The Next Step in Maintenance Strategy Evolution
INTRODUCTIONS

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- Mechanical Engineering from the University of Maryland Baltimore County
- 15 years of experience in Oil & Gas and Heavy Industries
- Published numerous technical articles on machinery health management, vibration analysis, torque monitoring, and fatigue life prediction

Kevin Jones
- CEO and lead strategist at Ectobox, Inc., an IoT and software consulting company in Pittsburgh, PA
- Certified IoT Professional
- Active in multiple industry organizations
TRADITIONAL VIEW OF MAINTENANCE

Nowlan and Heap

When the Boeing 747 was introduced, it was soon realized that traditional maintenance strategies would not be cost effective.
IMPACT OF PROACTIVE

Cost of Maintenance
EPRI Power Generation Study (Modified)

Maintenance Spend ($/HP/Year)

Reactive
Preventive
Predictive
Proactive

Types of Maintenance Programs

Costs 77% less than reactive!
MAINTENANCE IS CRITICAL

“5 to 20% of overall plant production capacity is influenced by its maintenance strategy” — May 2017 Deloitte article

- Availability, Throughput, Quality: Largest gains typically from increased availability
- Safety & Environmental Incidents: Increased employee welfare, fewer environmental releases
- Inventory & Capital Replacement: Stocking less MRO, reducing carrying costs (can be upwards of 20%)
CBM MAINTENANCE CHALLENGES

- Limited effectiveness with traditional route-based methods
  - Being phased out and replaced with online/continuous monitoring solutions
- Information from monitoring systems typically not integrated throughout organization
  - Contextual information to discern between degradation and operation missing
- ‘Predictive’ Maintenance is a misnomer
  - Usually difficult/impossible to predict when corrective actions need to be taken

Finding faults/degradation is advantageous, but answering ‘when do I need to do something?’ is the outcome our customers need.
Chilled water pumps in the basement that no one ever looks at…

<table>
<thead>
<tr>
<th>Reactive</th>
<th>Proactive</th>
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<tr>
<td>Unexpected failure at 2 am</td>
<td><strong>Real-time data on system performance</strong></td>
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<td>- Find or salvage a spare motor</td>
<td>- Monitoring system provides an immediate alert of worsening vibration.</td>
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<td>- Mitigate safety hazards that occurred due to the catastrophic nature</td>
<td>- Real-time analytics determine there is an increase in misalignment and estimate remaining useful life.</td>
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<td>- Clean up environmental spills and releases</td>
<td>- Work order notification is automatically generated.</td>
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<td>- Mobilize rigging, mechanic, and electrician on emergency basis.</td>
<td>- Spare parts are allocated at nearest distributor in case production supersedes maintenance.</td>
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<td>- Restore equipment function in 24 hours.</td>
<td>- Technician is scheduled and corrects problem, taking only 2 hours.</td>
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<td>- Report lost production figures and high scrap rate to management.</td>
<td>- Report savings to management, who can focus capex on expanding production rather than replacement parts.</td>
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<td>- Move on to the next emergency.</td>
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<td>- Suffer the same failure next quarter because root cause was never determined and addressed.</td>
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PROACTIVE + IIOT

Add IIoT to Proactive Maintenance

• Proactive is difficult without technology
• What is IIoT
• IIoT enables Proactive
  • Machine Inspections
  • Condition Monitoring
  • Data Analysis
  • Connect to ERP/CMMS
PROACTIVE + IIOT

Start a small IoT Proof of Concept project

- Create business case for project
- Decide on problem to solve, what insights are needed
- Decide on data to gather
- Create simple project plan
- Execute Proof of Concept
- Review results, learn
- Expand the solution
  - More equipment
  - Better insights
CASE STUDY

Reactive

Reactive (Torque) + IoT

$400K USD saved thru early detection

Reactive

Reactive (Vibe) + IoT

$1M USD Savings thru early detection
SUMMARY

Proactive Maintenance

- Big financial performance impact
- Start your journey to Proactive Maintenance
- It will "help you see the future, and change it"