TURBINE TIPS
Turbine Tips provided by **Pond and Lucier, LLC.** ®
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January 2003

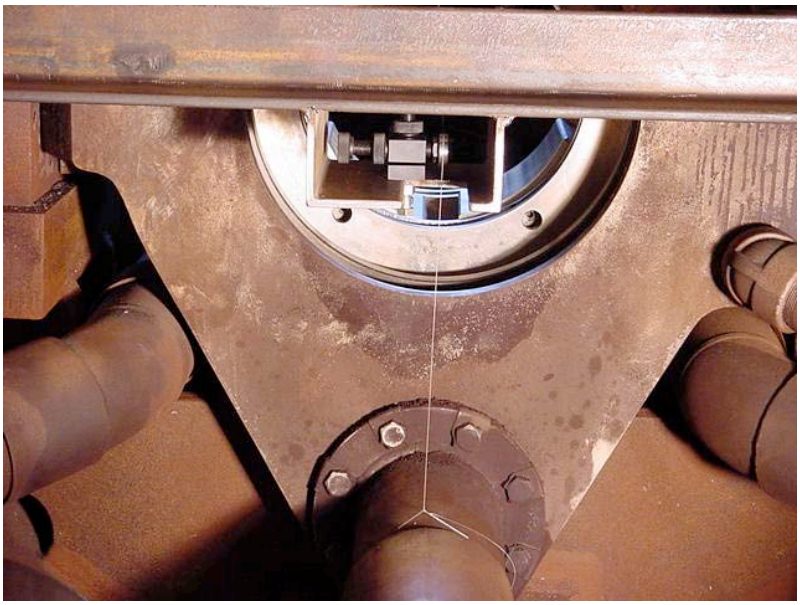
Concentricity is important to all rotating machinery. A high-speed rotor needs to rotate as concentric as possible with the internal stationary components of the turbine. Such internal components as diaphragm seals, shroud blocks, oil deflectors and bearing seals need to be concentrically aligned to preclude interference while minimizing radial leakage.

The internal alignment of the gas turbine should be considered at every major overhaul. It is crucial to correct the concentricity of the parts to prevent vibration and blade or bucket tip rubs. If a nozzle assembly is not properly set concentric to the rotor, the seals will be rubbed as the rotor turns and efficiency will be lost. On a frame 7 gas turbine, should bearing seals or oil deflectors be improperly set to the rotor, oil will leak axially along the shaft causing compressor fowling (#1 bearing) or compartment fires (#3 bearing in the load tunnel.)

Internal alignment usually fits well in an overhaul schedule where the turbine and/or the compressor rotor are sent off site for work. The performance of an internal alignment requires that all turbine casings be cleaned and mating casing halves need to be installed with dowels in place and bolted. Casing joints and bolts must be cleaned anyway; therefore, the only extra time required by the alignment is in the installation and later the removal of the upper-half casings. Since the rotors are sent off, there is usually little impact on the outage schedule.

Internal alignment can be done using tight wire or laser to set a reference to the factory-specified ***centerline*** of the turbine. Bearings and other internal parts can then be adjusted to their factory-specified locations using the reference wire or laser. The tight wire method is often favored because casing dimensions can be taken to determine “out-of-round” conditions.

30-pound weight ensures correct wire sag; fixture sets proper wire position

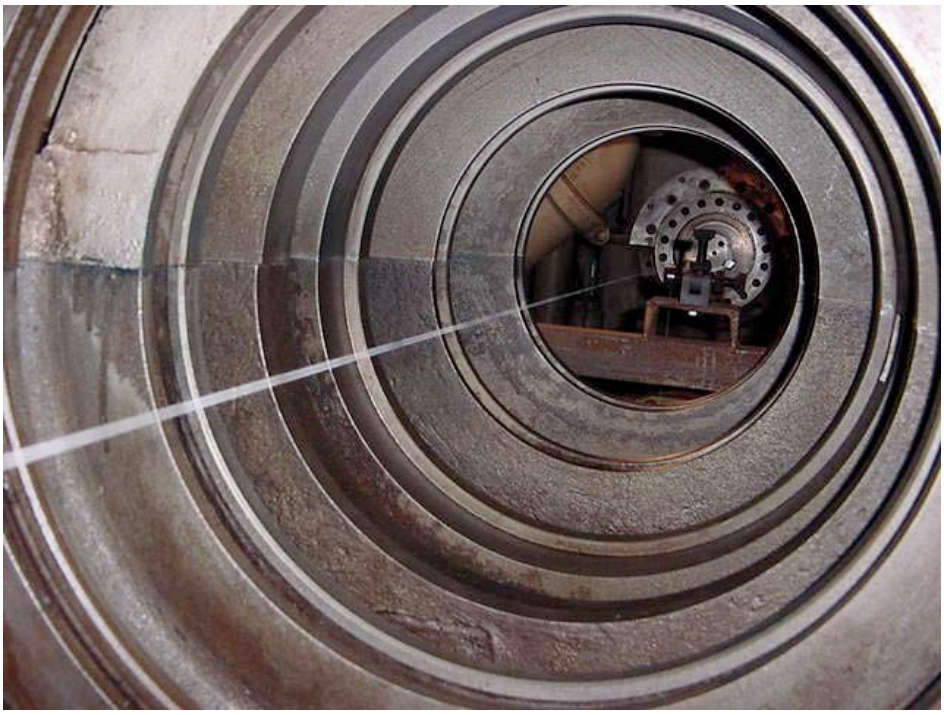


Wire is tied off at the other end of the turbine; fixture is used to set proper wire position

The wire is stretched though the casings simulating the centerline of the rotor. Radial measurements are taken so as to assure the concentricity of the internal parts. In effect, the tight wire assumes the theoretical centerline of the rotor as it is properly stretched using a 30-pound weight. Components are then shimmed and moved with respect to the casings so as to be set perfectly concentric to the wire. A wire "sag chart" allows the alignment engineer to account for the natural ***droop*** of the wire. That is, the wire ***sags*** slightly (thousands of an inch) between the bearing spans while in the alignment rig, which must be accounted for in the calculations regarding where a stationary component is set.

The pictures included herein depict an alignment done using wire on both a Frame 7B and 7E.

When the turbine is reassembled with the reworked rotors and a fresh internal alignment, vibration should be minimized as the rotor runs "smooth as silk."



Wire running through #1 bearing on a Frame 7E

Wire running through the compressor, inner barrel lower half and #2 bearing on a Frame 7E

Audio Micrometer used to take radial measurements from wire to bearing housings, etc.

If you have any questions about how to properly internally align a gas turbine, please contact ***PAL Engineering*** for assistance.