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From: Meredith Brown <racer@lanl.gov>
Subject: Blue Alert: Lubrication Control Concerns

TITLE: Lubrication Control Concerns

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LESSONS LEARNED: Equipment maintenance programs should include lubrication controls to ensure that the correct types of lubricants are used, and that lubricant containers are controlled so that associated hazard information (e.g., material safety data sheets) is available to workers at the point of use. Lubrication control programs should also address prevention of lubrication cross-contamination and proper lubrication storage.

DESCRIPTION: Facility management personnel determined that inadequate maintenance procedures could have resulted in a bearing failure in the main exhaust fan for one wing of the Chemistry and Metallurgy Research facility after an abnormal temperature increase was noted during post maintenance testing. The fan bearings were replaced after routine vibration checks indicated they were worn. After the replacement was completed, the fan was restarted on slow speed in accordance with the work package, which specified that the fan should be run at slow speed for 72 hours to break in the new bearings. The bearing temperature was monitored during the break in period.

Less than one hour after the fan was started up, a high-bearing-temperature alarm sounded in the facility control room, and personnel were dispatched to locally monitor the bearing temperatures. Noting what appeared to be a rapid increase in bearing temperature, the personnel stopped the fan. Because their initial visual inspection of oil containers located near the fan led the personnel to believe that an incorrect type of oil may have been used to lubricate the bearings, the personnel drew samples from one of the containers for analysis. Samples were also collected from the replaced bearing.

ANALYSIS: Analysis results indicated that the oil samples were SAE 40 equivalent synthetic oil. After the incident occurred, the oil manufacturer recommended use of SAE 20 equivalent synthetic oil for the bearings because the greater viscosity of the SAE 40 weight oil can generate excessive heat. The bearing manufacturer recommended an oil viscosity of 150 SUS, which is between SAE 20 and SAE 40. In view of this recommendation from the bearing manufacturer, the oil manufacturer then recommended that SAE 40 oil be used for the bearings.

Solvents and other types of lubricants were initially identified in the oil sample, but subsequent analysis by the oil manufacturer determined that the sample was SAE 40 equivalent synthetic oil containing 400 parts per million (ppm) silicone. Investigators determined that the 400 ppm of silicone came from vacuum pump grease used to install the bearing housing oil seals. Because grease is a lubricant, it would not degrade the bearing lubrication.

Investigators determined that the work package did not contain lubricant specifications or manufacturer's specification sheets for the bearings or the fan. Because maintenance personnel

have historically used synthetic oil to lubricate many exhaust fan bearings in the facility, they believe this was what was used for the bearings in the fan. However, neither the facility nor the maintenance organization had a system to formally control the different lubricants used and stored in the facility.

Maintenance personnel routinely fill small oil cans out of the larger 5-gallon shipping drums the oils arrive in, and various types of oils had been placed in the can that was sampled. Because no lubrication control system was in place, cross-contamination of oils occurred. Additionally, no requirements were in place to ensure that material safety data sheets were attached to the smaller cans.

RECOMMENDATIONS: The purpose of lubrication control programs is to ensure that essential safety equipment is properly lubricated for optimal availability and reliability. Additionally, such programs should consider including non-safety-related equipment requiring lubrication that is extremely expensive to replace or that involves substantial lead time for replacement. The use of diagnostic equipment such as shock pulse monitoring should also be considered in conjunction with manufacturers' recommendations to provide a means of determining when lubrication is required.

To ensure proper lubrication of critical equipment, LANL personnel have developed a lubrication control program with the following goals:

1. Provide a list of equipment requiring lubrication, and the specified lubricants.
2. Provide suitable segregated storage facilities for the lubricants.
3. Provide properly marked transfer containers for lubrication oils.
4. Provide a methodology for determining equipment lubrication requirements.
5. Provide equipment and technique training for personnel performing lubrication diagnostics.

Additional information on predictive maintenance programs can be found in the [Operating Experience Weekly Summary 96-16](#) edition published by the Office of Nuclear and Facility Safety.

ORIGINATOR: Los Alamos National Laboratory

CONTACT: Meredith Brown, 505-667-0604

AUTHORIZED DERIVATIVE CLASSIFIER: Meredith Brown, 505-667-0604

REVIEWING OFFICIAL: Ernest Staples, 505-667-7207

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FOLLOW-UP ACTIONS: Information in this report is accurate to the best of our knowledge. As a means of measuring the effectiveness of this report, please contact the originator of any action taken as a result of this report or of any technical inaccuracies you find. Your feedback is appreciated.