ISA100 Technology Webinar
Wireless Condition Monitoring

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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

Single platform, Predictive analytics, Decision support, High resolution data capture

Know the exact health of your equipment

Automate early detection of anomalies

Time spent on planned outages

Single platform, Predictive analytics, High resolution data capture, Reliability Game

Spend less time on planned outages
“I need to control costs.”

Unplanned maintenance is expensive

Predictive analytics, Global expert services team

Remove the surprises in equipment maintenance

Shortage of properly skilled and knowledgeable workers

Decision support, Customer training sessions, Global expert services team, Predictive analytics

Extend your internal expertise and expand your team

No correlation between condition monitoring data

Single platform, Option to phase-in, Predictive analytics

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**
  - Global expert services team, Predictive analytics, Predictive emissions monitoring
  - Reduce risky distractions

- **Distractions can't pull us away from our focus on EHS**
  - Predictive analytics, Global expert services team, Single platform
  - Eliminate maintenance surprises

**Reduce machinery uncertainty**
Key Components of an Integrated Plant Wide Solution

Condition Monitoring and Machinery Diagnostics

Protection & Continuous Monitors
- Rack monitors
- Distributed monitors

Balance of Plant/Supporting Assets
- DCS, MMS, ERP
- Wireless
- Application Specific
- Continuous
- Scanning
- PDC
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

![Asset Criticility Distribution](chart)
- 40% Highly Critical
- 30% Critical
- 15% Mid Criticality
- 10% Low Criticality
- 5% No Impact

![P-F Interval](chart)
- Function of Failure
- Failure using predictive technology
- Rule of Thumb: Sample interval no greater than ½ P-F
- Worst Case Lead Time
- P – F Interval
- Functional Failure
Equipment Criticality Ranking

Failure Mitigation Strategy

- RCM
- FMEA
- Templates
- RTF

Asset Ranking

- Highly Critical
- Critical
- Mid-level critical
- Low-level critical
- Non-critical

Typical Distribution

- Highly Critical: ~ 10-20%
- Critical: ~ 30-40%
- Mid-level critical: ~ 45-55%
- Low-level critical: ~ 5-10%
- Non-critical: ~ 5-10%
Criticality – Drives strategy & Spend

Start with understanding our customers' assets

Equipment Ranking
- Highly Critical
- Critical
- Mid Level
- Criticality
- Low Level
- Criticality
- Non critical

Equipment Type
- Reciprocating
- Rotating
- Electrical
- Fixed

Technology Examples
- Ultrasonics
- Thermography
- Vibration
- Process Variables
- Lubrication

Frequency Of Application
- Continuous
- Scanning
- Periodic
- Process System Dependent

Actions
- Protect
- Predict
- Plan
- Perform

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 Scanning offers potential towards:
- higher scanning frequency
- lower cost per point

Frequency of Measurements:
- 1/month
- 1/week
- 1/day
- 1/hour
- 1/min
Wireless Device Power Options
Diagnostics

Waterfall spectrum

Acceleration Enveloping Spectrum
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

Solution
Analysis of essential measurements brought in daily by the wireless system.
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 environments¹.
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!