



# Transmission & Bearing Corp.

A Division of Turbo Research, Inc.

## Technical Note from Dr. Mel

*In the past, Technical Notes on a variety of interesting rotating machinery subjects from Dr. Mel were issued three to six times a year using fax distribution method. Now, the PDF file method of presenting attachments to email has been perfected to make it possible to transmit easily this valuable information to members of the family of rotating machinery engineers.*

### **New Steam Turbine Rotors Use TRI Bearings**

In recent years, new HP, IP, and HP/IP steam turbine modules have been introduced that significantly increase the power that can be developed by a steam turbine. TRI has developed a version of its TRI Align-A-Pad® Bearing that improves the rotor-dynamic performance of these steam turbine rotors thereby permitting the steam path design to be further optimized. [\[Read More about TRI Bearings\]](#)

### **Alignment Issues of Babbitt Bearings**

One of the principal failure modes of Babbitt bearings is end-loading. This occurs for several reasons: 1. Journals are tapered when hot and in service, and when they trip out and run down, the tapered journal rubs against a bearing that was set for non-tapered journal, and wears the end of the bearing, often wiping the Babbitt. 2. When sliding pedestals or standards slide and twist instead of sliding straight, or tilt due to broken grout, the bearings are no longer aligned to the journals, and the bearings wear or wipe, depending upon severity.

### **TRI Resolved Problem of Repeatedly Damaged Bearing Due to a Tilting Front Standard**

TRI provided a "Turnkey" Solution to this Problem. Over the years, the overhung combined journal and thrust bearing of this steam turbine suffered repeated failures of the bearing which damaged the journal surface. It was known that the front standard tilted and slid irregularly, and that the soleplate was bowed. After trying the typical first solutions, without success, of improving the greasing of the standard, and then changing the loading on the bearing first higher loading and then lower loading, also without success, TRI was approached to resolve the problem. TRI's engineering and experience rapidly developed this solution: 1. Remove Standard and Soleplate, 2. Recondition the Sliding Surfaces, 3. Carefully Level and Regrout the Soleplate, 4. Reinstall the Sliding Standard, and 5. Install a new Combined TRI Align-A-Pad® journal bearing and fully equalizing thrust bearing. TRI Consulting Engineering services designed the complete bearing for this application and directed the site activities during the outage, from how to support and lift the turbine shell prior to removing the standard and soleplate through start-up. TRI Shops built the Combined Journal and Thrust Bearing and performed the reconditioning work during the outage. Now many years have gone by with no more issues.

### **30,000 MW of Generation on TRI Bearings**

The TRI Align-A-Pad® Bearing design was developed in the early 1980s to resolve a series of very difficult rotor vibration and bearing damage problems of large steam turbine - generators. Over the years, most of TRI Align-A-Pad® Bearings have been installed to resolve these kinds of problems. Today, several of these bearings are being installed with new steam- turbine rotors to gain the demonstrated advantages of these heavy duty bearings from the beginning of service. In twenty years, these bearings have been installed in an astounding 30,000 MW of electrical generation, a very significant portion of the US baseload power.

### **Making Rotor & Bearing Alignment Moves Easily**

A large number of bearings for steam turbines have "alignment pads" mounted on the outside of the bearing housing that seat against the bore of a pedestal or standard. Almost all of these alignment pads have only shims that move the pads in or out on the bearing, and these are used to make the bearing go up or down, or to the left or right. As a standard part of the alignment of a string of turbine rotors, the shims are changed and then the alignment blocks are "scraped in" by hand. This takes days to do, sometimes as much as a week. TRI bearings use "alignment pads" with two types of shim packs: Type 1. standard radial shim pack that moves the alignment pad in or out, Type 2. two tangential shim packs, one pack on each side of the alignment pad. The use of both types of shim packs permits precise movement of the bearing housing in any direction according to a table of changes while maintaining full contact of the alignment pads on the pedestal bore without any hand scraping. This feature adds cost, but it has shortened outages by several calendar days. We are told "they pay for themselves before the turbine is on line."

### **TRI Align-A-Pad® Bearings from 4" to 28"**

TRI Align-A-Pad® bearings are made in five or six pad configurations, from 4 inch diameter to 28 inch diameter, and can be made larger. A proven use of the five-pad version, two pads down, is for very heavy loads. This bearing design has been used for 1800 rpm LP turbines. Because each tilting pad has the ability to twist and to tilt, the pads remain aligned to the journal and avoid end loading problems, while the LP hoods tilt due to vacuum loading.

### **TRI Makes House Calls.**

Call us to discuss your rotating machinery problems. We are available to resolve your maintenance and upgrade problems.

This Technical Note was written by Dr. Melbourne F. Giberson, P.E., President of TRI Transmission & Bearing Corp., Turbo Research, Inc. The objectives are to disseminate useful information on understanding problems and how they have been solved. We attempt to send this Technical Note to only those people for whom the information could be useful. Over the years, many people have asked to be added to the distribution list. However, occasionally, a few individuals inform us that they do not wish to receive the information. Should you desire not to receive future Technical Notes, please advise TRI by [info@turboresearch.com](mailto:info@turboresearch.com) MFG 4/2003