KOLLMORGEN
Electro-Optical

7/14/2003

From: **Jeff Knox**
To:
Subject: **Monel/Stainless Galling Tests**

Background

A large diameter Monel 400 Coupling Ring (7.1875-32 UNS 3B threads) was severely galled after being assembled repeatedly to the 304 stainless mating part (submarine periscope Outer Tube, 7.1875-32 UNS 3A threads). Both materials have significant nickel composition, similar hardness, and an oxide film. These surface properties probably lead to adhesive wear conditions, and with high thread loads generated by very tight fitting class 3 threads, severe adhesive wear (galling)

Test Objective

The purpose of the test was to rank the galling threshold of material couples simulating the stainless steel/monel combination used on the Outer Tube/Coupling Ring joint. This material couple was then compared to the stainless steel/monel couples using various lubricants. Standard Test Method ASTM G98 provided the procedure for testing. It is “designed to rank material couples in their resistance to the failure mode caused by galling” and further is applicable to “ sliding systems that are slow moving and operate intermittently. The galling and seizure of threaded components is a classic example which this test method most closely simulates”.

Test Procedure

The test procedure is simple. Half inch diameter monel “buttons” were loaded in compression against a stainless steel block. The button was then rotated through 360 degrees, the material couple was unloaded, separated and checked for evidence of galling. This procedure was repeated for various loads until a transition between galling and no galling was determined. Figures 1-3 show the overall test set-up and an example of a galled material couple.

Figure 1. Instron Compression Test Machine

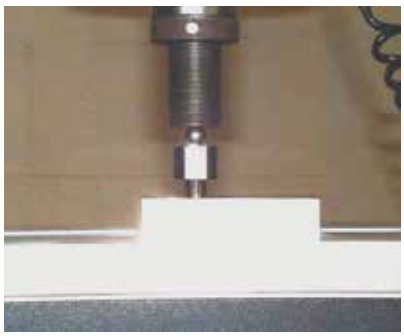
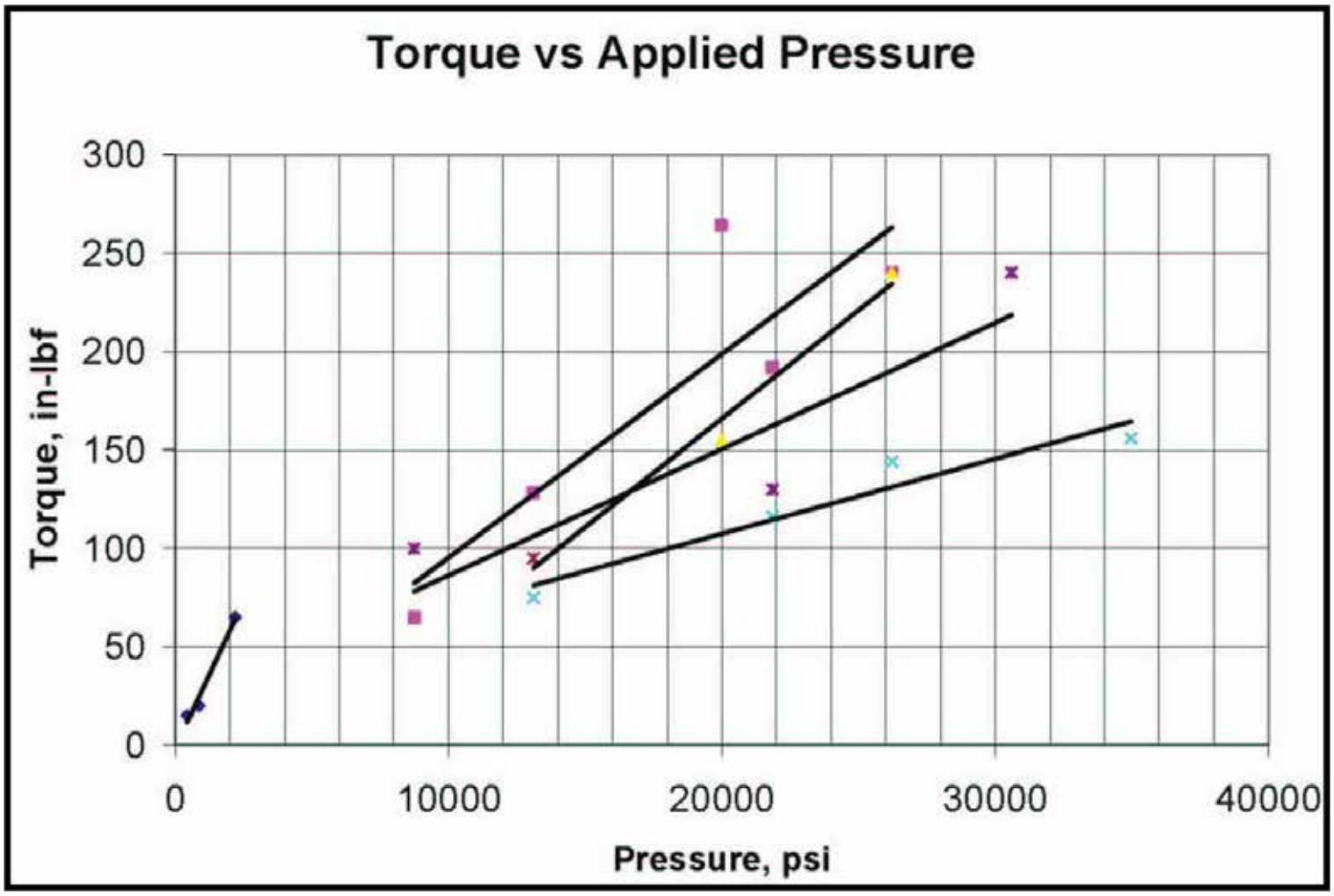


Figure 2. Monel Test Button and Stainless Steel Block in Test Machine

Figure 3. Galled Test Button and Block

Test Results

The following graph shows applied load (contact pressure) vs torque required to rotate the test
button through 360 degrees. Torque is an indicator of shear stress at the contact surface and
therefore high torque is a by-product of galling.

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