

# The Next Step in Maintenance Strategy Evolution





# INTRODUCTIONS

## **Dan Phillips**

- Technical Director of Lifecycle Services for Regal Beloit
- 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

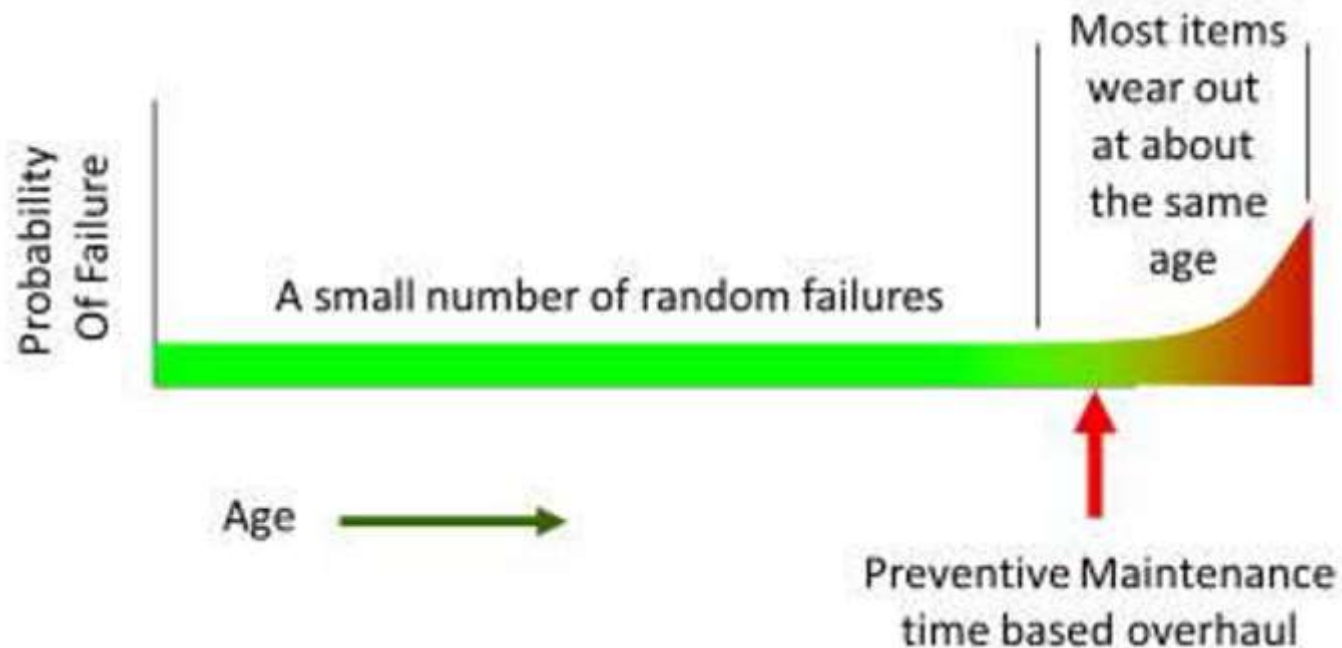
## **Kevin Jones**

- 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

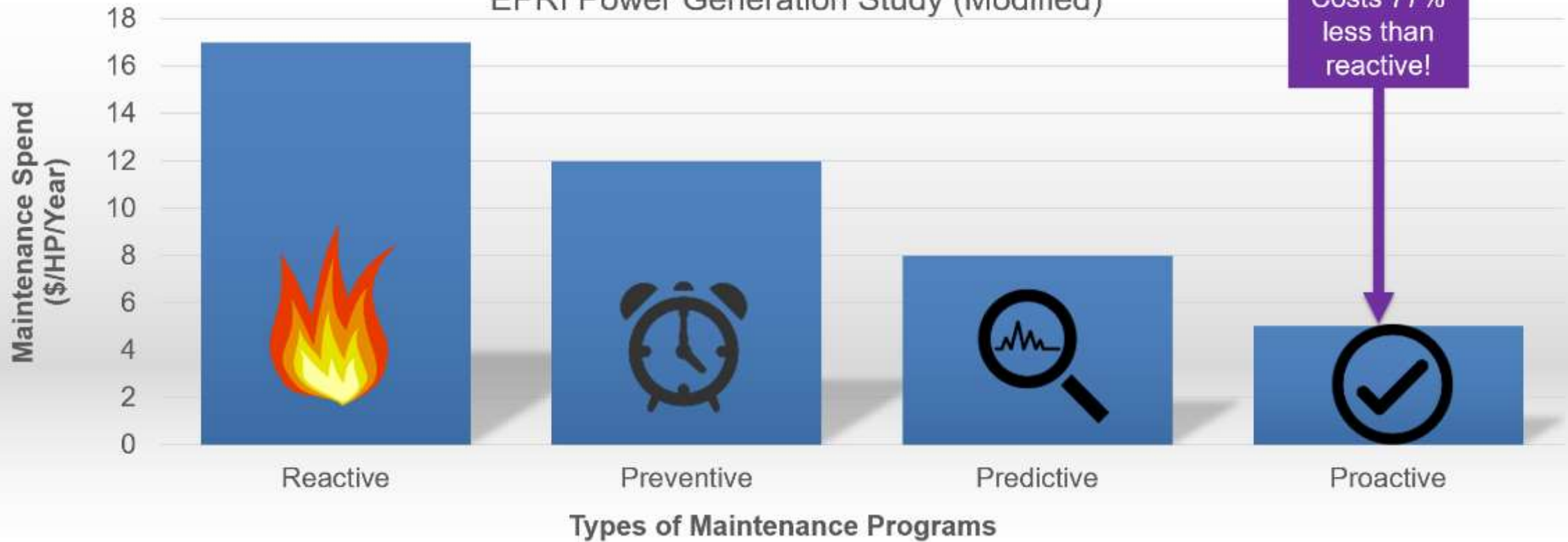
## Nowlan and Heap

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



# IMPACT OF PROACTIVE

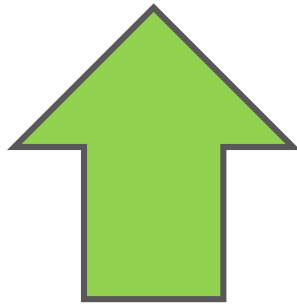
Cost of Maintenance  
EPRI Power Generation Study (Modified)



# MAINTENANCE IS CRITICAL

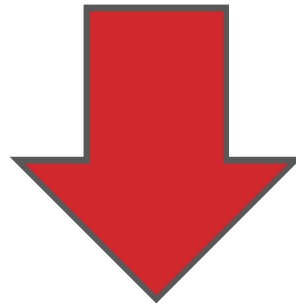
**“5 to 20% of overall plant production capacity is influenced by its maintenance strategy”** --May 2017 Deloitte article

**Availability,  
Throughput,  
Quality**



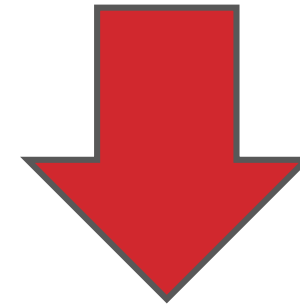
Largest gains typically from increased availability

**Safety &  
Environmental  
Incidents**



Increased employee welfare, fewer environmental releases

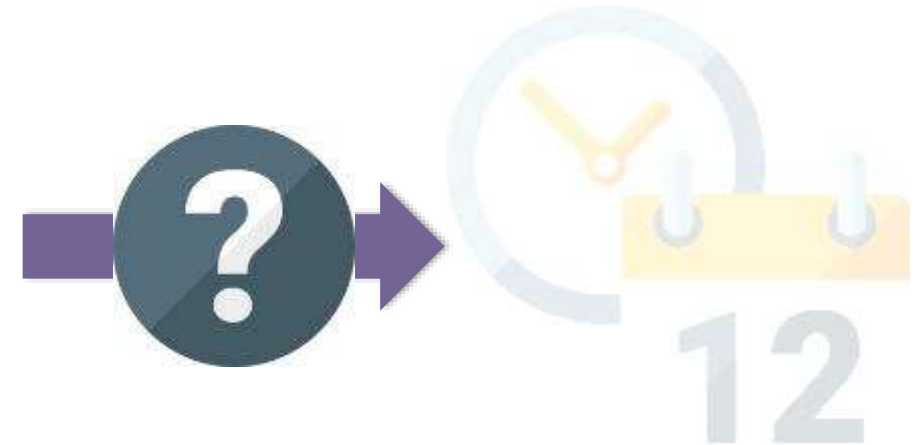
**Inventory &  
Capital  
Replacement**



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



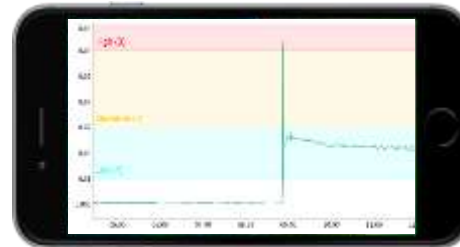
# NEXT STEP IN EVOLUTION

Chilled water pumps in the basement that no one ever looks at...

## Reactive

Unexpected failure at 2 am

- Find or salvage a spare motor
- Mitigate safety hazards that occurred due to the catastrophic nature
- Clean up environmental spills and releases
- Mobilize rigging, mechanic, and electrician on emergency basis.
- Restore equipment function in 24 hours.
- Report lost production figures and high scrap rate to management.
- Move on to the next emergency.
- Suffer the same failure next quarter because root cause was never determined and addressed.



## Proactive

Real-time data on system performance

- Monitoring system provides an immediate alert of worsening vibration.
- Real-time analytics determine there is an increase in misalignment and estimate remaining useful life.
- Work order notification is automatically generated.
- Spare parts are allocated at nearest distributor in case production supersedes maintenance.
- Technician is scheduled and corrects problem, taking only 2 hours.
- Report savings to management, who can focus capex on expanding production rather than replacement parts.



# 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

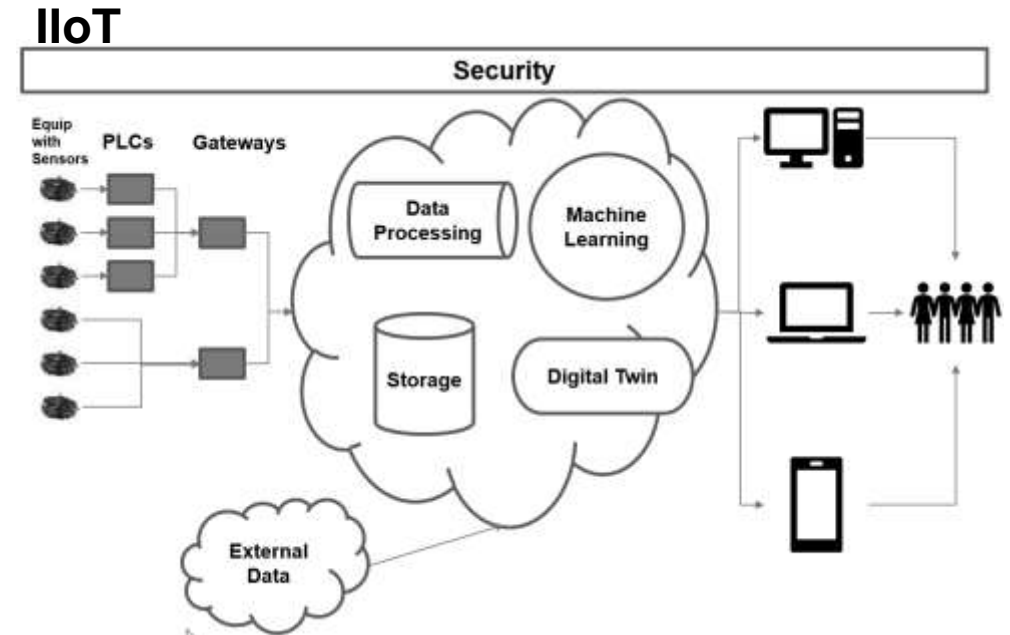




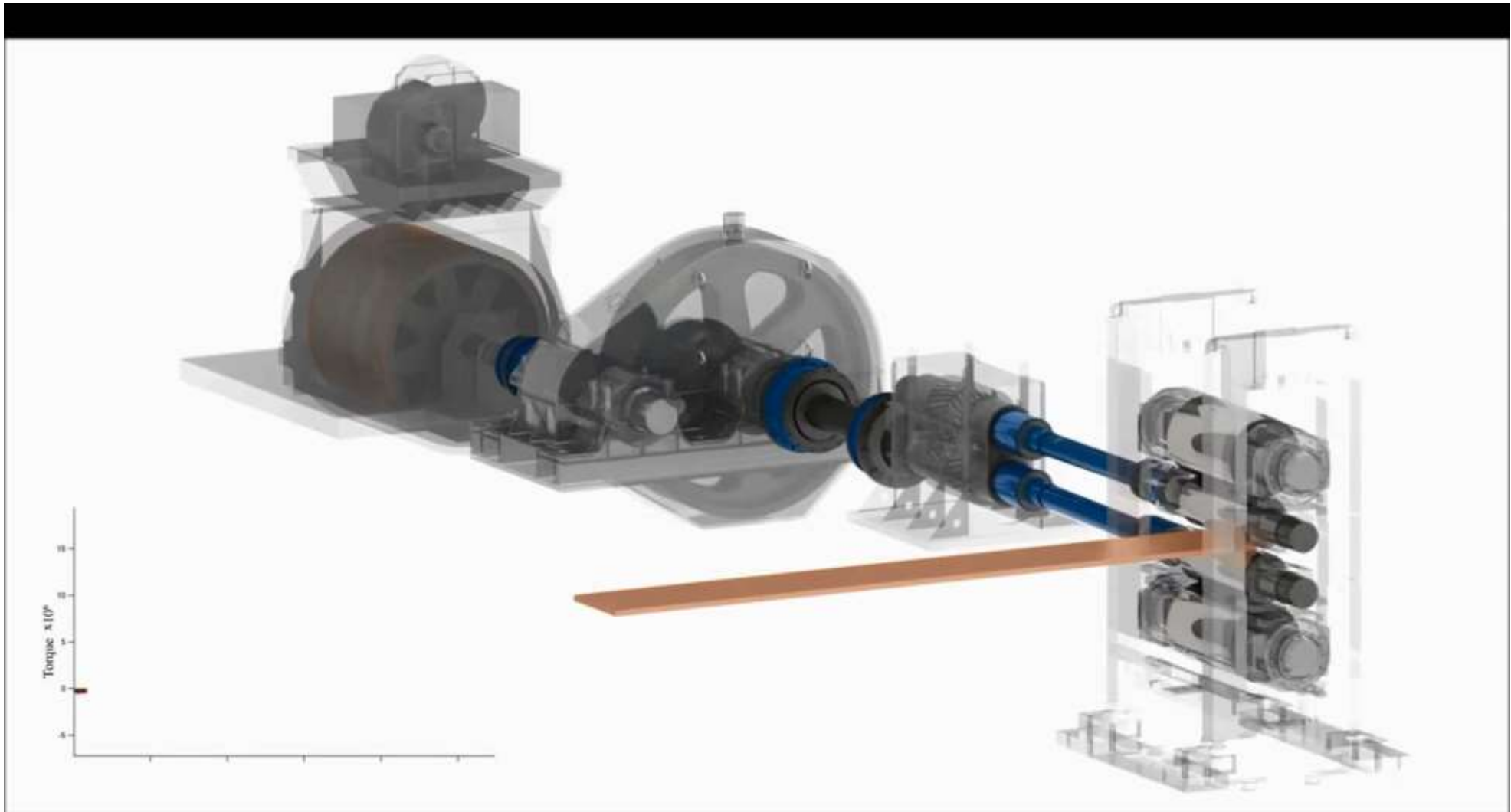
# PROACTIVE + IIOT

## 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

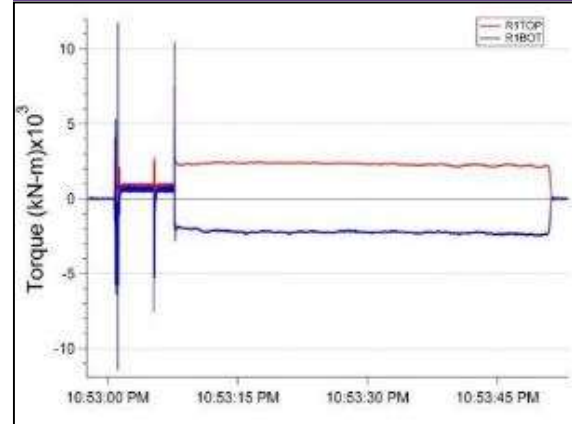


# CASE STUDY

Reactive



Reactive (Torque) + IoT



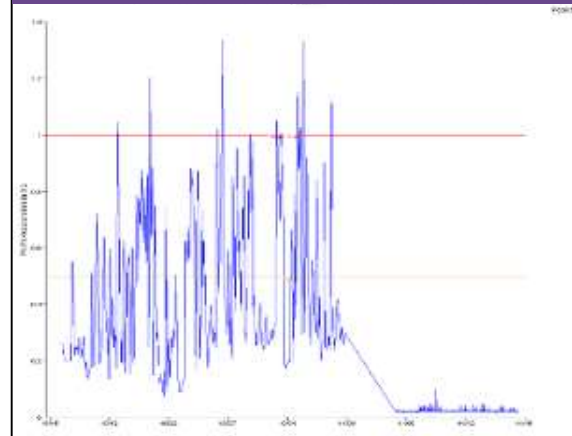
\$400K USD saved thru early detection



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"



# digitalbridge<sup>2018</sup>

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