



Issue 18: The Difference Between True and False Brinelling

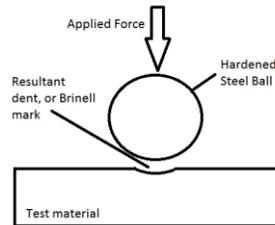
Note from Author: I wrote this article back in 2012 and it was only seen by those receiving our mailings. Now that we have gone digital with email and posting on our website we felt it was time to roll out all of my older articles. They are still relevant and I hope you enjoy! --Bud

In my years of dealing with bearing failure I have heard the term brinelling used over and over with the relationship of being true or false. It's not a question of whether or not the dent mark exists; the word true or false is defining if the dent mark is a result of the materials elastic limit being exceeded. In this short article I will try my best using as few as possible engineering terms to explain.

First we need to review what these terms mean:

Brinell Mark is the mark left in metal which is created by another piece of metal (or hard object.)

Brinell Hardness is a scale designed to define the hardness of a material. This is measured by pressing a hardened ball into a material and measuring the brinell mark.



Pic 1: Concept of Brinell Hardness

Brinelling is the term that refers to the indentation caused by impact or contact with a hard object.

So then what is True Brinelling?

True brinelling is a dent or brinell mark caused by contact stress that is above the allowable material limit. The estimated amount of pressure to leave a dent that is 0.0001 times the size of the rolling element is 609,000 psi in ball bearings and 580,000 psi in roller bearings. Some may argue plus or minus some, but for sake of argument I am using these numbers. To demonstrate the feeling of how much pressure is required to leave a dent I took a clean raceway (outer ring) and used a ceramic (Si_3N_4) knowing it is harder material and will not deflect as much as normal bearing steel. I placed the outer ring in a vice, placed the ball on the raceway and struck it with a ballpeen hammer; it took some pretty massive blows to even leave a mark.



Pic. 2: Ceramic ball in raceway, and resulting damage.

So then what is False Brinelling?

False brinelling is damage that is caused by fretting that may or may not include corrosion, and looks very similar to True Brinelling. Fretting is wear damage that is caused by metal to metal contact, under load and experiencing repetitive surface motion (vibration.) Under high magnification a false brinelling mark appears like small scratches.



Pic 3: False brinelling looks more like particle scratching.

The most famous examples of false brinelling were the shipment of automobiles in the 30's. The vibration caused by the train cars passing over the track joints caused false brinelling of the wheel bearings.

Conclusion:

Now We Got It!

The conclusion is that although both dents look similar to the human eye, under magnification we can see the difference and they are very different. True Brinelling is caused by exceeding material load limits and False Brinelling is micro scratches caused repetitive motion (vibration.)

