relative humidity range of less than 50% to less than 75%. The recommended maximum vibration level is not to exceed 0.15 IPS (3.8 mm/s) or 0.8 mils (0.02 mm). A good practice is to store motors in an environment that is temperature and humidity controlled with low vibrations.

This facility houses a number of motors in long-term storage.

Moisture protection

In addition to humidity, all sources agree that the importance of protecting the windings from moisture cannot be understated. Moisture protection while in storage is vital. The most common recommendation is to utilize the on-board space heaters to keep the winding temperature about 10° F (5° C) above ambient. If a motor is not equipped with space heaters, single-phase AC power is an alternative means to heat the windings (e.g., trickle heating).

Approximately 8-12% of nameplate current (AC) will be required to heat the windings, and the original equipment manufacturer (OEM) should be consulted for voltage and transformer capacity. An important point to consider is that some manufacturers allow for no heaters being utilized if complete environmental climate control is available, while others recommended using heat only if the temperature was going to be below the dew point. While there are many ways to protect motors from moisture, what is most important is to verify (see insulation resistance on **Page 10**) periodically that no moisture ingress has occurred during the long-term storage period.

Bearing maintenance

There are wide variations in the recommended methods for the maintenance of bearings while in storage. The

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recommendations for sleeve bearings are very different than those for grease lubricated rolling element bearings. The rolling element bearing recommendations range from no maintenance at all, to rotating shafts 30 rpm for 15 seconds every month. Most sources recommend stopping the key way 90 degrees from the last position, but one source recommends using the key way and clock positions and stopping five hours from the last clock position after rotation.

When designing a maintenance process for end users, several factors need to be taken into consideration. A few points to consider might be: Does the end user have a motor storage procedure? Does the motor manufacturer have specific motor storage provisions to maintain warranty coverage on new equipment?

Several sources recommend a 100% bearing cavity fill while in storage. Compliance with this recommendation requires additional planning before the machine is put in storage and upon removal from storage. The practice of filling bearing cavities on motors being placed in storage must be identified and communicated clearly, as a typical cavity fill during repair or manufacturing is one-third to one-half. A 100% filled bearing cavity that is erroneously put into operation can cause several serious problems including excessive bearing temperatures.

For sleeve bearings, the recommendations are wide ranging as well, stretching from monthly rotation with oil, to no rotation with Tectyl® 511 sprayed in the housing every six months for two years. Beyond the two-year storage mark, removal and coating of the bearings with rust inhibitor is advised.

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Like rolling element bearing storage recommendations, there is also some consensus amongst sources regarding shaft rotation. Every three months appears sufficient and although most manufacturers did not make a recommendation on where to stop the shaft there were some that suggested using the key way and clock positions. The method of advancing the keyway position five hours after each shaft rotation seems logical (per rolling element bearing method).

Insulation resistance

All the sources recommended performing periodic insulation resistance measurements. One of the key recommendations was to correct the megaohm reading to 40° C (104 F°). These measurements and this correction is important for comparing readings as variances in temperature greatly affect megaohm readings. The frequency of megaohm testing ranges widely from once before storage and once before installation to testing the IR and PI monthly while in storage. Across the sources, the recommended insulation resistance values varied from a stated 10 megaohms minimum to calculated values utilizing the formula (machine rated voltage + 1000 / 1000).

Examination of current available information reveals a wide disparity in motor storage recommendations. No standard yet exists for defining what a motor owner should do to protect assets placed in long-term storage. A conservative approach is to begin with a review of the storage standard of the manufacturer of the machine. Once this information has been evaluated, a storage review discussion between the motor owner and the storage provider can be held to develop a specific and agreed upon storage plan.

Special emphasis should be placed on the procedure for removing motors from long-term storage. What are the minimum test values required for placing a stored motor in service? Is a test run required prior to delivery of the motor removed from long term storage? Answers to questions such as these provide the motor owner with vital input into the care of their asset while in storage, help educate all the involved parties on the importance of proper motor storage and clarify the tasks necessary to place a stored motor in service. All parties can then agree on an effective storage plan best suited for that machine. ●