walco

Keeping Industry Productive

Industrial Power Systems

Never Underestimate the Power of Total Commitment

Laser Alignment

Reduce Unplanned Downtime and Operating Costs

Alignment

Condition Monitoring

RPM	Angular Misalignment Mils per in. .001/1 in. Excellent	Acceptable	Offset Misalignment Mils .001 in. Excellent	Acceptable
3600	0.3/1 in.	0.5/1 in.	1.0	2.0
1800	0.5/1 in.	0.7/1 in.	2.0	4.0
1200	0.7/1 in.	1.0/1 in.	3.0	6.0
900	1.0/1 in.	1.5/1 in.	4.0	8.0

Symptoms of Improper Alignment

- Premature bearing, seal, shaft, or coupling failures
- Excessive radial and axial vibration.
- High casing temperatures at or near the bearings or high discharge oil temperatures
- Excessive amount of oil leakage at the bearing seals
- Loose or broken coupling bolts
- Unusually high coupling failures
- Excessive amounts of grease (or oil) on the inside of the coupling guard

Laser Alignment is critical to the installation of any motor, pump, or gearbox. Proper alignment will increase the life of bearings and seals. Laser alignment is not limited to an installation. Over time changes can occur due to thermal growth.

Annual Monitoring is Recommend

Contact Us:
303 Allens Avenue Providence, RI 02905
800-521-6505 Fax 401-941-4451
www.walcokip.com

Understanding Shaft Alignment

What is shaft alignment?

Shaft alignment is the positioning of the rotational centers of two or more shafts such that they are co-linear when the machines are under normal operating conditions. Proper shaft alignment is dictated by the proper centers of rotation of the shaft supporting members (the machine bearings).

There are two components of misalignment—angular and offset.

Offset misalignment, sometimes referred to as parallel misalignment, is the distance between the shaft centers of rotation measured at the plane of power transmission. The units for this measurement are mils (where 1 mil = 0.001 in.). Angular misalignment, sometimes referred to as "gap" or "face," is the difference in the slope of one shaft, usually the moveable machine, as compared to the slope of the shaft of the other machine, usually the stationary machine. The units for this measurement are comparable to the measurement of the slope of a roof (i.e., rise/run). In this case the rise is measured in mils and the run (distance along the shaft) is measured in inches. The units for angular misalignment are mils/1 in.

Shaft alignment tolerances

Historically, shaft alignment tolerances have been governed by the coupling manufacturers' design specifications. The original function of a flexible coupling was to accommodate the small amounts of shaft misalignment remaining after the completion of a shaft alignment using a straight edge or feeler gauges. Typically this value is given as an absolute value of coupling face TIR (as an example, a specification might read "face TIR not to exceed 0.005 in."). It should be noted that the tolerances offered by coupling manufacturers are to ensure the life of the coupling with the expectation that the flexible element will fail rather than a critical machine component.

Harmonic forces are dangerous

When shafts are misaligned, forces are generated. These forces can produce great stresses on the rotating and stationary components. The bearings and seals on the machines that are misaligned will most certainly fail under these conditions. Excessive shaft misalignment, say greater than 2 mils for a 3600 rpm machine under normal operating conditions, can generate large forces that are applied directly to the machine bearings and cause excessive fatigue and wear of the shaft seals. In extreme cases of shaft misalignment, the bending stresses applied to the shaft will cause the shaft to fracture and break.

Bearing life expectancy

The most prevalent bearings used in machinery, ball and roller bearings, all have a calculated life expectancy, sometimes called the bearing's L-10 life— a rating of fatigue life for a specific bearing. Statistical analysis of bearing life relative to forces applied to the bearings has netted an equation describing how a bearing's life is affected by increased forces due to misalignment. As the force applied to a given bearing increases, the life expectancy decreases by the cube of that change.

For instance, if the amount of force as a result of misalignment increases by a factor of 3, the life expectancy of the machine's bearings decreases by a factor of 27.