Setting the Standard for Automation™

Assets Condition Monitoring Using ISA100.11A Wireless System

Standards

Certification

Education & Training

Publishing

Conferences & Exhibits

Presenter

Michael Thevanh – Senior Field Application Engineer GE Oil & Gas, Houston, Texas

Michael began his career as an Electrical Hardware Design Engineer with Bently Nevada Corporation, and then progressed to Project Engineer, overseeing several successful products that are still sold today.

After GE acquired Bently Nevada in 2002, Michael moved into an Application Engineering role supporting the U.S. Southern region of GE Oil & Gas, Measurement & Control business. Michael's experience provides a thorough knowledge of all Bently Nevada products, applications, and system integration.

Michael graduated in 1990 from Texas A&M University in College Station, Texas, with a Bachelor of Science degree in Electrical Engineering.

Introduction

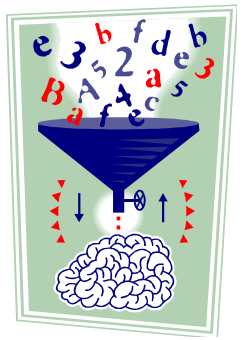
Increase Profit
Improve Production
Raise Availability

Reduce Costs
Decrease Down-time
Eliminate HSE Events

Production Imperatives

Managing production targets

- Can't predict down time
- Spending too much time on planned outages
- Difficult to identify causes of process inefficiencies
- TMI (too much information)
- Insufficient resources to predict downtime (interpret the data)
- Ensure planned maintenance is focused on the right area



Operation Imperatives

Shortage of skilled and knowledgeable workers

Myopic approach to asset management:

Early foresight

Deeper insight

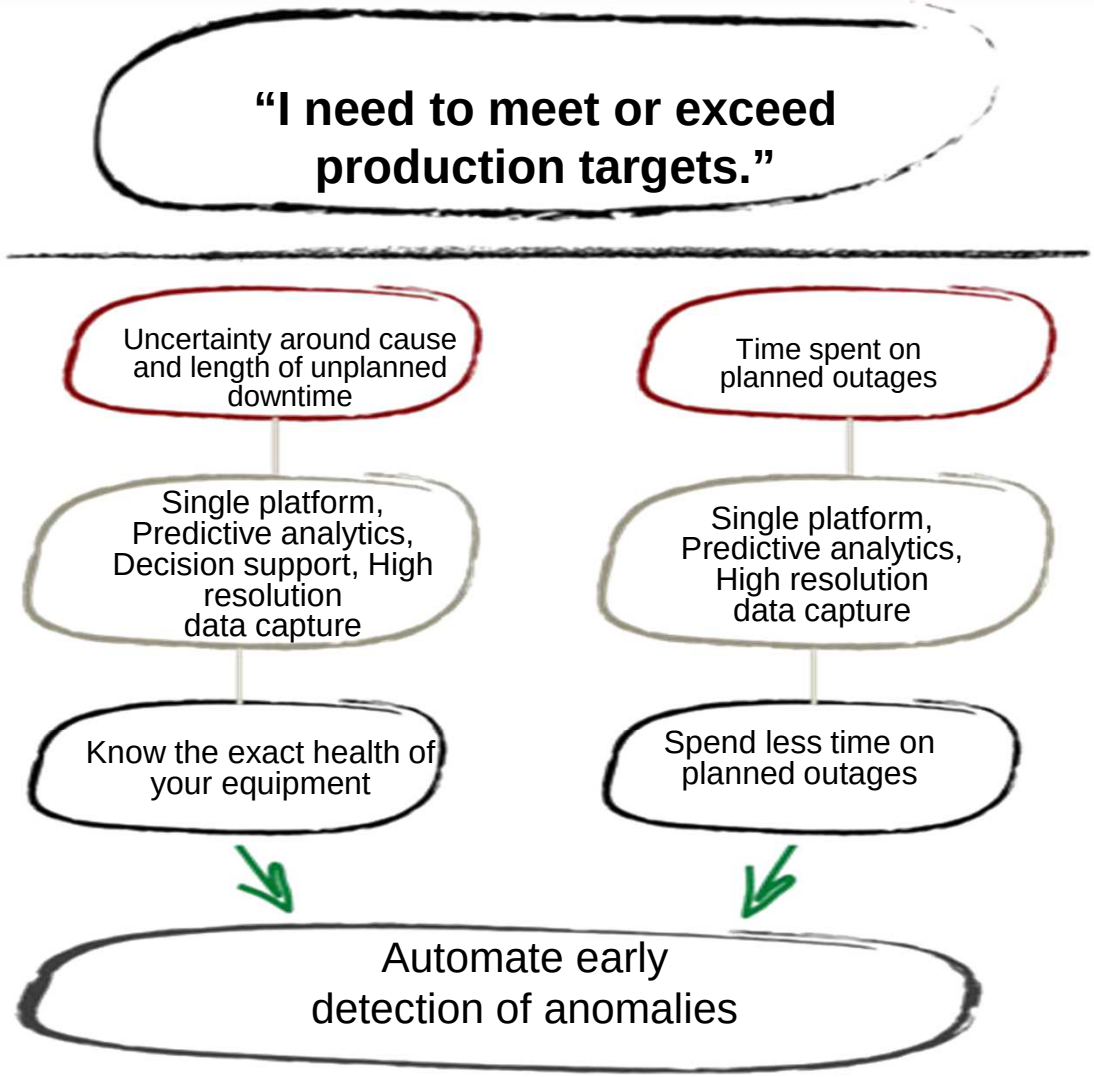
Risk management

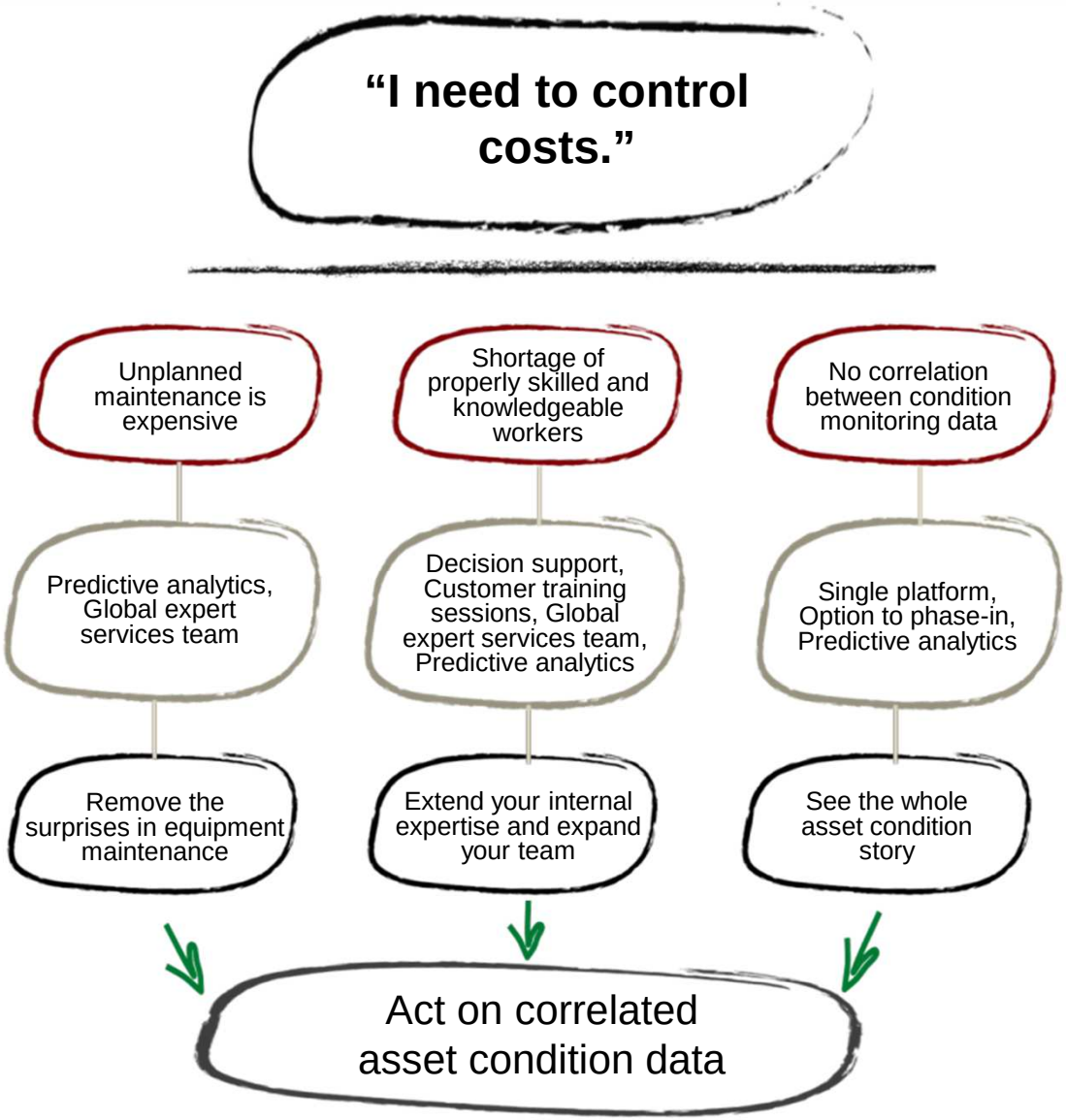
Data management

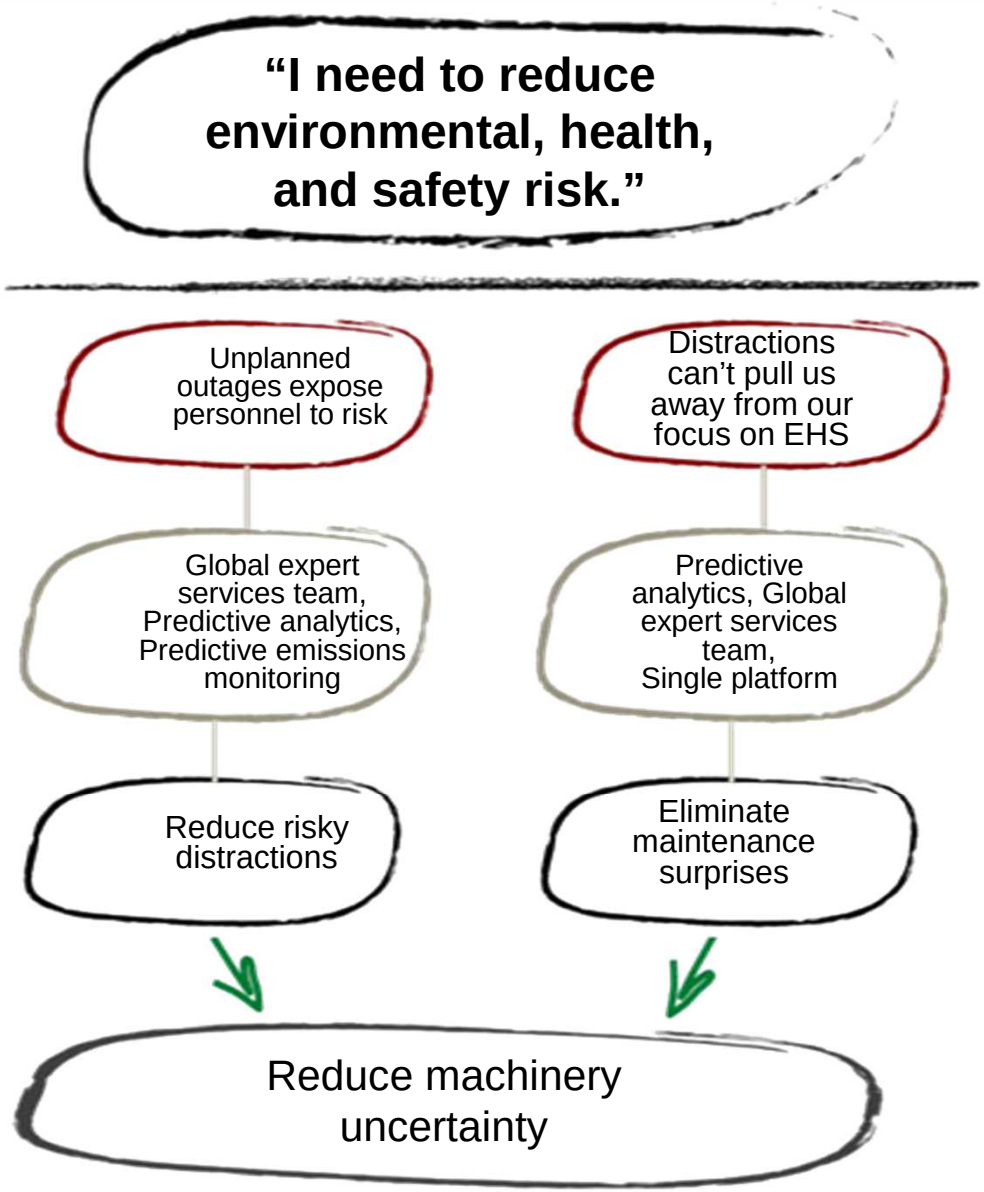
Information management

Issue management

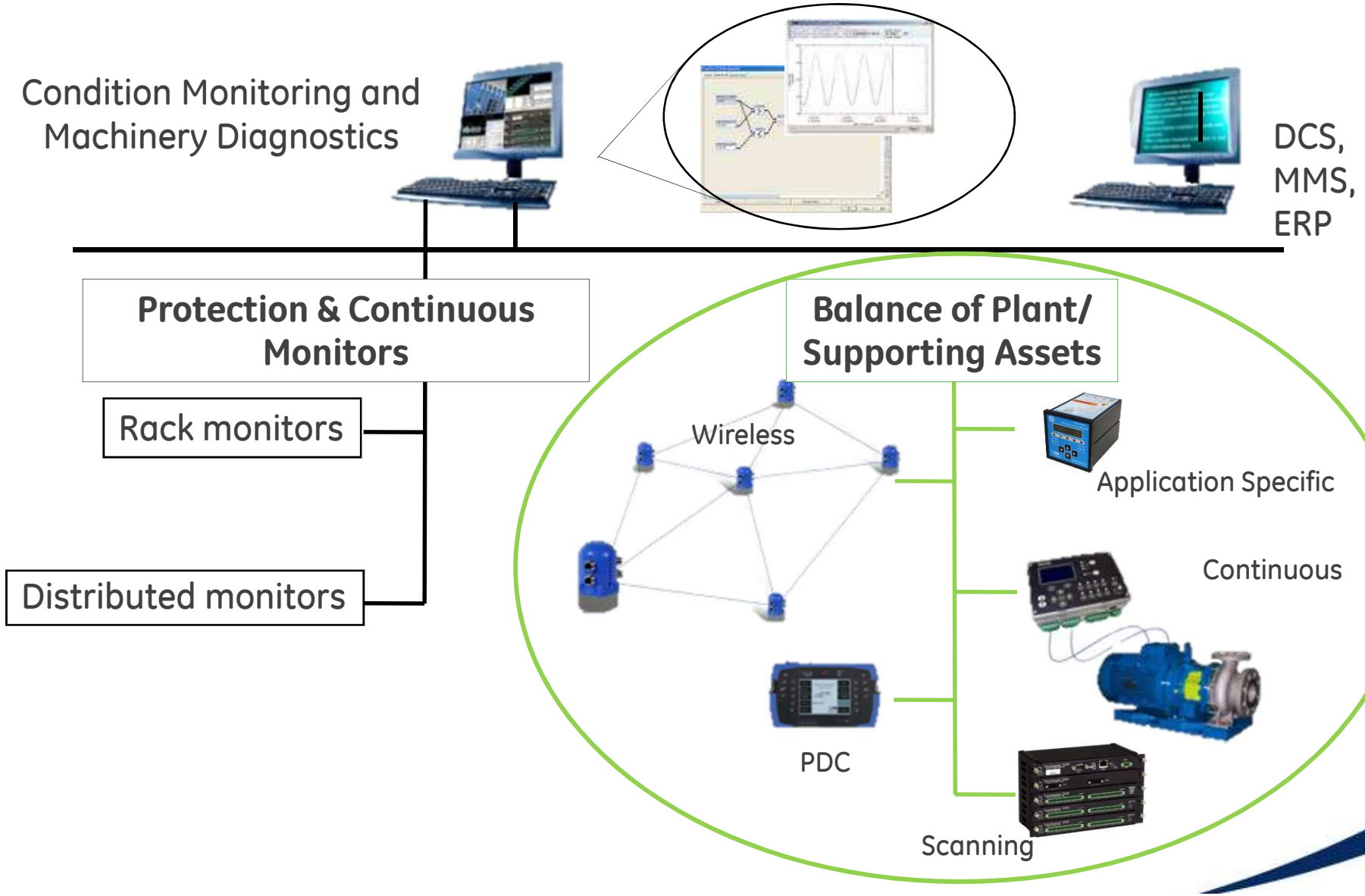
Machinery insight


“I need to meet or exceed production targets.”
Uncertainty around cause and length of unplanned downtime
Time spent on planned outages
Single platform, Predictive analytics, Decision support, High resolution data capture
Single platform, Predictive analytics, High resolution data capture
Know the exact health of your equipment
Spend less time on planned outages
Automate early detection of anomalies


"I need to control costs."
Unplanned maintenance is expensive
Shortage of properly skilled and knowledgeable workers
No correlation between condition monitoring data
Predictive analytics, Global expert services team
Decision support, Customer training sessions, Global expert services team, Predictive analytics
Single platform, Option to phase-in, Predictive analytics
Remove the surprises in equipment maintenance
Extend your internal expertise and expand your team
See the whole asset condition story
Act on correlated asset condition data


“I need to reduce environmental, health, and safety risk.”
Unplanned outages expose personnel to risk
Distractions can’t pull us away from our focus on EHS
Global expert services team, Predictive analytics, Predictive emissions monitoring
Predictive analytics, Global expert services team, Single platform
Reduce risky distractions
Eliminate maintenance surprises
Reduce machinery uncertainty

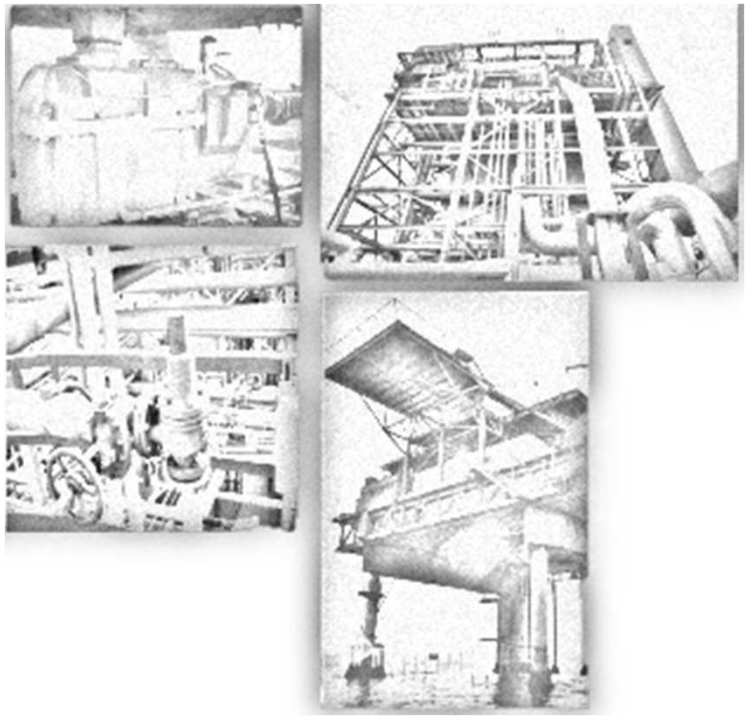
Key Components of an Integrated Plant Wide Solution



Wireless Target Applications

Target Applications

- Difficult-to-access locations
- Explosive areas – Zone 2, Zone 1, & Zone 0
- Pumps, motors, fans, small gearboxes, valves
- Remote locations
- Safety & Health Hazards
- Brownfield – high cost of retrofitting with wired solutions



Wireless Applications Overview

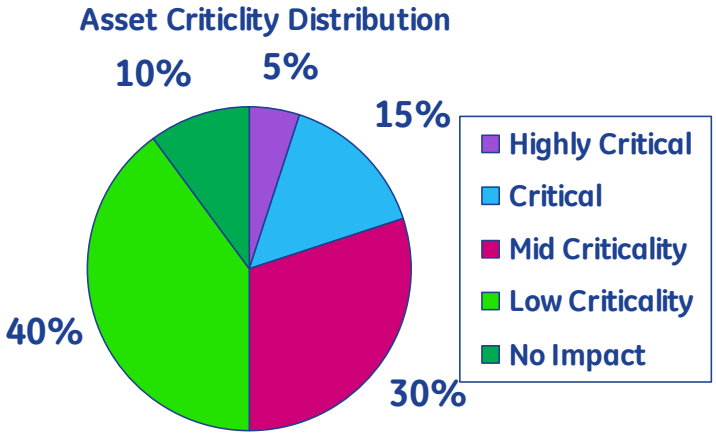
Protection

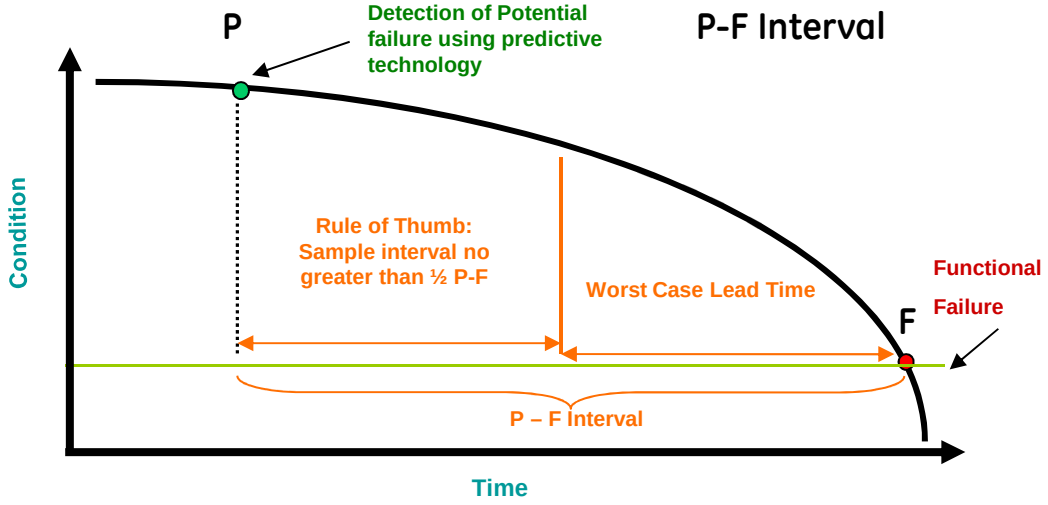
Not recommended

Not permitted under API 670
(i.e. “critical” turbomachinery auto-shutdown applications)

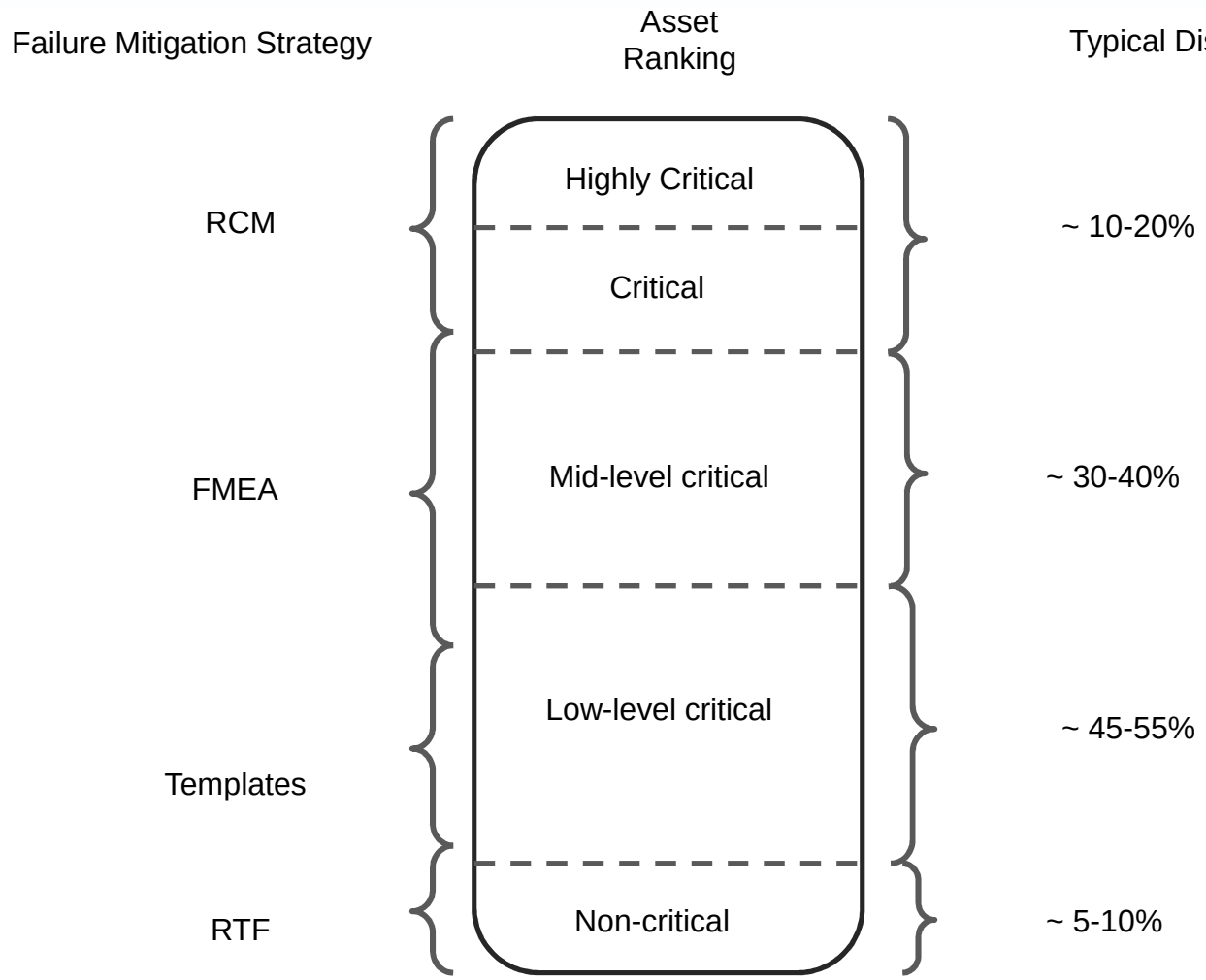
Monitoring

Periodic data as part of reliability centered maintenance program

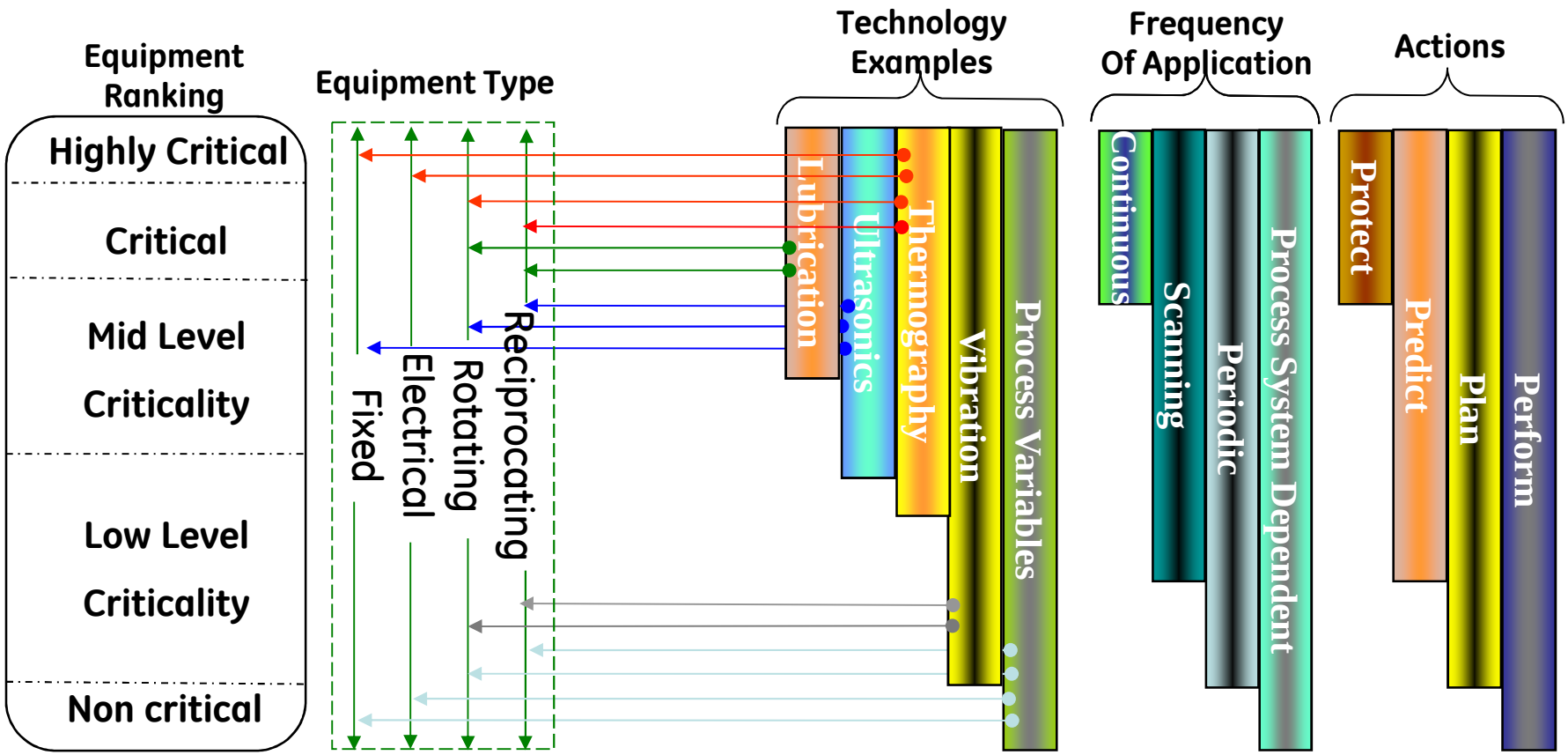




Equipment Criticality Ranking



Criticality – Drives strategy & spend



Based upon failure modes, detectability and criticality apply technologies across the asset base

Wireless Monitoring Value Proposition

Fewer surprises

Reduces costs

Enables production improvements

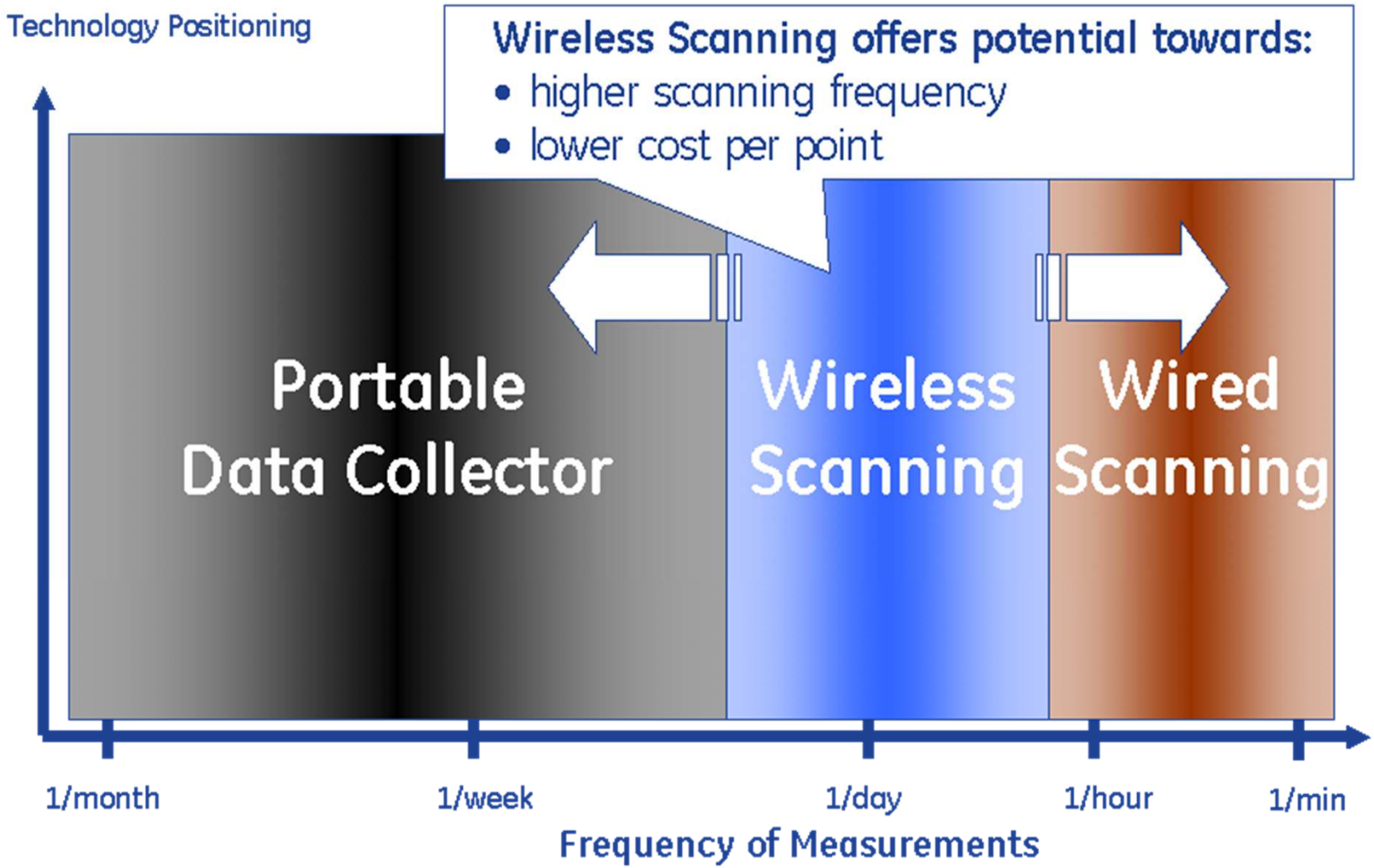
Increases equipment availability

Easily expandable

Temporary & long term surveillance and diagnostics

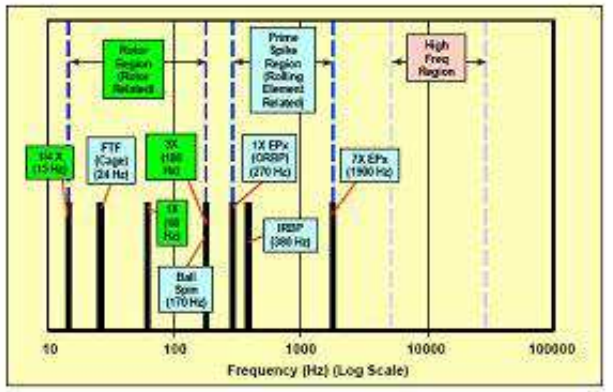
Improves human and capital resource utilization

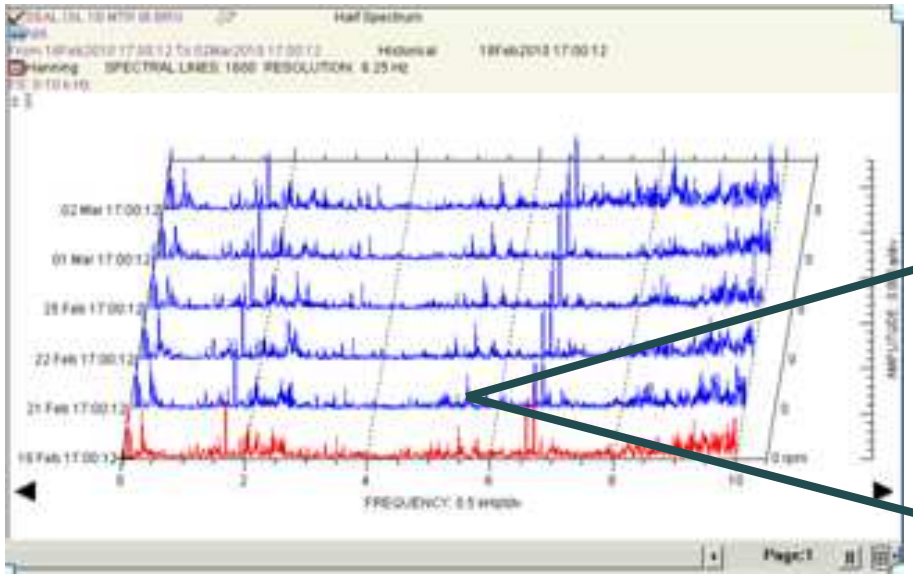
Technology Positioning

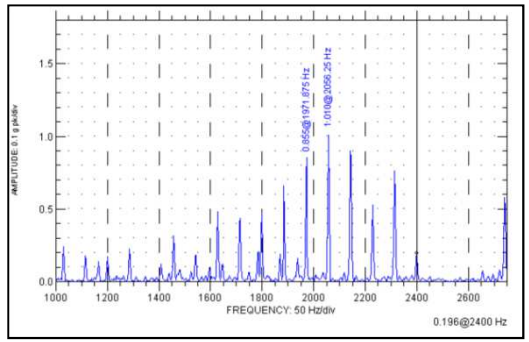


Wireless Device Power Options

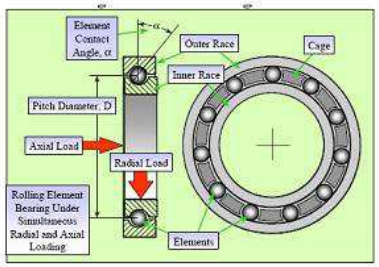
Diagnostics





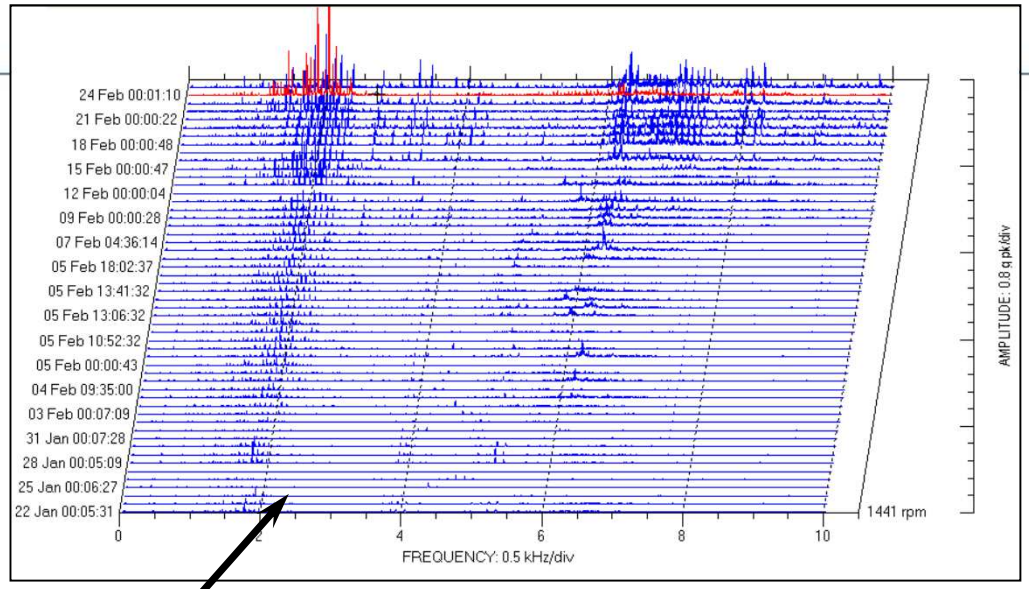


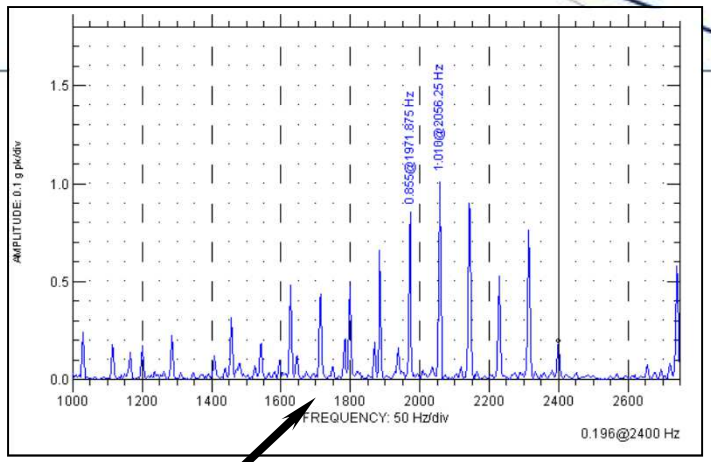
Waterfall spectrum



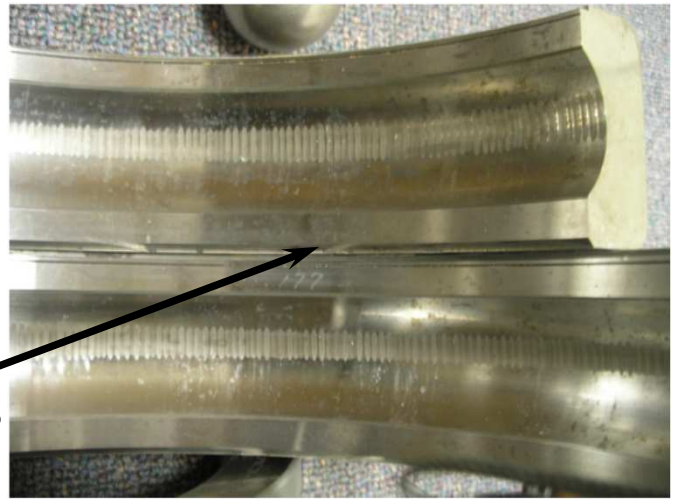
Acceleration Enveloping Spectrum

Condition Monitoring example

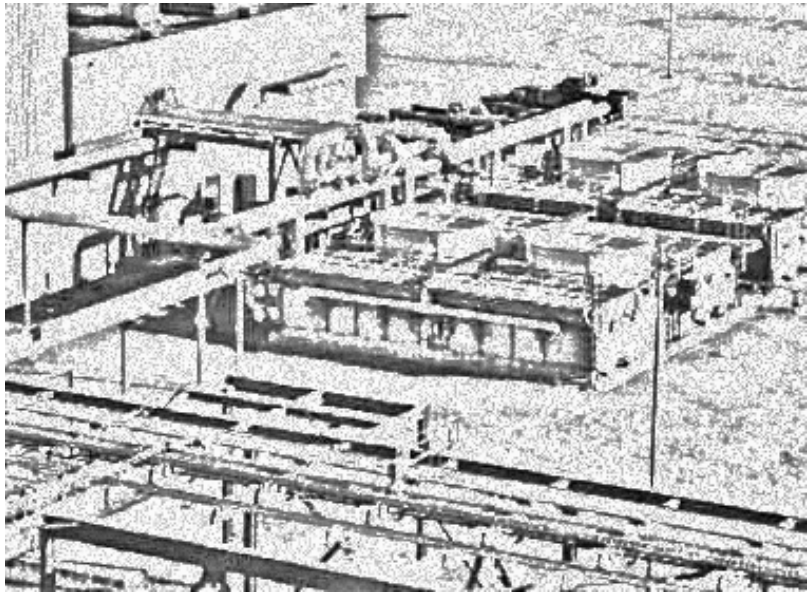




1. Historical data shows increasing vibration at higher frequencies.
2. Spectral analysis pinpoints a bearing outer ring failure
3. Physical inspection verifies diagnostics



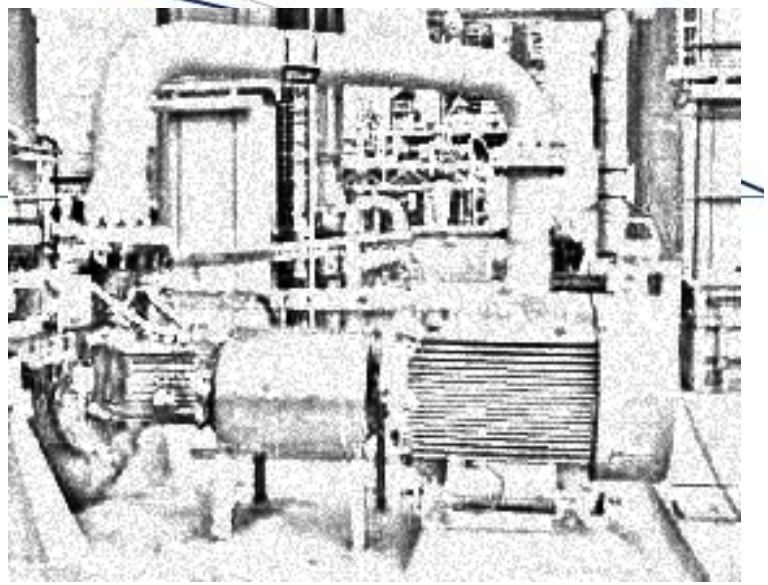
Target Applications



Fin fan heat exchangers

Tank Farm Pumps

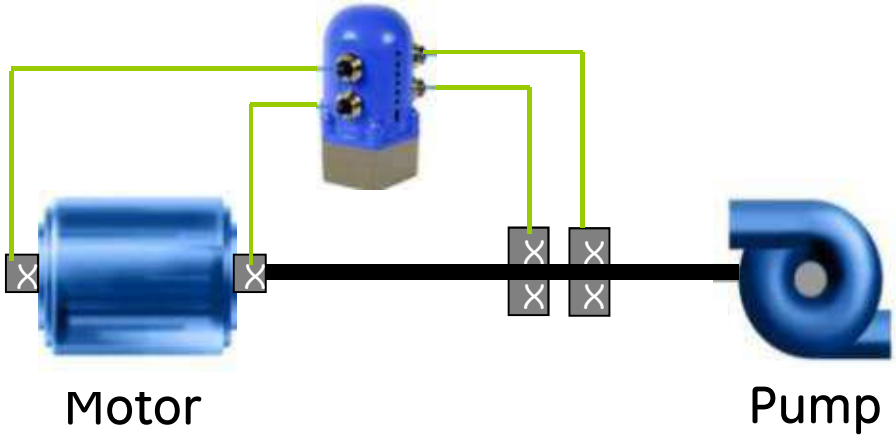
Target Application
Tank Farm Assets



Current Practice:
Walk-arounds @ 3 week intervals

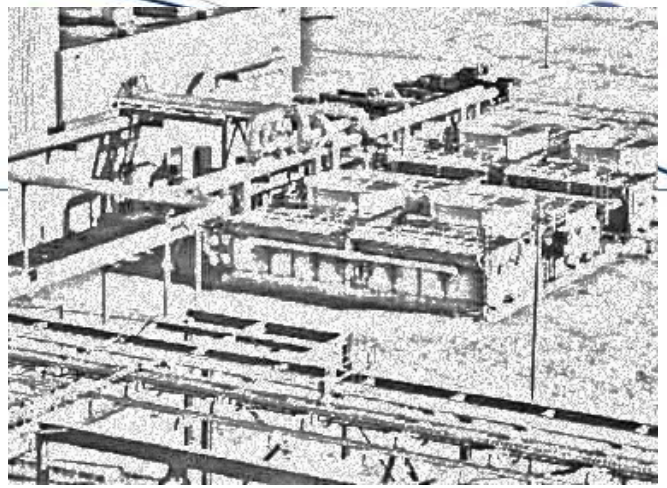
Failure Modes:
Undetected Failure occurs between rounds

Solution:
Monitoring vibration at key points several times per day with wireless system



Application Solution

Fin Fan Heat & Exchangers



Current Practice

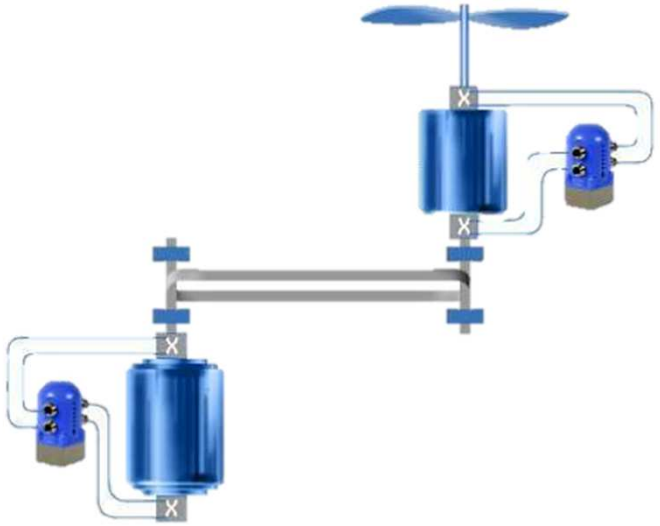
Monthly walk-arounds with portables

Failure modes

Reduced efficiency from fouling or environmental conditions, undetected failure between rounds

Our solution

Condition monitoring system analysis of essential measurements brought in daily by wireless sensors.



Example Deployment

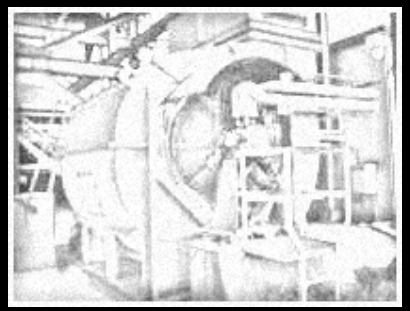
Steam Turbine BoP machinery

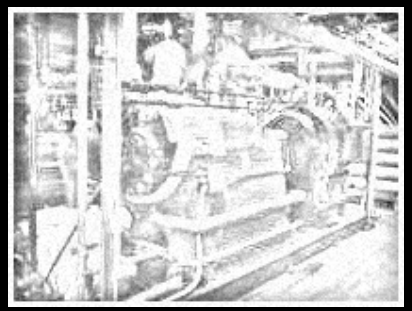
Integrated to existing condition monitoring system

Remote access for support and monitoring

21 points deployed in two days on:

boiler feed pumps
condensate pumps
lube oil pumps
service water pumps
FD fan
circulation water pumps





Example Deployment

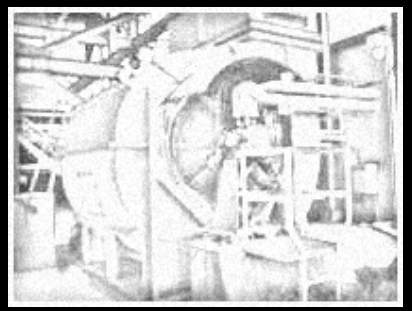
Results

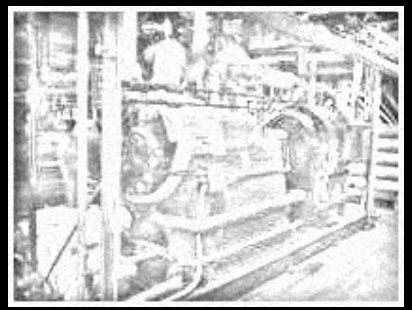
Validated ease of deployment, rapid deployment

Quick and easy anomaly identification

System detected anomaly on cooling water pump; verified detection using a portable.

Critical to repair this pump in summer months to avoid loss of generating capacity.





ISA100 Wireless™
Benefits

Low costs of entry; technology specifications included in ISA100 WCI membership entitlements.

Open source (free) ISA100 wireless communication stack

- Major milestone in the evolution of the ISA100 standard and its community
- Proves maturity of the standard and the community's commitment to making this successful
- Attracts additional industrial companies and end users to ISA100.11a

Flexible application layer

- ISA100 Wireless™ technology is the only protocol that supports large data sets such as wave forms and FFT.
- Wired HART devices communicate over ISA100 Wireless™ networks using adapters.
- Proprietary supplier protocols can communicate with ISA100 Wireless™ gateways.

Opportunity for any supplier to participate since all certified ISA100 Wireless™ products interoperate in any ISA100 Wireless™ network.

ISA100 Wireless™ ensures lower cost of installation, operation and, maintenance throughout its lifecycle.

ISA100 Wireless™
Technical Superiority

Proven distributed control in the field (object technology in smart devices).

Functionality beyond traditional WSN applications.

Comprehensive two-level security features including AES-128.

Easy to use - provision over the air (OTA) or directly using out of band (OOB).

Scalable and reliable network tested to 500 devices (so far).

Proven reliable in congested wireless environments[1].

IPv6 based technology (6LoWPAN) for industrial applications:
"Big Data and Smart Machines"

[1] IEEE paper presenting research completed by NASA Johnson Space Center, March 2012

ISA100 Wireless Compliance Institute

Rigorous compliance testing to ensure interoperability among all certified products.

A single source supporting implementation of ISA100 Technology™.

Develops the essential specifications needed by vendors to produce products that users want.

Thank You!