



Preamble:

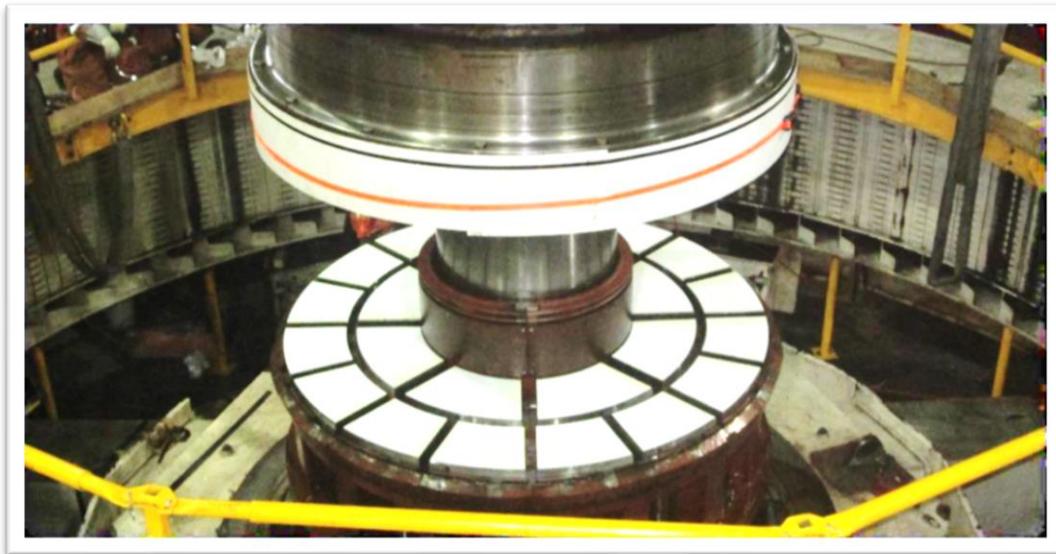
A 2018 inspection reveals very little wear has occurred to the 3,000,000+ lb capacity PTFE bearing that was installed in 2003. The bearing upgrade in 2003 from babbitt to PTFE was conducted due to repeated bearing failures which had occurred every 2 to 5 years. This bearing conversion was one of North America's first PTFE bearing installations and has not had any failures over the last 15 years.

Hydro Tech recently completed an inspection of the PTFE bearing and is pleased to report that very little wear has occurred, and projects "a further wear life of 70 years or more".

Site Unit #1

PTFE Thrust Bearing Inspection

after 15 years of service



Inspection Date: May 31, 2018

Heavily Loaded PTFE Thrust Bearing Shows Little Wear After 15 Years

In May 2018, Hydro Tech inspected a set of PTFE (PolyTetraFluoroEthylene) thrust bearing pads after the first fifteen years of service. These bearing pads were supplied in 2003, as an upgrade to the Babbitt bearing pads originally used in the 1400 tonne [1500 ton] thrust bearing which had experienced repeated failures every 2 – 5 years. While most thrust bearings see between 2 – 3 MPa [290 – 435 psi] of average pressure acting on the bearing surface, the pressure acting on this bearing is more significant at 4.4 MPa [640 psi]. Thus, the bearing is more susceptible to damage due to irregularities during operation, such as oil contamination or over-speed events. Whereas Babbitt bearing liners tend to fail outright during harsh operating conditions, PTFE bearing liners are designed to wear over time, and so are machined with wear indicators to estimate the remaining service life of the PTFE. In this case, despite some instances of heavy scoring which may have caused a failure in conventional Babbitt bearing pad, very little loss of the indicators was observed.

In this particular thrust bearing, there are two rows of pads: sixteen on the outer diameter and eight on the inner diameter. Four of the outer bearing pads and two of the inner bearing pads are machined with two indicators each: one near the outer diameter and one near the inner diameter, both towards the trailing edge of the pads. The indicators consist of four concentric circular grooves, with depths starting at 0.05 mm [0.002"] on the outside and incrementing in 0.05 mm [0.002"] steps to 0.20 mm [0.008"] for the innermost groove. Once the 0.20 mm groove can no longer be observed, the pads must be replaced or resurfaced to restore their leading and trailing edges.

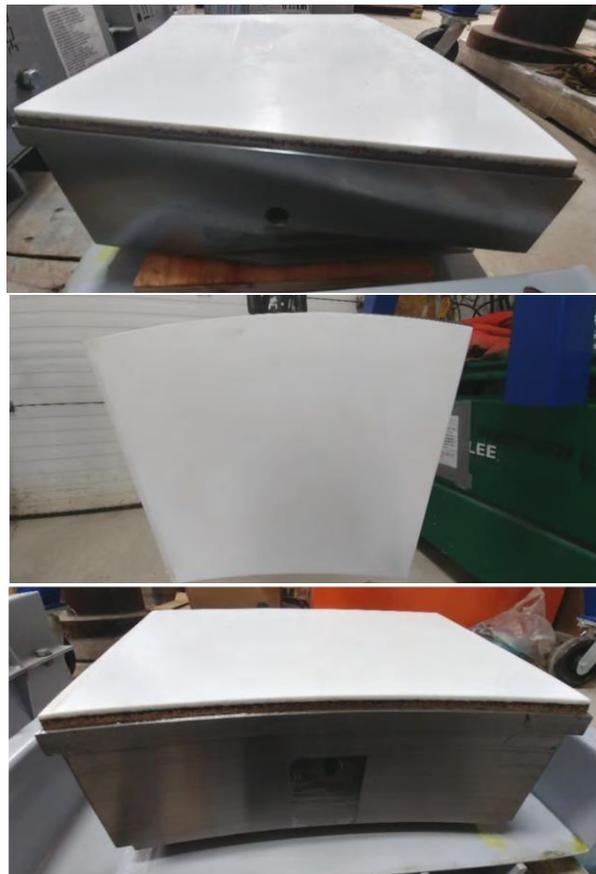
The inspection revealed three key points:

- Measurements indicated that the current wear was 0.035 mm [0.0015"] after 15 years of service. At this wear rate, the bearing pads had approximately 70 years of service life remaining before replacement / resurfacing would be required.
- Dimensional inspections indicated that the pad parallelism and overall thicknesses were still within the original manufacturing specification.
- The visual inspections did not reveal any serious defects, such as crack indications on the PTFE surfaces or at the liner-shoe interface. As noted above, heavy grooves were observed on some of the pads, likely caused by contamination of the bearing oil. This localized damage did not affect the condition of the rest of the pad, and no remedial action was required.

Thus, the inspection was able to conclude that the PTFE bearing pads had performed very well in their first fifteen years of service, under conditions that had caused the original Babbitt bearing pads to repeatably fail. They were returned to the client, ready for re-installation and another 70 years of use.



Typical Wear indicators on PTFE thrust bearing pads



As Found Condition of Typical PTFE Pad