

The effect of pressure on Closed System Lubricators

The purpose of this technical information sheet is to make end-users aware of the effect of pressure on a closed system lubricator on a sealed bearing housing that is not equipped with a Trico Expansion Chamber.

Trico offers two closed system lubricators, the **Closed System Opto-Matic®** and the **WATCHDOG®**. These lubricators should be used in environments that are contaminated with high humidity and/or airborne particulate, but may also be used to ensure maximum oil purity in indoor or clean environments. They help answer the question, "How can I improve the purity of my equipment's lubrication?". Both of Trico's offerings operate on the constant level lubrication principle. The most important difference between these products and vented constant level lubricators is that the air required to cause feeding when the oil level drops, comes from the pressure balancing line connected to the bearing housing.

Testing conducted at Trico has shown that both the Closed System Opto-Matic® and the WATCHDOG® will feed oil when the pressure differential between the air trapped in the top of the oil reservoir and the air in the bearing housing is greater or equal to ½ psi. This feeding is cyclic and will eventually stabilize, but the overall effect will be a higher oil level in the bearing housing than was originally intended. The dynamics of this cyclic feeding is as follows:

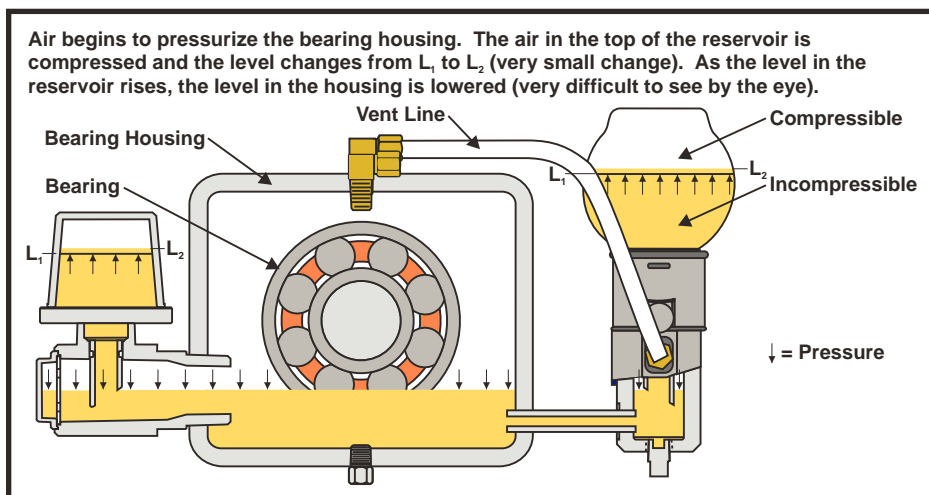


Figure 1

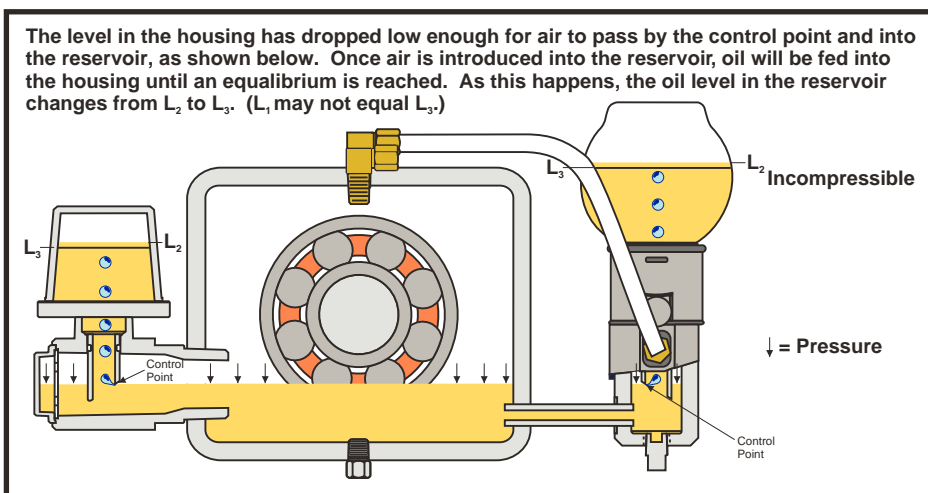


Figure 2



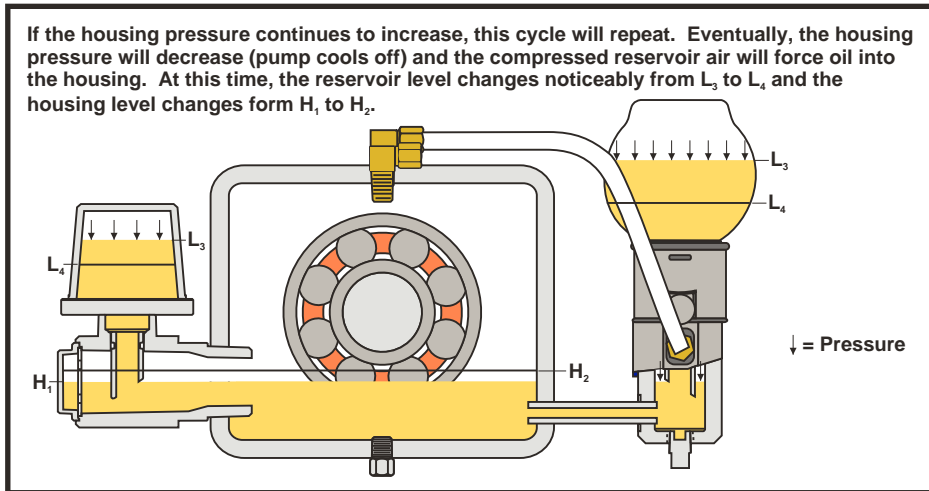


Figure 3

As the bearing housing goes from ambient (starting) temperature to steady state running temperature, a pressure rise will occur as the air molecules move faster. As the pressure rises, the air trapped in the top of the oil reservoir begins to compress and you will see a slight rise in the oil level in the reservoir (Fig. 1). As the pressure approaches ½ psi, the oil in the housing has been lowered enough for air to be introduced through the control point of the lubricator to cause a small amount of oil to feed. The control point is where the spout of the oil reservoir contacts the column of oil. The vertical location of this point dictates the oil level in the bearing housing (Fig. 2). After feeding has occurred, the oil level in the reservoir is at its starting level. This cyclic feeding will continue as the pressure rise in the bearing housing continues. When the equipment has been shut down and begins to cool, the pressure in the bearing housing will decrease and the compressed air in the top of the lubricator's reservoir will force more oil into the bearing housing (Fig. 3).

There are three styles of shaft-to-housing closures that make up the vast majority of bearing housing seals. They are as follows:

Lip Seals - Lip seals are typically made of an elastomer and have a circular spring that keeps the elastomer pressed against the shaft to prevent the entry of dirt and moisture. Testing conducted at Trico has shown that some lip seals will hold pressure less than or equal to 0.4 psi when the shaft is not rotating. The pressure holding ability of a lip seal should be expected to deteriorate as the elastomer of the seal wears from contact friction with the shaft. Consult the manufacturer for the pressure holding ability of a specific seal.

Labyrinth Seals - Labyrinth seals consist of two mating parts that form an intricate structure of interconnecting passes through which it is difficult for dirt and moisture to find its way to the bearing housing. This is only true while equipment is rotating due to the centrifugal forces created by the shaft. While static however, a labyrinth seal may permit dirt and moisture to enter the bearing housing. Consult the manufacturer for the pressure holding ability of a specific seal.

Lip/Labyrinth Hybrids - Lip/Labyrinth hybrids have gained in popularity. These seals combine the benefits of both the lip and labyrinth design. The lip seals upon the stator, in both static and dynamic applications, hermetically seal the bearing housing, thus preventing contamination from entering into it. Consult the manufacturer for the pressure holding ability of a specific seal.

The type of seal used on a bearing housing will play an important role in determining what closed system lubricator setup is right for your application. A properly sized expansion chamber will eliminate the pressure differential between the lubricator and the bearing housing. See Technical Information Sheet "Selection of expansion chamber" for further information.

