

# Automotive TechTips

**TIMKEN**  
Where You Turn

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Maximizing bearing performance and life remains an objective throughout The Timken Company, from design teams and manufacturing associates to our field sales team and distributors. TechTips help you install and maintain Timken® bearings, seals and components to maximize their life and performance and the systems in which they operate. For more information regarding Timken automotive products and services, visit [www.timken.com](http://www.timken.com) or contact your local Timken distributor.

## INADEQUATE GREASE LUBRICATION IN BEARINGS: WATER CONTAMINATION AND DEBRIS CONTAMINATION



The life of a Timken® bearing depends to a great extent on the proper lubrication of the bearing. Lubricants aid in carrying away heat, protecting bearing surfaces from corrosion and reducing friction.

Statistics show that nearly 50 percent of all bearing damage can be attributed to inadequate lubrication. Although a very broad term, inadequate lubrication can be classified into eight basic categories: **1) overfilling, 2) underfilling, 3) incorrect grease, 4) mixing**

**greases, 5) incorrect lubrication systems and intervals, 6) worn-out grease, 7) water contamination, and 8) debris contamination.**

The following offers a quick reference to two of these eight basic categories: **water contamination and debris contamination.**

### Water Contamination

Fig. 1 shows the effect of water on grease by comparing fresh grease (left) to a grease emulsified with 30 percent water (right). The fresh grease



*Fig. 1 - Effect of water on grease.*

is smooth and buttery compared to the water laden grease, which is milky white in appearance. As little as 1 percent water in grease can have a significant impact on bearing life.



**Fig. 2 - Etching**

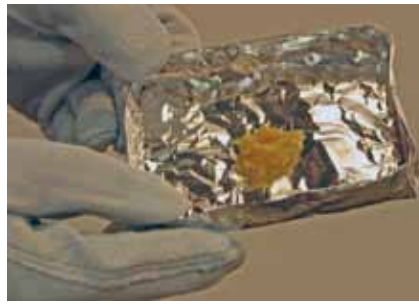
A tapered roller bearing cone and rollers (Fig. 2) and a ball bearing outer race and balls (Fig. 3) show rusting with pitting and corrosion from moisture/water exposure. This condition is referred to as etching.



**Fig. 3 - Etching**

### Quick & Easy Field Test to Determine Water in Grease

An easy, non-technical method of determining the presence of water in grease is known as the 'crackle test.' To perform this test, place a sample of grease on a piece of aluminum foil (Fig. 4) and put a flame under the foil (Fig. 5). If the grease melts and lightly smokes, the presence of water is minimal or absent. However, if the grease crackles, sizzles and/or pops, the grease contains a considerable amount of water. *See warning below.*



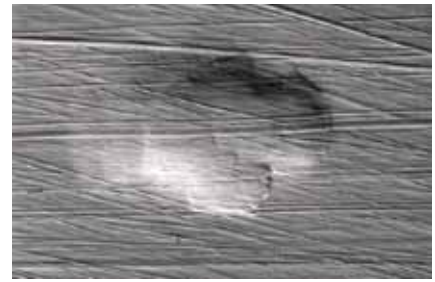
**Fig. 4 - Grease sample**



**Fig. 5 - Crackle test**

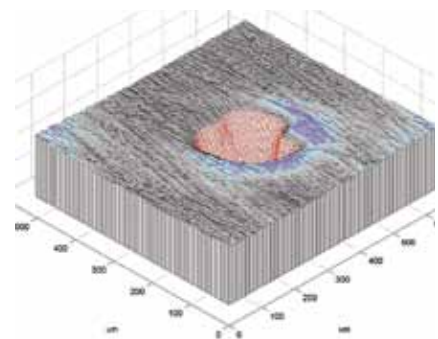
### Debris Contamination

Common causes of external debris contamination include dirt, sand and environmental particles. Common causes of internal debris contamination include wear from gears, splines, seals, clutches, brakes, joints and failed or spalled components. These hard particles travel within the lubrication, through the bearing, and eventually bruise (dent) the internal surfaces. The dents form shoulders that act as surface-stress risers, causing premature surface damage and reduced bearing life.



**Fig. 6 - Debris contamination**

Fig. 6, a photo taken using a microscope, shows a debris contamination bruise on a bearing race. A corresponding surface map of the dent is shown in Fig. 7.



**Fig. 7 - Surface map**



**Fig. 8 - Spalling**

Fig. 8 shows a tapered roller bearing inner race (cone) with spalling from debris contamination bruises.

**⚠ WARNING Failure to observe the following warnings could create a risk of serious injury.**

Proper maintenance and handling procedures are critical. Always follow installation instructions and maintain proper lubrication.

Never spin a bearing with compressed air. The rollers may be forcefully expelled.

Heated grease or water may create a risk of burns or eye damage. Wear suitable personal protective clothing, including eye protection and gloves, when performing a crackle test.

*TechTips is not intended to substitute for the specific recommendations of your equipment suppliers. Every reasonable effort has been made to ensure the accuracy of the information contained in this writing, but no liability is accepted for errors, omissions or for any other reason.*

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