



**PUMPS THAT EXPERTS SELECT.**

## Thermography- Mechanical Applications for PPM Infrared Thermography for PPM

With increasing demand to cut costs and remain competitive, many companies are expanding their maintenance programs to include predictive and proactive technologies such as infrared thermography.

Recent years have seen an increase in the acceptance and use of infrared thermography for preventative and predictive maintenance. While early applications were confined primarily to electrical and structural situations, today's industrial environment has found new and diverse applications for thermal imaging and noncontact temperature measurement.

A study performed to investigate the effects of shaft misalignment on the performance of flexible couplings and bearings, and how technologies can be used to detect problem conditions.

The study goals included:

- to discover the most efficient means of identifying misalignment problems in flexible coupling systems
- to isolate the source of heat energy in a coupling (conduct/reflection vs. misalignment)
- to identify multiple approaches to problem identification
- to identify problems associated with over and under tension of belt driven mechanical systems, as well as ramifications of over lubricated bearings
- to quantify over consumption of power, if any, in misaligned systems

Each coupling mounted between driver and load was subjected to a number of 10 minute test runs at controlled amounts of misalignment. Misalignment was measured in three ways: parallel, angular, and combination. Thermographs show that the motor and coupling temperature rises as shaft misalignment increases.

The study produced the following general conclusions and recommendations:

- In nearly every case evaluated, axial vibration was higher than radial vibration, confirming the rule that misalignment should be considered a possible cause when axial vibration is as much as 50% of the radial vibration.
- Sometimes misalignment causes high vibrations at 2X rpm. Results indicate the response characteristics depend on coupling design and speed.
- Coupling design definitely impacts the amplitude of vibration in the presence of various misalignment conditions.
- Data indicate that spectral data normally associated with a severe looseness condition (many harmonics of running speed) may actually be due to the effects of misalignment, especially in chain coupling applications.
- Misalignment must not be diagnosed from spectral data alone. Though spectral characteristics may provide clues that misalignment may be the problem, but phase data or ancillary technologies should be used to confirm misalignment. Future research efforts should incorporate the use of phase data in order to evaluate these effects as misalignment is introduced.
- The effects of bearing condition on results could not be evaluated for this study. Future research is warranted.

As components begin to fail, a change in the original sonic signature occurs. This change can be detected with an ultrasonic detector that translates ultrasound down to the audible range as translated signals are noted on a built-in meter or recording device like the Ultraprobe 2000 portable ultrasonic inspection instrument. Overall the study suggests that the best use for using ultrasound for the purpose of coupling misalignment inspection, would be as a quick sorting device in the airborne mode for detecting problems by the loudness level of the coupling/

Coupling Types:

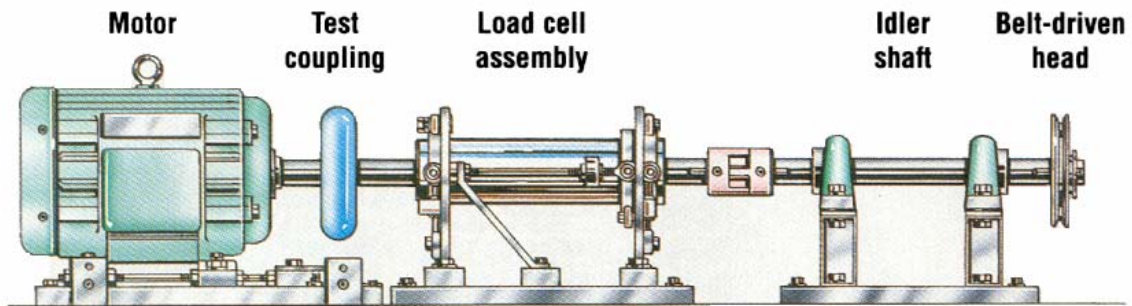
- Jaw

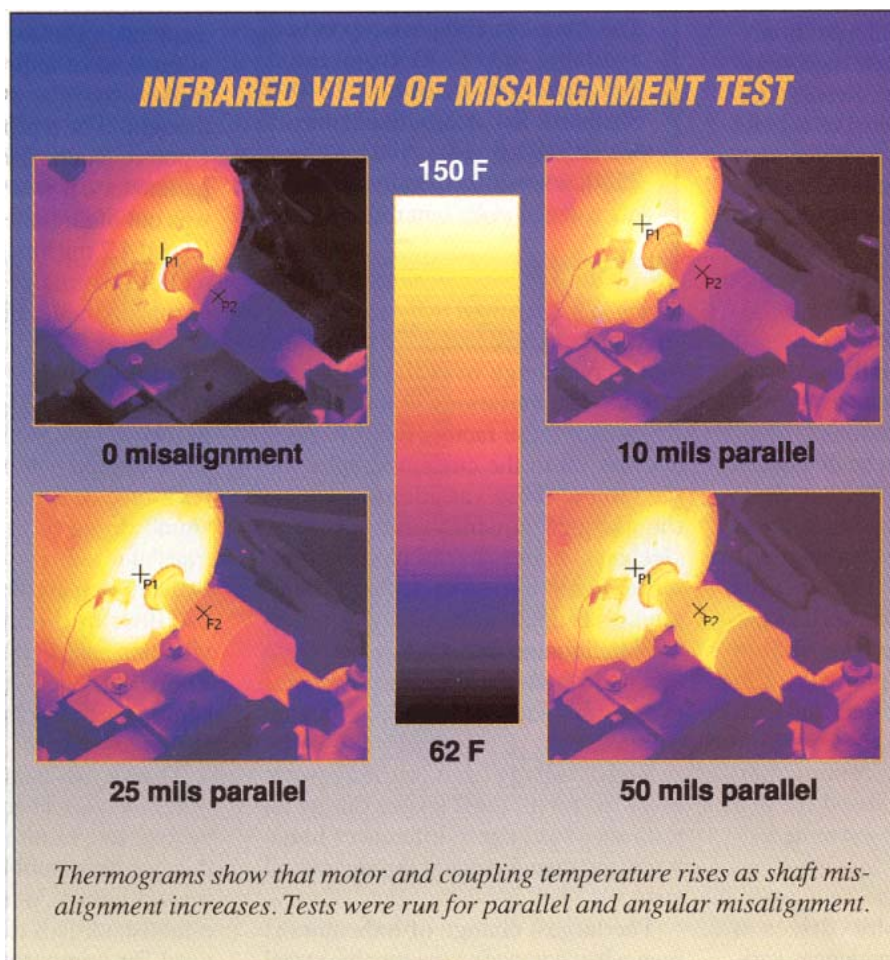
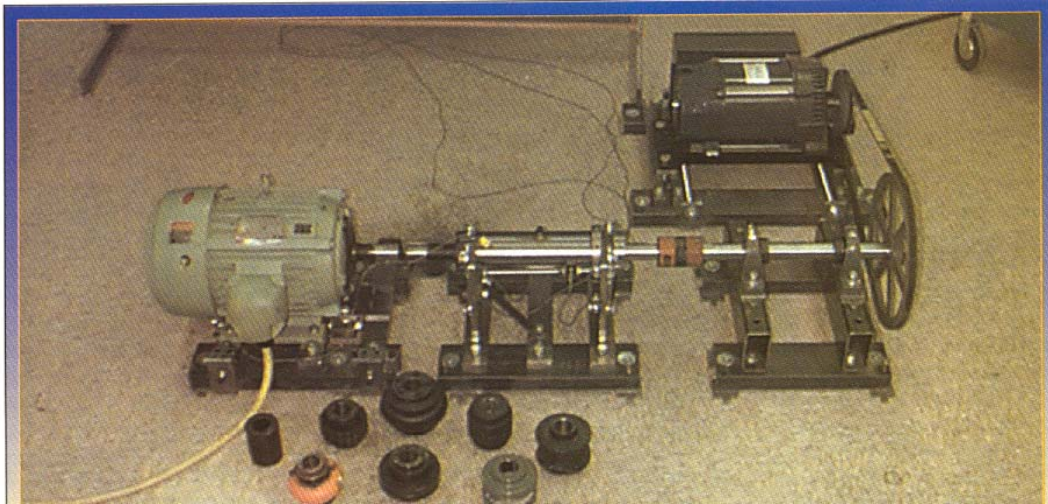
- Enclosed Insert
- Fluted Sleeve
- Gear
- Chain
- Plastic Toroid
- Rubber Toroid
- Grid

Alignment of the shafts at the coupling are shown in the table below:

Test Run	Offset, mils	Angularity, mils
1	0	0
2	10	0
3	25	0
4	50	0
5	0	0.1
6	0	0.5
7	0	1.0
8	0	2.0
9	0	5.0

### ***OVERVIEW OF TEST SETUP AND PROCEDURES***





The 160 page report is available from the Infraspction Institute, [www.infraspction.com](http://www.infraspction.com), 802-985-2500

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