Pepper Maintenance®

The Hottest Name in Reliability!

Specializing in Reliability-Centered Maintenance

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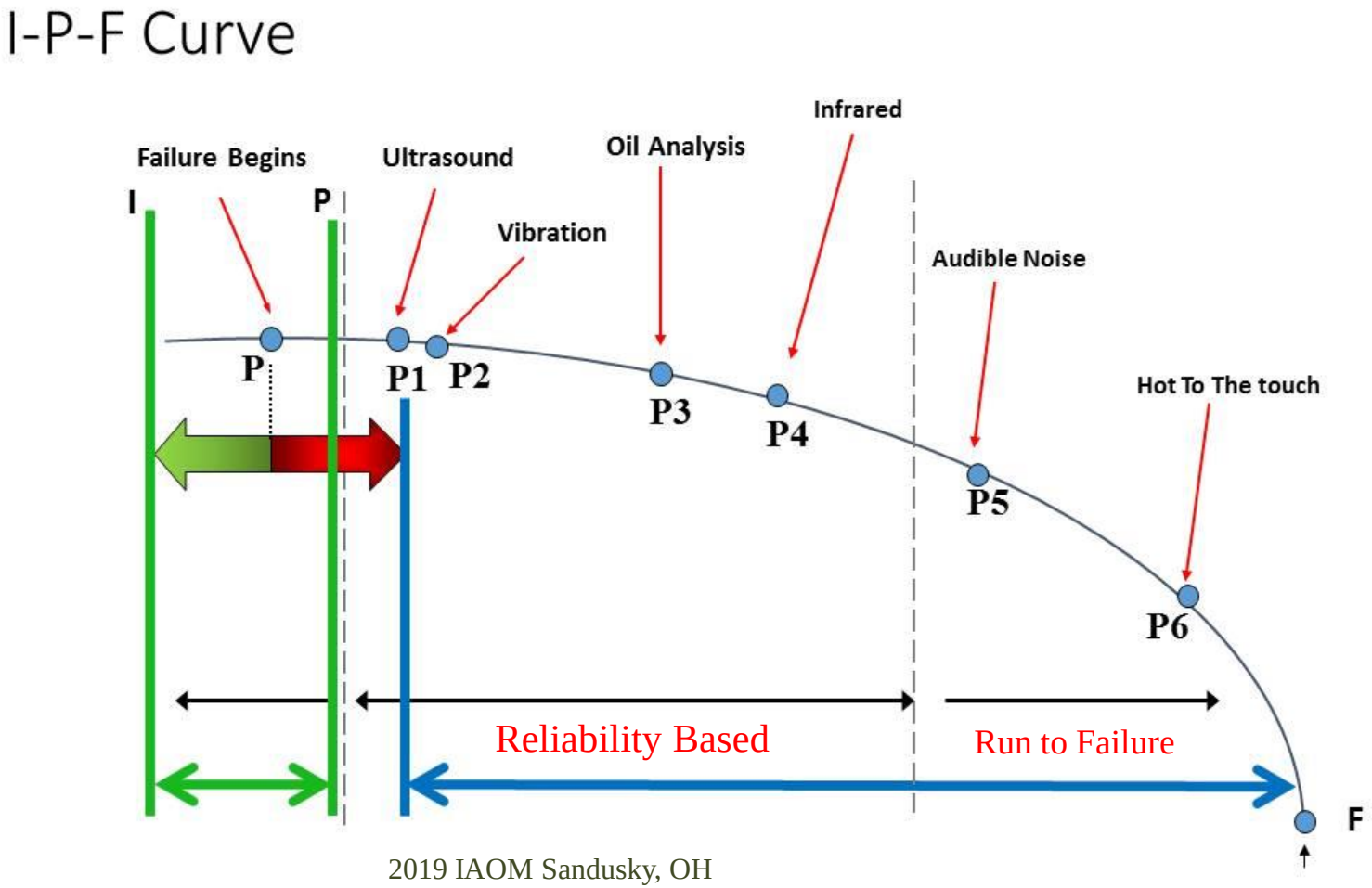
Level II Thermographer
Category II Vibration Analyst
Certified in Precision Alignment / Balancing
SMRP Member

Traditional Failure Curve



The Tools to Reliability:

Infrared Thermography

- Discover electrical resistance problems
- Discover electrical overloads
- Discover power circuit imbalance
- Discover mechanical problems

Vibration Analysis

- Discover bearing wear & alignment
- Complements Infrared Thermography

Laser Alignment

- Give equipment the best chance

Ultrasonic Services

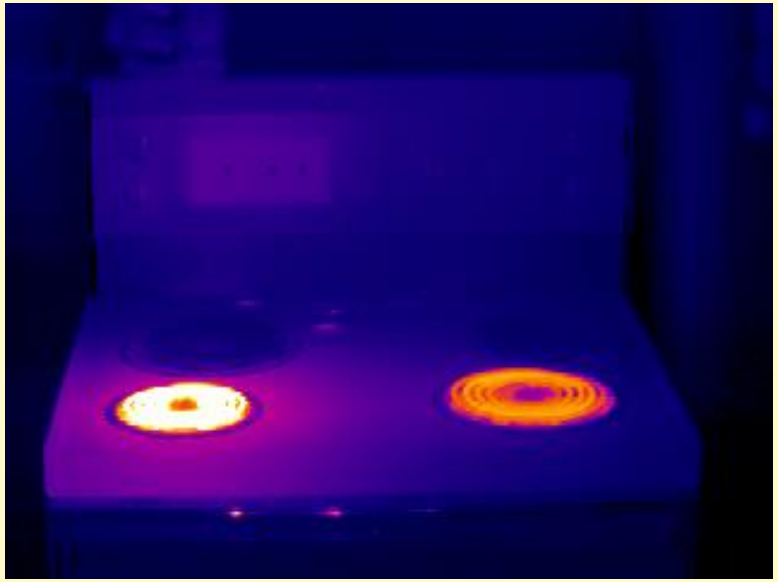
- Airborne electrical inspections
- Compressed air system leak surveys
- Bearing Lubrication

Motion Amplification

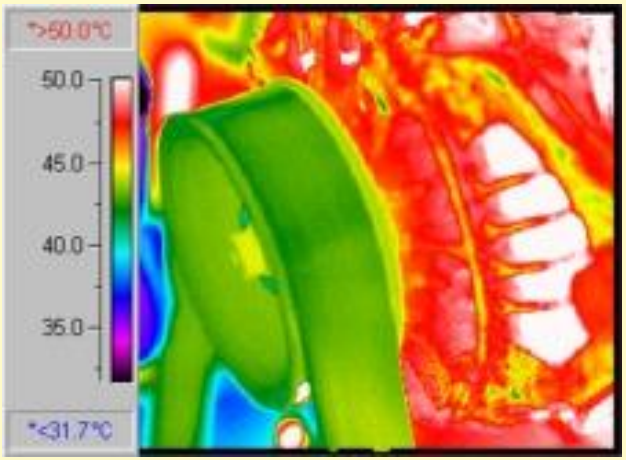
- Visual Vibration and movement

WHAT IS THERMOGRAPHY?

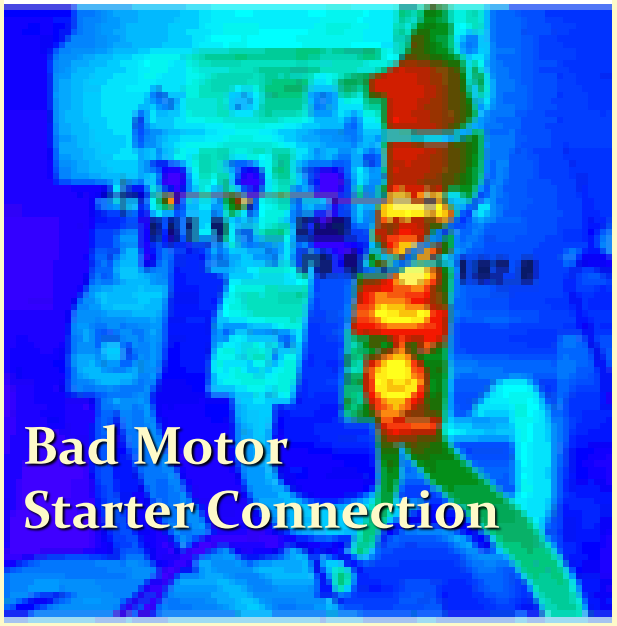
Thermography is the use of infrared radiation sensing equipment that can detect conditions which are not visible to the human eye.

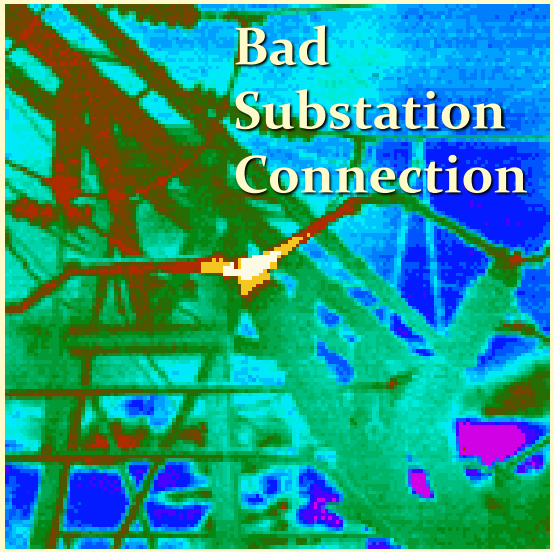


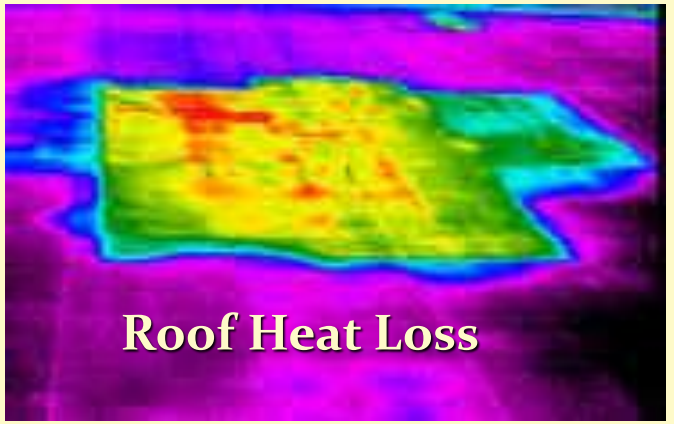
IR Applications



- Mechanical Issues
- Electrical Issues
- Steam Leaks
- Roof Issues
- Abnormal heat flow



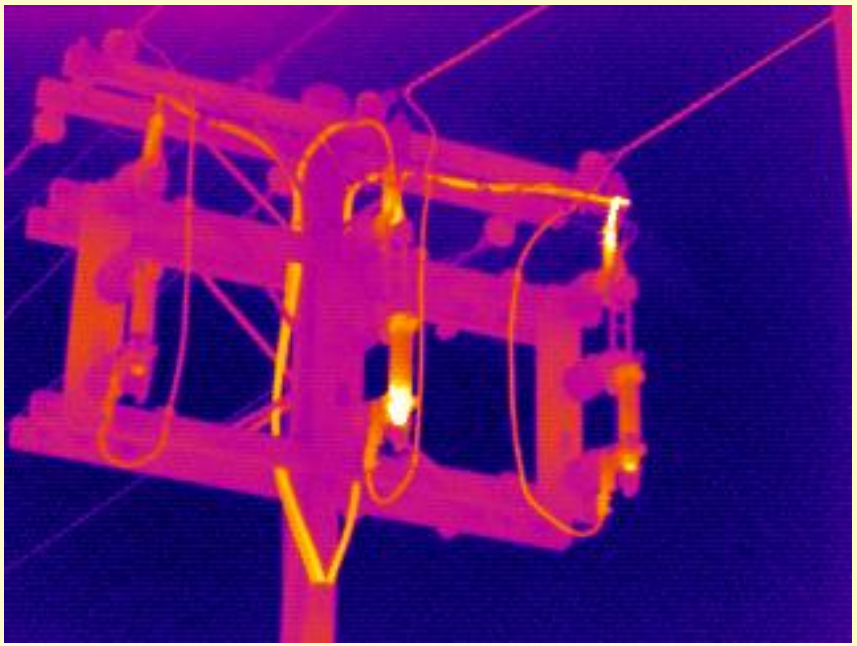




Main Incoming Utility Supply

Regular Photo Image

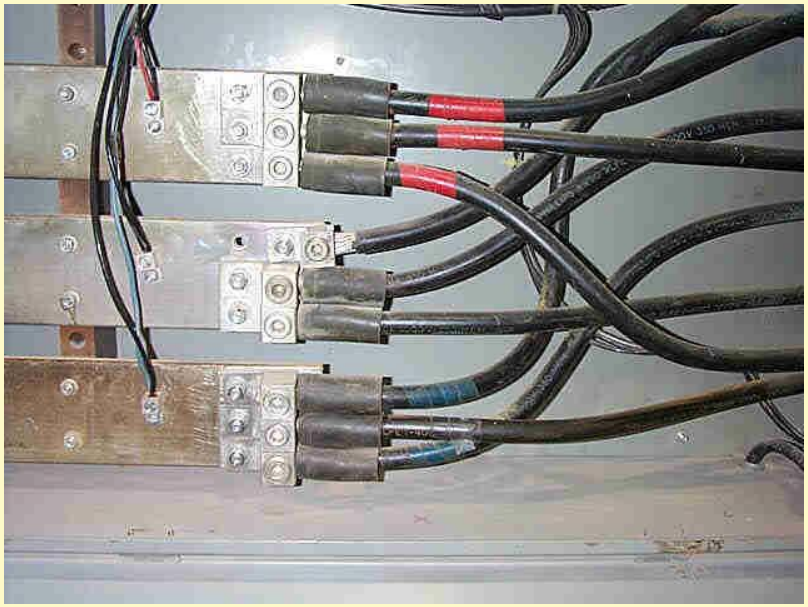
Infrared Image



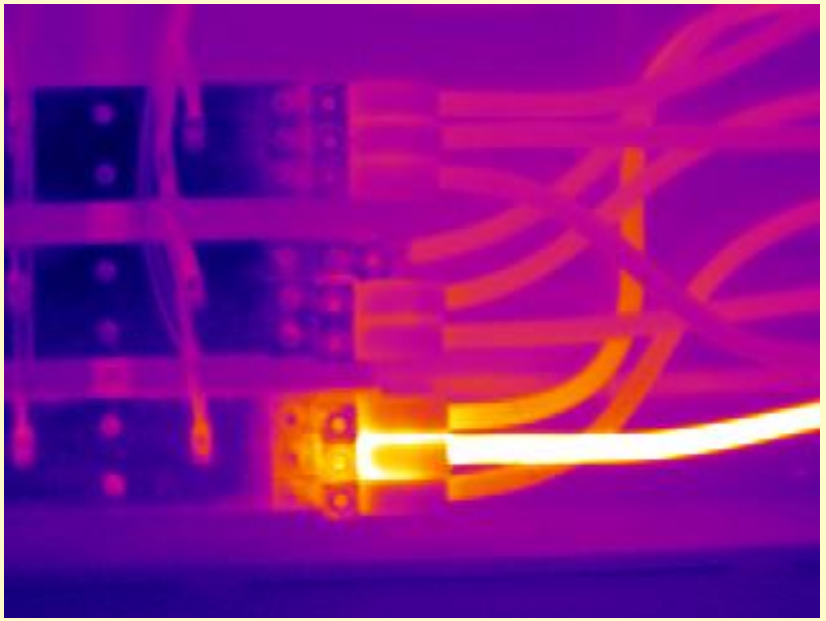
- If the main power supply is not reliable, facility power is not reliable

Main Electrical and MCC Rooms

Regular Photo Image



Infrared Image



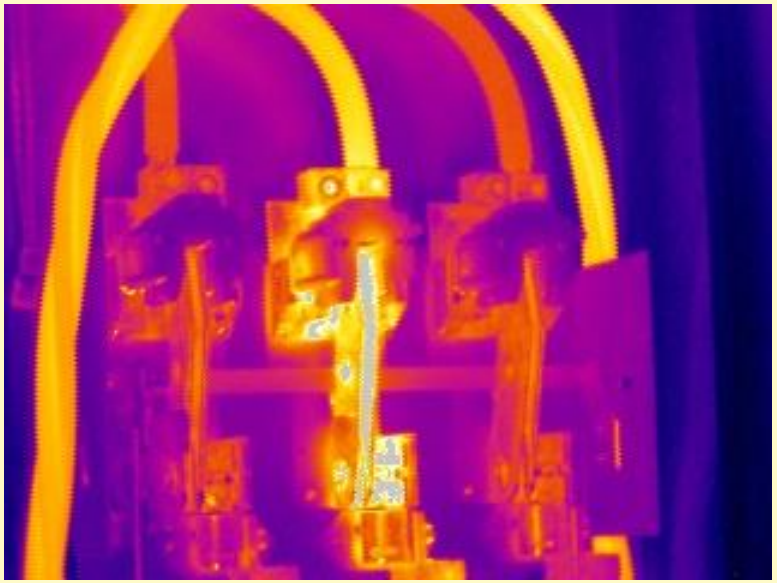
- Main incoming 3-phase splitter box connections

- Connection temperatures over 212 degrees F. noted

Main Electrical and MCC Rooms

Regular Photo Image

Infrared Image

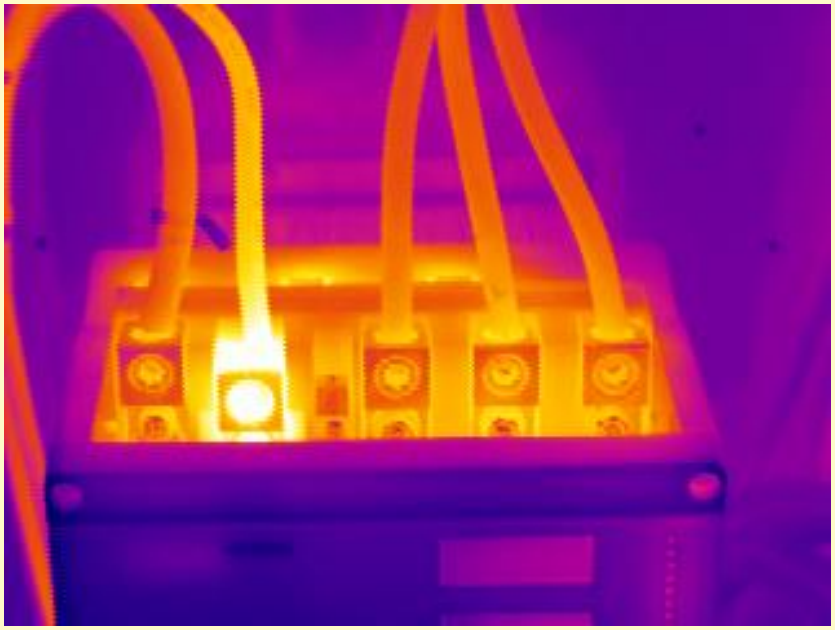


- Main incoming 400 amp switch
- Current imbalance was noted

Equipment Control Panels

Regular Photo Image

Infrared Image

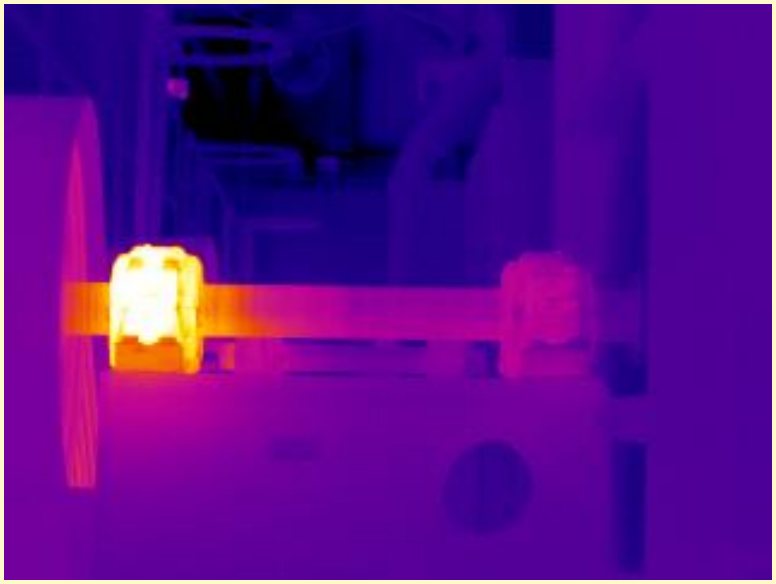


- Variable speed DC drive unit

Mechanical Equipment

Regular Photo Image

Infrared Image

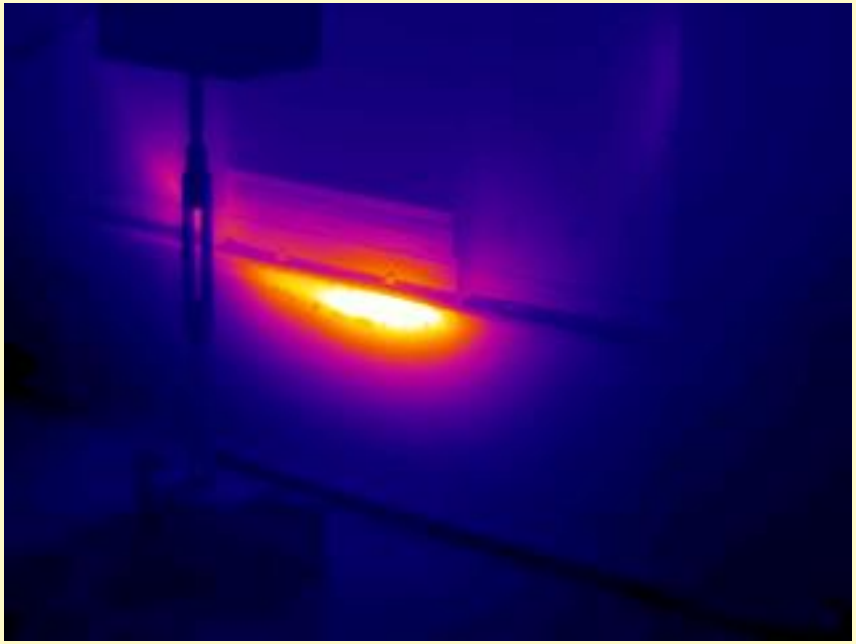


- Lubrication and alignment should be checked. Also check to ensure proper bearings are installed.

Mechanical Equipment

Regular Photo Image

Infrared Image

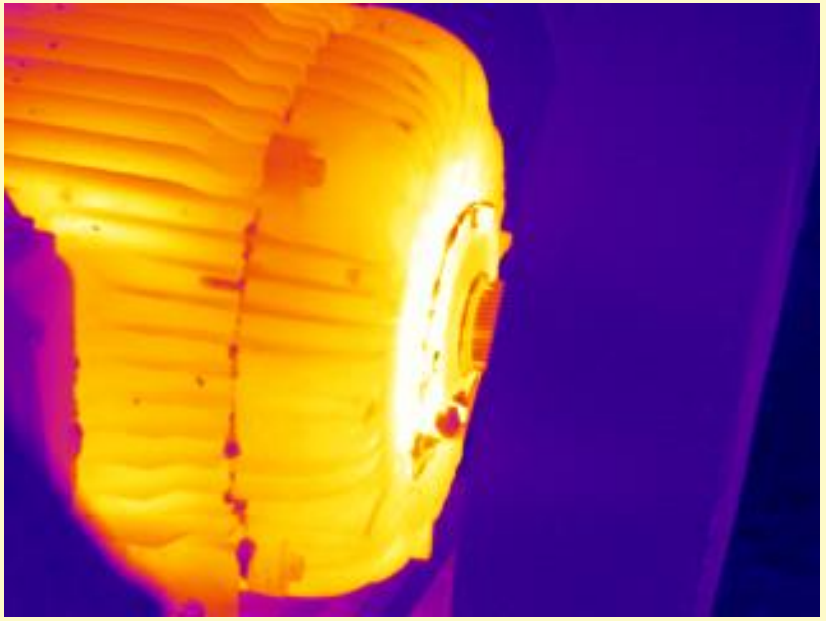


- The elevator was shutdown and the interior belt was found rubbing and then aligned BEFORE more damage occurred

Mechanical Equipment

Regular Photo Image

Infrared Image



- The bearing temperature should be monitored until the situation can be investigated further

Introduction To Vibration Analysis

What is vibration?

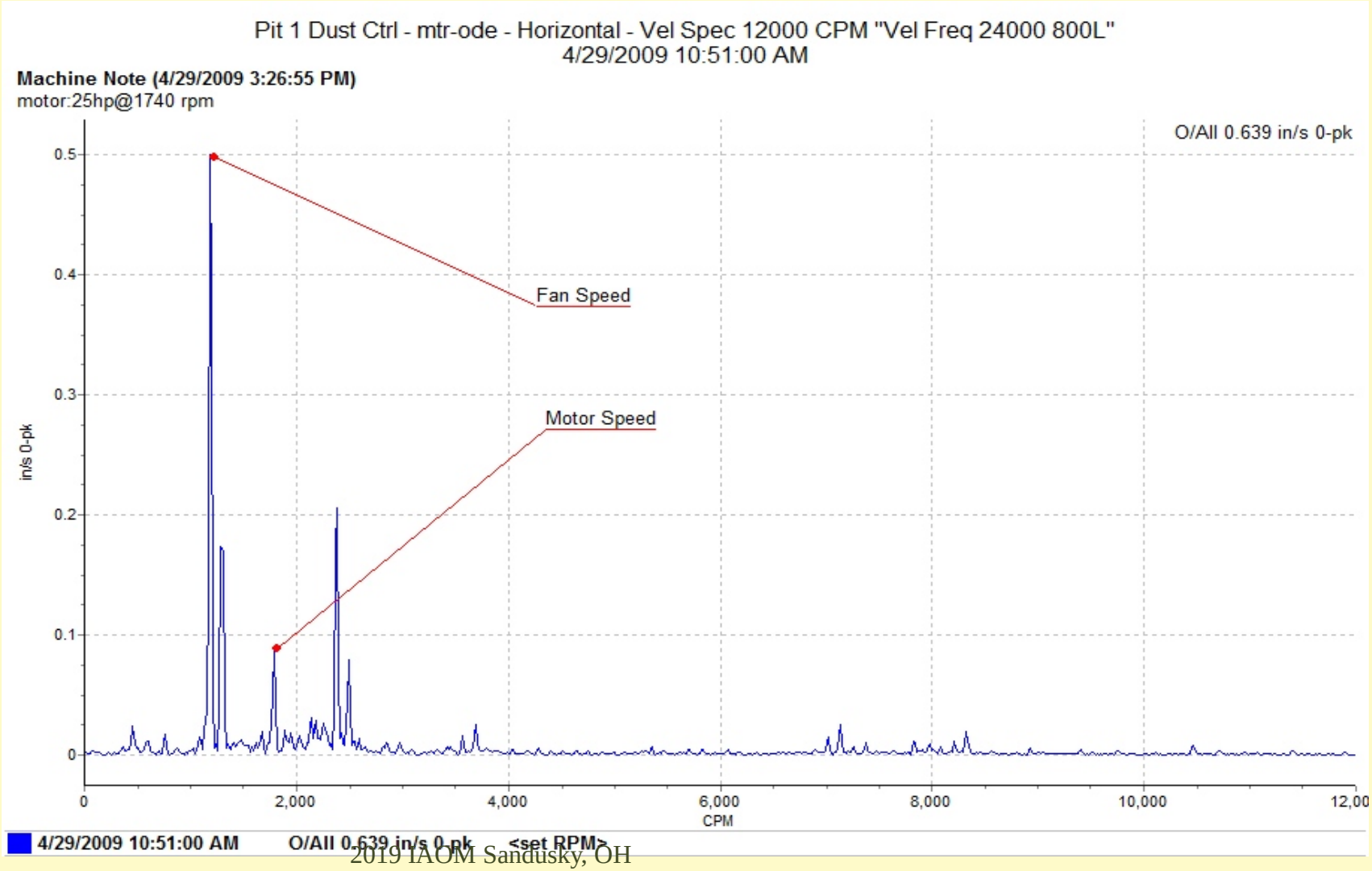
It is the movement present in all rotating equipment. Both destructive and non-destructive movement. Not all vibration is a problem.

Vibration analysis is a natural diagnostic tool for equipment which turns all sources of vibration into a graph format. This allows us to detect faults early…thus managing the way we prepare for equipment maintenance.

Vibration Analysis Applications:

- Imbalance – Static, Dynamic, Coupled
- Misalignment – Offset, Angular, Shaft, Bearings, Belts, Gears, etc.
- Looseness – Structural, Internal Components, Machine Feet, Belts, etc.
- Electrical – AC Motor Rotors, Stators, DC Drives, VFD's, etc.
- Rolling Element Bearings – Cage, Races (Outer & Inner), Rollers, etc.
- Gears – All types…Many Issues: Cracked/Broken Teeth, HTF, etc.
- Flow Issues – Blades/Vanes/Cavitations, etc.
- Bent Shafts
- Resonance
- Eccentricity, etc.

Vibration Analysis



Precision Alignment

- Give equipment the best start on life
- Ensure the most effective transfer of power
- Reduce stress on bearings and seals
- Increase life on belts and sheaves

Precision Alignment

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

Find Problems BEFORE Failure Occurs

Reliability Based Maintenance

QUESTIONS?