



Smart Tools for Smarter Maintenance

Leveraging Predictive Technologies to Optimize Facility O&M

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Meet Our Presenter:



John Rimer, CFM

- 17 Years in the Facility Industry
- B.S. Mechanical Engineering
- IFMA Qualified Instructor
- PdM Experience
 - Implemented/Managed PdM Programs
 - PdM Consultant
 - Vibration Analyst Level III
 - PdM/Vibration Analysis Instructor



The Road to Better
Facility Management

- Owner of FM360 Consulting
- President, Facility University
 - www.facilityu.com
 - john@facilityu.com





Review Session Learning Objectives

- Define the various Maintenance Strategies
- Describe the benefits of Predictive Maintenance (PdM)
- Identify the different PdM Technologies
- Discern when & how to implement PdM

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Maintenance Strategies

- Run-To-Fail (RTF)
 - “Ain’t Broke, Don’t Fix It...”
- Preventive Maintenance (PM)
 - Calendar/Run-Time Based
- Predictive Maintenance (PdM)
 - Data & Trend Based
- Condition-Based Maintenance (CBM)
 - Information Based – Holistic
 - Right Maintenance at the Right Time



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Benefits of PdM

Rule of 100/10/1

- 100 – People/Production
 - Increase Uptime (70%+, Fluke)
 - Schedule Downtime
- 10 – Facilities
 - Reduce Maintenance Costs (25%+, Fluke)
- 1 – Utility Costs
 - Lower Energy Costs (15%-25%, MT Online)



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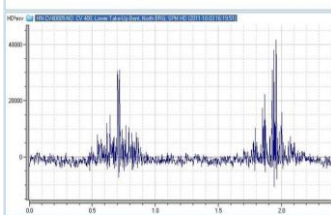
Predictive Technologies



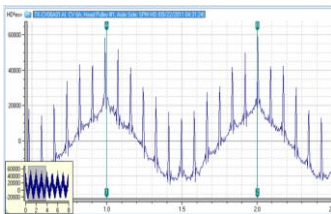
- Vibration Analysis
- Infrared Thermography (IR)
- UltraSound (U/S)
- Ferrography – Oil/Fluid Analysis
- Motor Circuit Analysis (MCA)
- Laser Alignment

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Vibration Analysis



Measures vibration to identify faults and potential failure modes

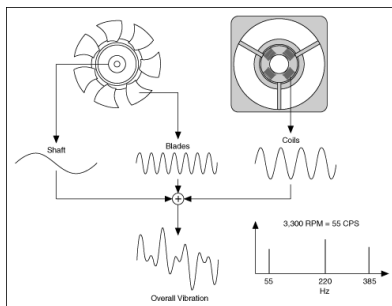


- Overall Vibration
- Fast Fourier Transform (FFT)
 - Amplitude vs. Frequency
 - Velocity (in/s) and Acceleration (g)
 - RPM/Shaft Speed or Multiple of 1X

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Vibration Analysis

More than Bearings...



- Unbalance
- Misalignment (Coupling/Sheaves)
- Bent Shaft
- Gear/Gearbox issues
- Looseness
- Belts
- Fan & Impeller Issues
- Electrical & Motor Issues
- Resonance & Beat Frequencies

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Vibration Analysis

When to Use Vibration Analysis

- Rotating or Reciprocating Equipment
- 10HP or larger
- Critical Equipment/Systems
- Monthly to Quarterly Readings

How to Implement

- Resources
 - Tools & Software
 - Training/Certification
- In-Source vs. Out-Source
 - Overall Vibration Tester
 - Call-in Experts when Needed



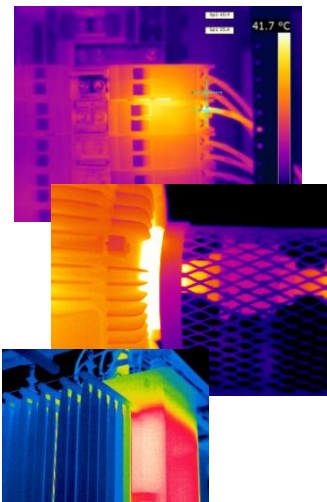
*images courtesy of SPM Instruments

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Infrared Thermography (IR)

Uses infrared imaging, detecting radiation in the infrared range, to measure and visualize relative heat of objects



- “Picture is worth a thousand words”
- Identifies but does not Specify

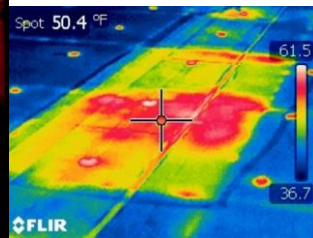
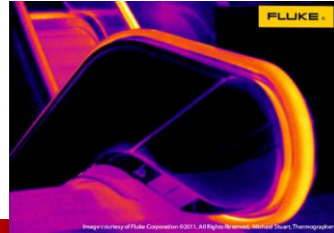
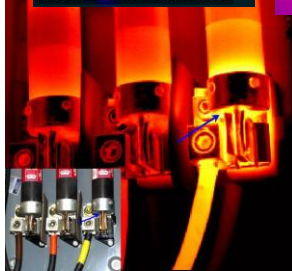
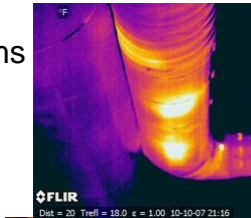
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Infrared Thermography (IR)

Applications...

- Mechanical Systems
- Transformers
- Breakers
- Switches
- Envelope Testing
- Conveying



*Images courtesy of FLIR and Fluke

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Infrared Thermography (IR)

When to Use IR

- Annual PdM
- 200A or larger
- Troubleshooting
- Selling...

How to Implement

- Resources
 - Tools & Training
- In-Source vs. Out-Source
- IR Ports



*Images courtesy of FLIR and IRISS

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UltraSound (U/S)



Acoustical analysis at the ultrasonic level - hearing things we can't...

- Steam/Air/Gas Leaks
- Steam Traps
- Transformers
- Bearings
- Lubrication
- Cavitation



*Images courtesy of UE Systems

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UltraSound (U/S)

Examples

- Indiana University - \$300k/yr savings on ~3000 traps
- 1" pipe @10psig = \$162/month

When to Use U/S

- At least Annually
- Troubleshooting

How to Implement

- In-Source vs. Out-Source
 - Size of Plant/Number of Equipment
 - Bearing Tester

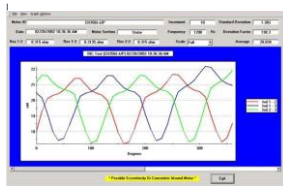
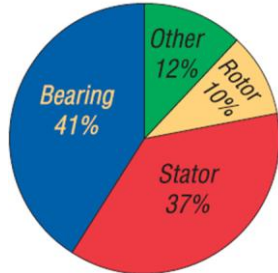


*Images courtesy of UE Systems, SPM Instruments, & SDT Ultrasound

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Motor Circuit Analysis (MCA)



*Images courtesy of PdMA

Ascertain motor health through detection of electrical imbalances and insulation degradation

- Winding Defects
- Cable Defects
- Rotor Issues
- Integrity of Insulation
- Load Problems
- One-Time or Routine
- Online & Offline Tests
- Couple with Vibration Analysis
- Providers - Motor Shops



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Laser Alignment

Aligning rotating equipment within recommended specifications

*“Nearly 50% of all breakdowns in rotating machines are due to misalignment”
(Vibralign)*



- Couplings
- Belts/Pulleys
- Example
 - 14% amp draw

*Images courtesy of Vibralign and LudECA

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Incorporating & Integrating

The Whole is Greater Than the Sum of its Parts



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Thank You!

For attending this
IFMA On Demand Session.
For questions, please contact IFMA's Online Educational
Manager, Vicky Acosta at Vicky.Acosta@IFMA.org

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