

2.3.4 LIMITORQUE LUBRICATION

General

Lubrication of the actuator internals is critical to the proper and sustained operation of the equipment. Lubricant functions to reduce wear, remove heat, and resist moisture penetration.

Grease carries away little heat, but Limitorque actuators are not normally run continuously like a motor or pump. The actuator does not build up much heat, so greases work well. Greases tend to cling to the parts of the actuator where oil might run off and allow corrosion to begin. If oil were used and drained from the component surfaces, the parts would initially be run dry and sustain excessive wear.

The major wear areas of the actuator components are:

1. Bearings on the drive sleeve, spring pack, and worm shaft.
2. Sliding surfaces such as the drive sleeve splines, worm shaft splines, and worm and worm gear teeth.
3. The motor pinion and drive gear.

One point that is often missed is the valve stem area. For rising stem valves, the loads on the threads can be very high, and a dry running set of threads can rapidly wear both the stem and stem nut creating excessive loads, possibly causing the torque

switch to trip. The actuator housing lubricant has no way to get to the valve stem, so a responsible individual must be conscientious about maintaining the interface. The stem lubricant is recommended by the valve manufacturer.

Limitorque actuators are built to operate with the worm/worm gear interface immersed in lubricant. The housing is meant to be leakproof regardless of the housing orientation, except for minor weeping during periods of actuator inactivity.

The amount of lubricant that is used in an actuator depends on the actuator size and type. Approximate weight and volume based on actuator size and type are listed in Table 2-9.

When checking the lubricant for quantity, remove one of the upper pipe plugs (which one depends on the actuator orientation), and verify that the worm/worm gear interface is immersed in grease. If sampling for quality, a small plastic tube can be pushed into the lubricant and removed with a sample. As a precaution, any scum or film which may have collected on top of the grease underneath the pipe plug should be removed before inserting the plastic tubing. A small quantity should be removed and inspected for contaminants such as metal filings, dirt, and water.

Table 2-9 Lubrication Volume and Weight

ACTUATOR SIZE	VOLUME (GAL)	WEIGHT (LBS)
SMB/SB/SBD-000	0.5	3.5
SMB/SB/SBD-00	0.5	4.0
SMB/SB/SBD-0	1.0	9.5
SMB/SB/SBD-1	1.5	15.0
SMB/SB/SBD-2	1.75	14.5
SMB/SB/SBD-3	5.5	50.0
SMB/SB/SBD-4	8.5	75.0
SMB-4T	8.0	71.0
SMB-5	8.5	72.0
SMB-5T	7.5	65.0

On some SMB/SB actuators, the clutch housing is separated from the main actuator gearcase by an internal wall, and only the worm shaft bearing can pass grease. This style requires filling and checking the grease in the clutch housing as a separate and additional step.

The worse grease is normally found in the motor pinion cavity of the actuator when the actuator is installed normally (valve stem pointing upward), but may be in the housing if the motor is installed pointing downward. Water (when present) tends to collect in the lower part of an actuator.

It is recommended that lubricant not be checked by removing the housing cover because of the danger involved. The valve could be pressurized, which could force the drive sleeve out of the actuator and cause injury to personnel and/or damage to equipment. When lubricant is to be added, the type of lubricant existing in the actuator must be verified to assure adding the same type of grease. If the type is unknown, all the old lubricant must be removed before adding new. **CAUTION! GREASES SHOULD NEVER BE MIXED.**

Mixing different type greases can cause unknown or unexpected chemical reactions inside the actuator which can harm or render inoperable the mechanicals of the actuator. To change the lubricant, the actuator should be disassembled, cleaned with solvent, and the correct amount of the proper lubricant added to the actuator. The solvent must be compatible with the Buna-N and Viton seals in the actuator. The old grease should never be flushed out of the casing by forcing in new grease.

Limitorque Recommendations

For the SMB and SB, Limitorque's lubricant recommendations are:

1. Not corrosive to steel gears, ball or roller bearings.
2. Must contain an EP additive.
3. No grit, abrasive or filler present.
4. Suitable for the temperature range of the environment.
5. No separation at temperatures to 300° F.
6. Must not cause Buna-N or Viton to swell more than 8%.
7. Good resistance to moisture.
8. Good resistance to oxidation.

Limitorque's recommended lubricant is Exxon Nebula EP-O for unit sizes through SMB-4. This is a dark tan calcium complex grease. Prior to SMB/SB/SBD serial 295809, the recommended lubricant was Sun Oil Co. 50 - EP, a black lithium lead

base grease, which cannot be mixed with the EP-O. For nuclear service inside containment, Nebula EP-1, which has a higher temperature rating than Nebula EP-0, is used.

Lubrication frequency for the actuator is established by a grease sampling program to determine the proper cycle. Actuators operate in vastly different environments and cycles, some in high temperature areas, some in cold areas, some in wet areas. Some operate frequently, some hardly ever. The gearcase sampling frequency recommended by Limitorque is 18 months, or 500 cycles, whichever occurs first.

Limit switches in SMB/SB models have enclosed gears and the recommended lubricant is Beacon 325, which is a buttery tan grease with good clinging properties. Mobil 28, a red synthetic grease which can operate at temperatures up to 325°F, is an acceptable substitute. The Beacon 325 temperature limit is below that of the Mobil 28, which generally prevents the Beacon 325 from being used in nuclear service.

Limitorque's recommended frequency for limit switch gear set lubrication inspection is once every 36 months or 1000 cycles, whichever comes first. However, industry experience has shown that if the Limitorque actuator is lubricated at proper intervals, and the limit switch lubricated at the same interval, a

separate lubrication cycle need not exist for the limit switch.

In addition, if an SB actuator is disassembled for maintenance or overhaul, the SB stem nut splines should be lubricated to allow the stem nut to move inside the drive sleeve.

The motors should not require lubrication because the bearings are sealed and lubricated for the life of the motor. The shaft lip seals should be checked to ensure that housing lubricants don't enter the motor.

New MOV Lubricants

As stated earlier, Exxon Nebula EP0 and EP1 are the only lubricants qualified for nuclear service. However, Exxon has discontinued their Nebula EP lubricant product line. The nuclear industry has identified a new grease, MOV Long Life, for future use in Limatorque actuators for nuclear service. The goal is to apply one grease for the gearbox, limit switch, and even the valve stem/stem nut locations. The change from Exxon Nebula EP to MOV Long Life may not require complete removal of the old grease and might be mixed with Nebula to "top off" gearboxes when low lubricant levels are observed.

The conversion to MOV Long Life is ongoing. ANSI bench tests of the lubricant have satisfied the Limatorque lubricant recommendations listed earlier in this

section. Testing is underway by EPRI to evaluate the performance of MOV Long Life at the valve stem/stem nut interface. We are not aware of any plans to test the gearbox or limit switch applications.