Industrial IoT

Realize Industrial Internet of Things Benefits in Your Plant Before 2016 is Up

Jonas Berge
Director, Applied Technology
Emerson Process Management
Singapore

Topics Covered

- Plant challenges
- Gain new abilities with IIoT
- IIoT deployment requirements

Areas of Major Challenges

Process Operations Productivity
Automate manual tasks

Reliability & Maintenance
Improve equipment reliability and process availability, reduce maintenance cost

Health, Safety, and Environment (HS&E)
Improved situational awareness to reduce incidents and response time, CO2 emissions

Energy Efficiency
Reduce overconsumption, loss, and carbon emissions

PERVASIVE SENSING™

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Reliability & Maintenance - Typical Applications

- Improve equipment reliability and process availability, integrity, reduce maintenance cost


Technical White Paper Available

Ideal for remote monitoring services: IIoT

Condition Monitoring for All Essential Assets – Not Just Turbines & Compressors

- Critical equipments already have condition monitoring
  - Expensive turbines, process compressors, and large pumps
- Balance of equipments are not monitored
  - Many are still essential to operation
- Manual data collection
  - Not frequent enough
- Also need condition monitoring

Critical

Essential

Non-essential
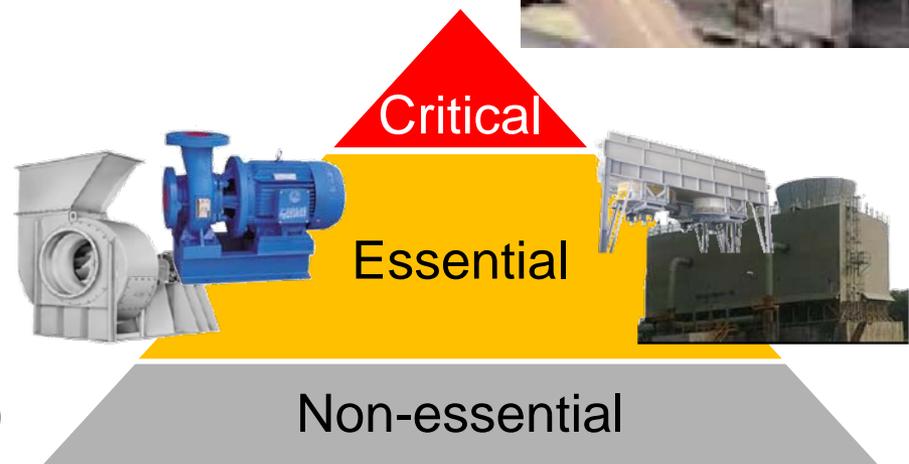
From Routine Manual Data Collection to Automatic Data Collection and Analysis

- Able to reduce manual data collection
  - Vibration
  - Temperature
  - Acoustic noise (valve leaks)
  - Acoustic noise (steam traps)
  - Corrosion
  - Power consumption
- Result
  - Fewer inspection/test rounds
  - Reduce exposure of people to hazards
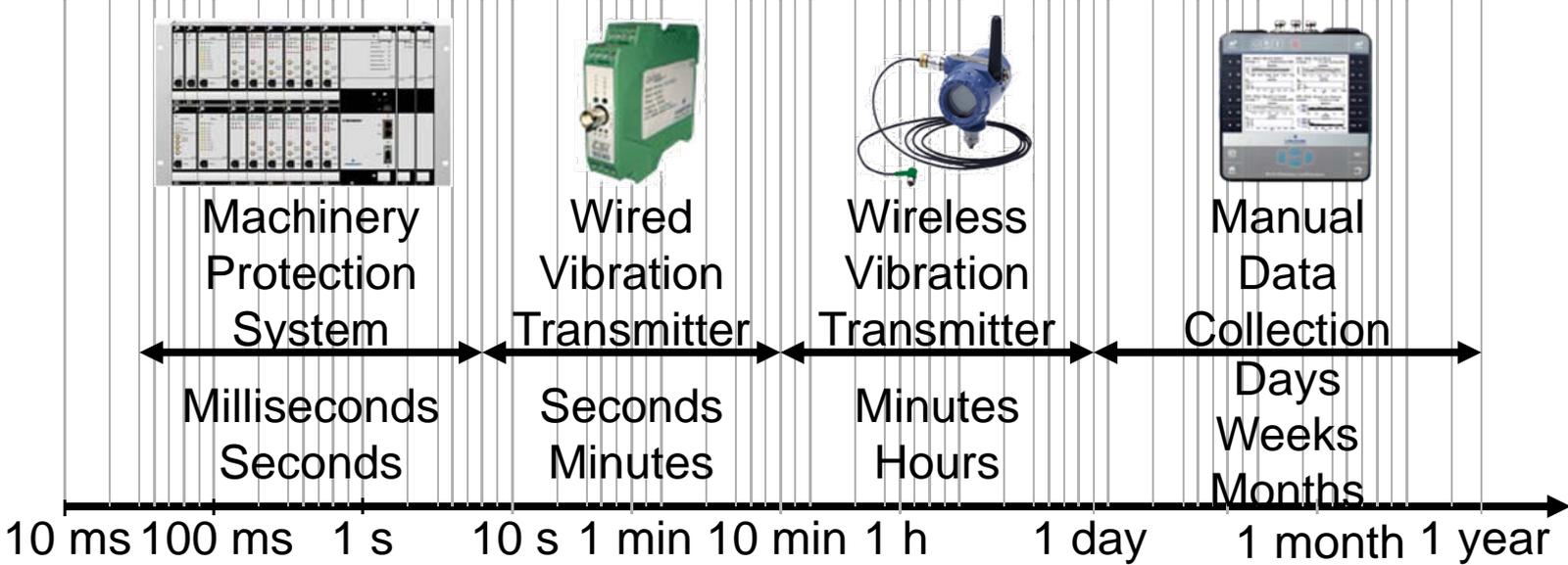
Vibration

Valve Leak

Corrosion

Steam Trap

Temperature

# Complementary Vibration Monitoring Solutions: milliseconds to months

Machinery Protection System	Wired Vibration Transmitter	Wireless Vibration Transmitter	Manual Data Collection
Milliseconds Seconds	Seconds Minutes	Minutes Hours	Days Weeks Months

10 ms 100 ms 1 s   10 s 1 min 10 min 1 h   1 day   1 month 1 year
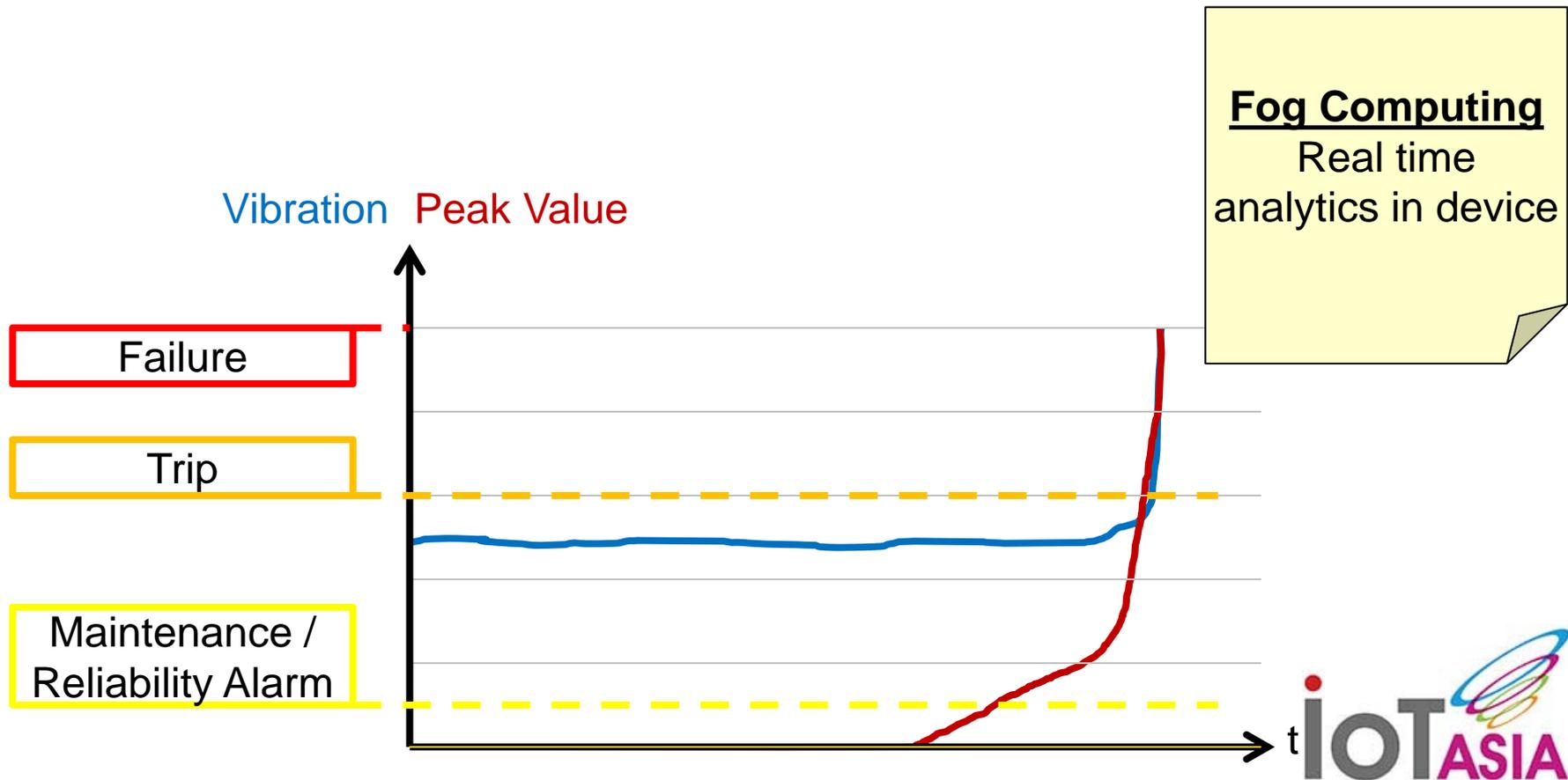
7 orders of magnitude

Periodic Inspection Misses The Point
- of Failure

- Many issues only become noticeable close to the point of failure
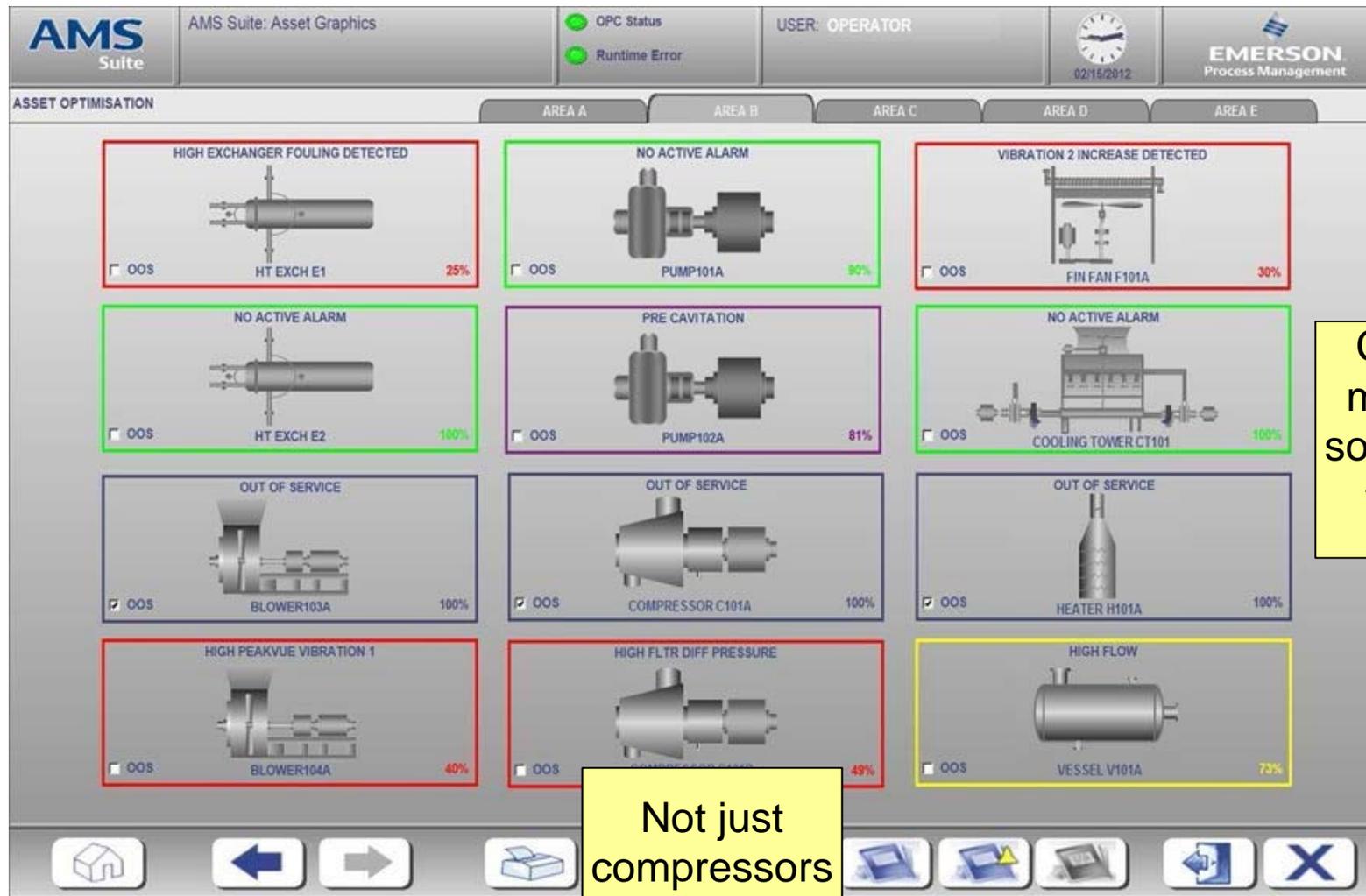- Manual inspection often misses this sudden degradation
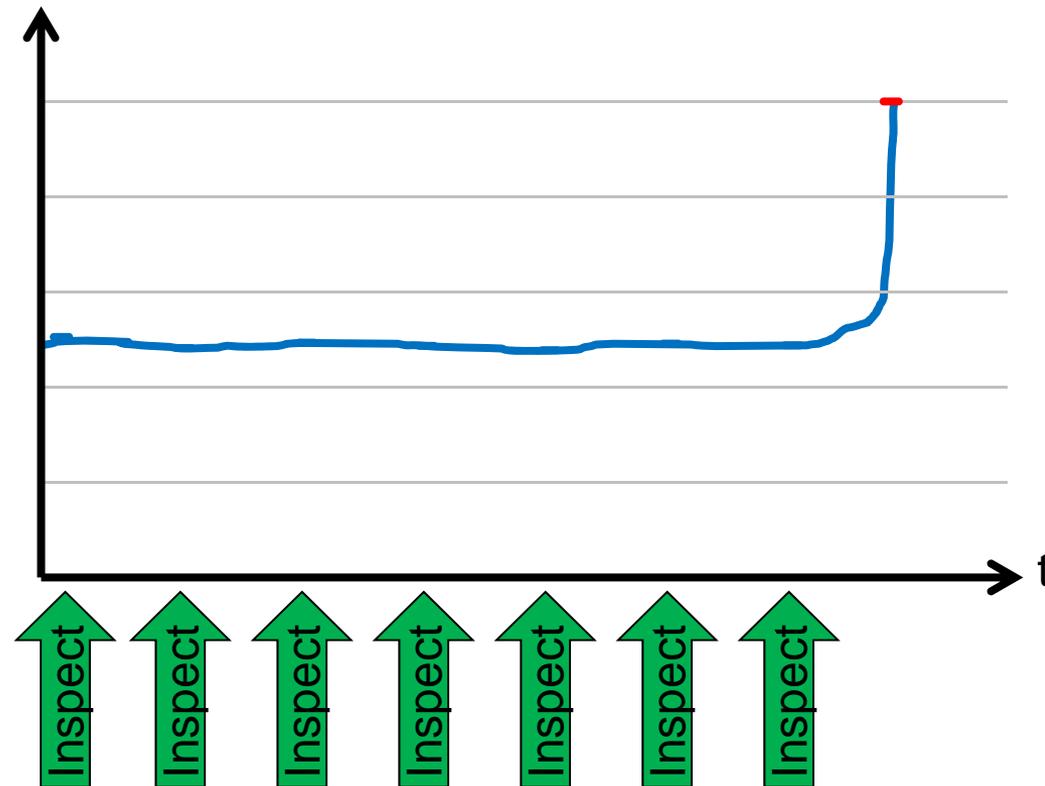
Onboard Vibration Analytics Provide Early Warning

- Easy to sort equipment in Good condition from those that are Bad
- Effective maintenance and turnaround planning

Fog Computing
Real time analytics in device

Vibration Peak Value

Failure

Trip

Maintenance / Reliability Alarm

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Equipment Condition Dashboard
- Focus Attention Where It Is Needed

Energy Efficiency
- Typical Applications

- Reduce overconsumption, loss, and carbon emissions

Technical White Paper Available
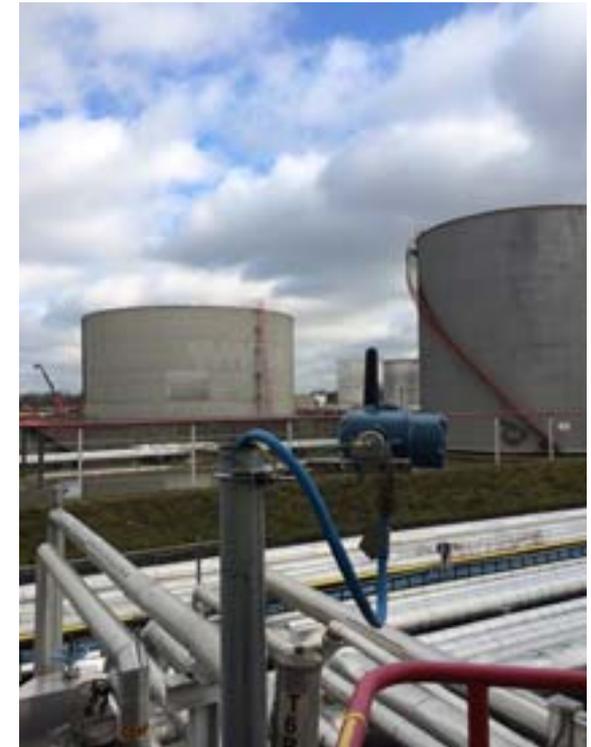
Ideal for remote monitoring services: IIoT

HS&E
- Typical Applications

- Improved situational awareness to reduce incidents and response time, CO2 emissions

Remote monitoring services less common: on-prem

Technical White Paper Available

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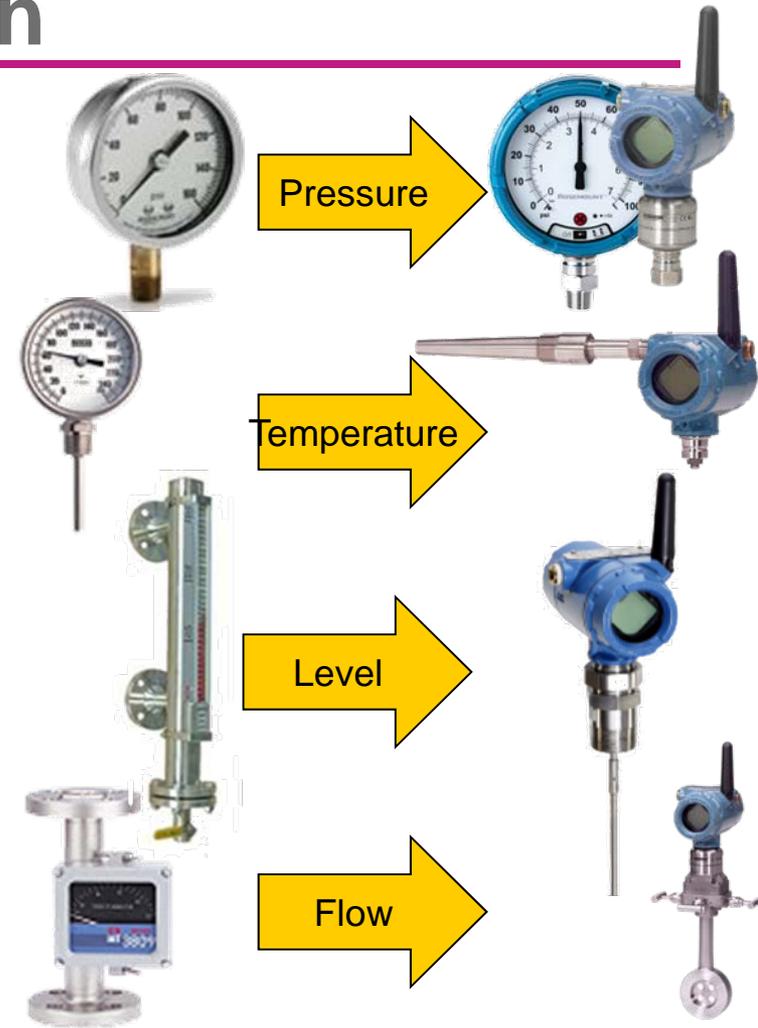# Process Operation Productivity - Typical Applications

- Automate manual tasks

Remote monitoring services less common: on-prem

Technical White Paper Available

From Periodic Manual Data Collection to Automatic Data Collection

- ● Able to reduce field work
  - – Dial gauges
  - – Sight glasses
  - – Variable area flow meters
  - – Dip sticks
- ● Result
  - – Fewer field operator rounds
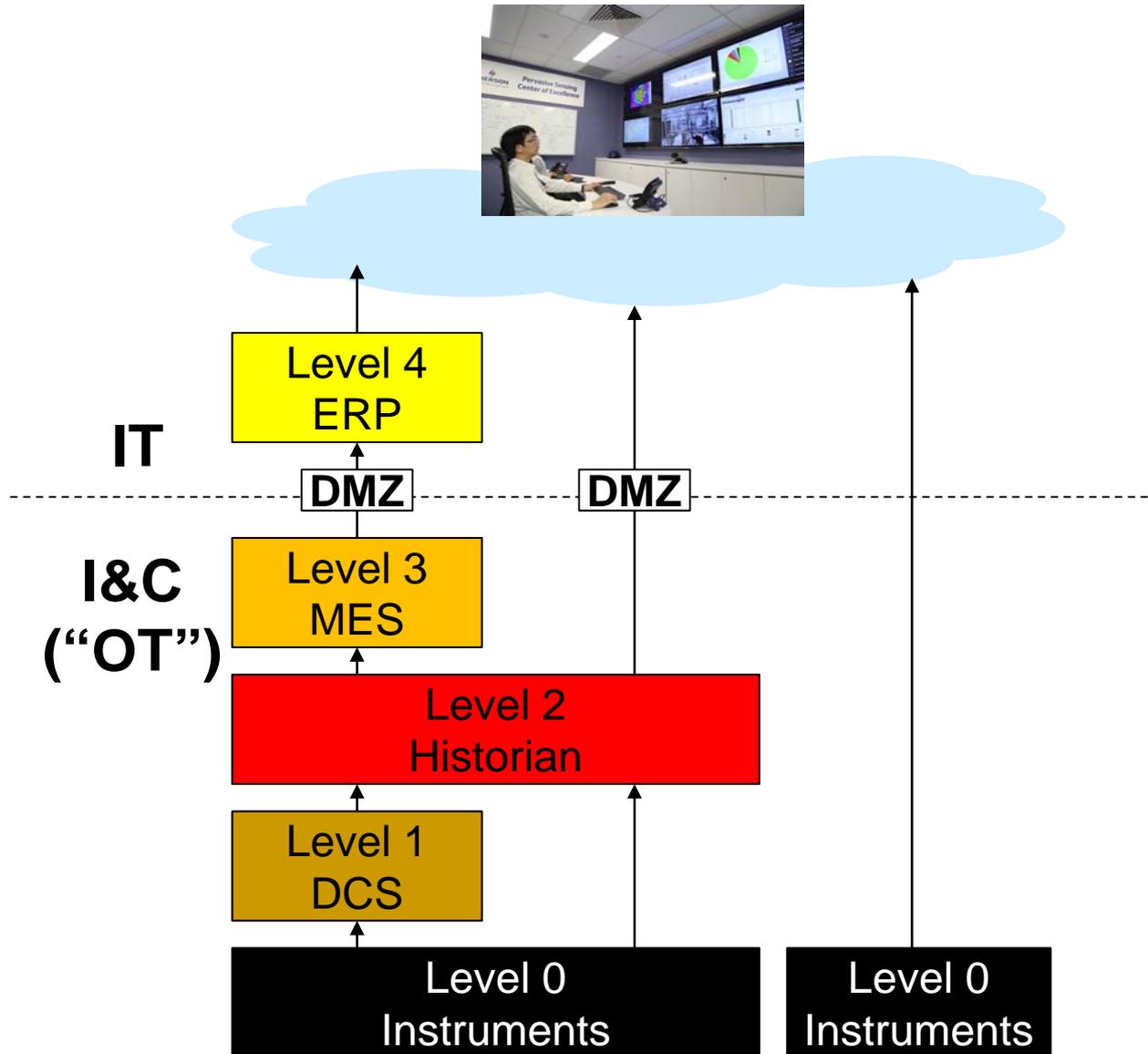 - – Reduce exposure of people to hazards or bad weather

Pressure

Temperature

Level

Flow

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IIoT Architectures

IIoT Architectures
- Often Bypass DCS

IT

I&C ("OT")

Level 4
ERP

DMZ   DMZ

Level 3
MES

Level 2
Historian

Level 1
DCS

Level 0
Instruments

Level 0
Instruments

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# 3G Mobile Backhaul Architecture

- Make sure cloud data center provider and mobile telecom provider have established a connection


3G

JB

Report

Report
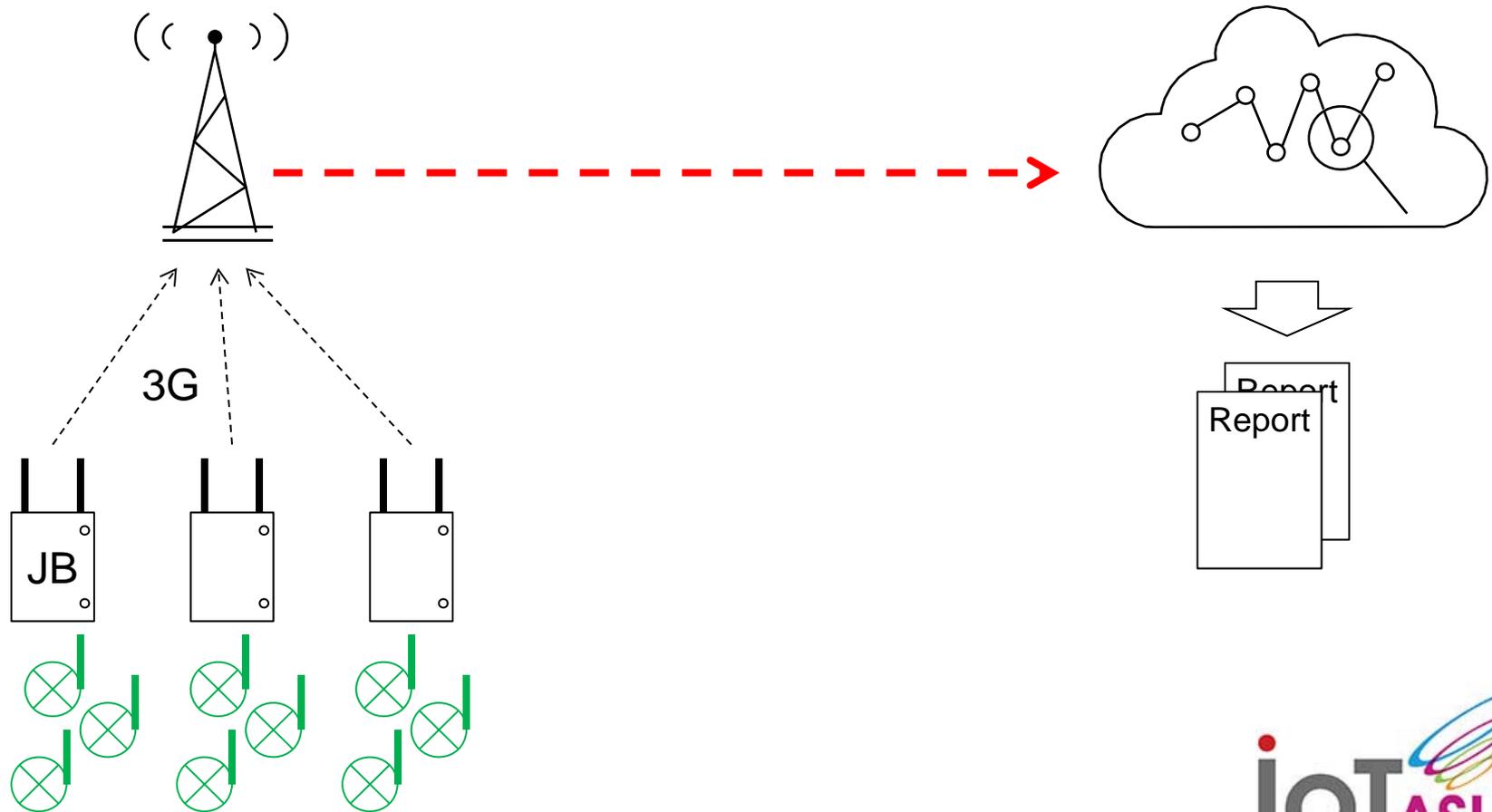
An Independent System

- The remote monitoring system is totally isolated from the plant control system
- No access to the plant's control system can be gained through the remote monitoring system

Control and Safety System

Remote monitoring system
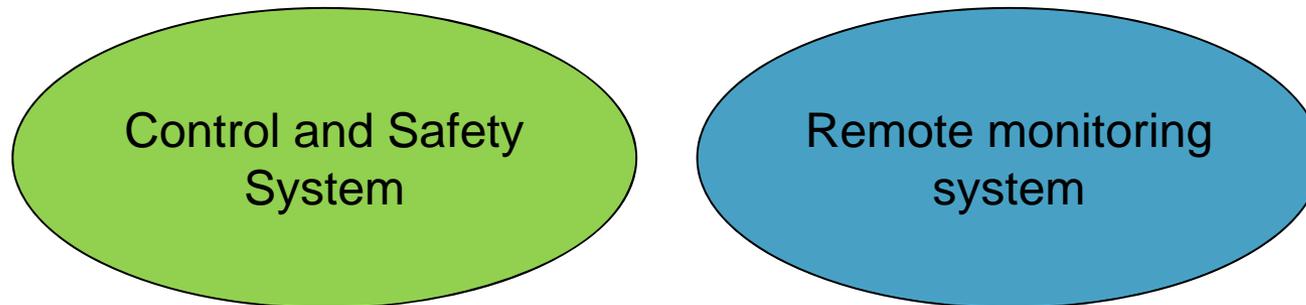
Non-Critical System

- The remote monitoring system is not used for control or safety
- Automatic data collection and analysis
- Even if 3G network is congested or even down it does not impact the process
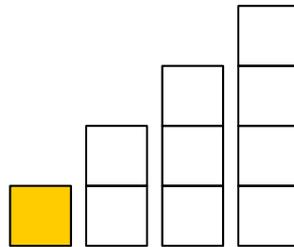
Non-Process Data

- The data used for condition monitoring is simple equipment diagnostics
  - Non-confidential
- Plants traditionally share manually collected maintenance data with service providers
- Confidential process data is not part of the remote monitoring system

INDUSTRIAL IoT (IIoT) Protocols

- Industrial strength network: FOUNDATION fieldbus
  - High noise tolerance
  - Long distance
  - Spur topology
  - Two-wire power
  - Rugged connectors
  - Intrinsic safety, non-incendive

IEC 61784-1 profile 1/1

- Industrial strength wireless network: WirelessHART
  - Full multi-hop multi-path mesh
  - Self-organizing

IEC 62591

- Well defined application protocol
  - Standard data types, parameters, blocks, semantics
  - Device profiles for process instrumentation
  - Device description

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Business Transformation

New business models

Business Models

	Traditional	Business Model A	Business Model B	Business Model C	Business Model D
Owns and manages the instrumentation	Client	Client	Client	Service Provider	Service Provider
Does the monitoring	Client	Client	Service Provider	Service Provider	Service Provider
Performs the maintenance	Client	Service Provider	Service Provider	Service Provider	Client

Chemical Plant in Singapore

- 148 Traps monitored
- 34 identified as failed (23%)
- Bypassed traps reduced from 50% to 4%
- Flange leak & bypass valve passing identified
- 7% steam savings

Normalized: Steam/Product — **Monitoring**

Before 0.278 • 0.270 • 0.260 • 0.287 • 0.260 • 0.302 • 0.278 • 0.277 • 0.252 • 0.242 • After 0.257
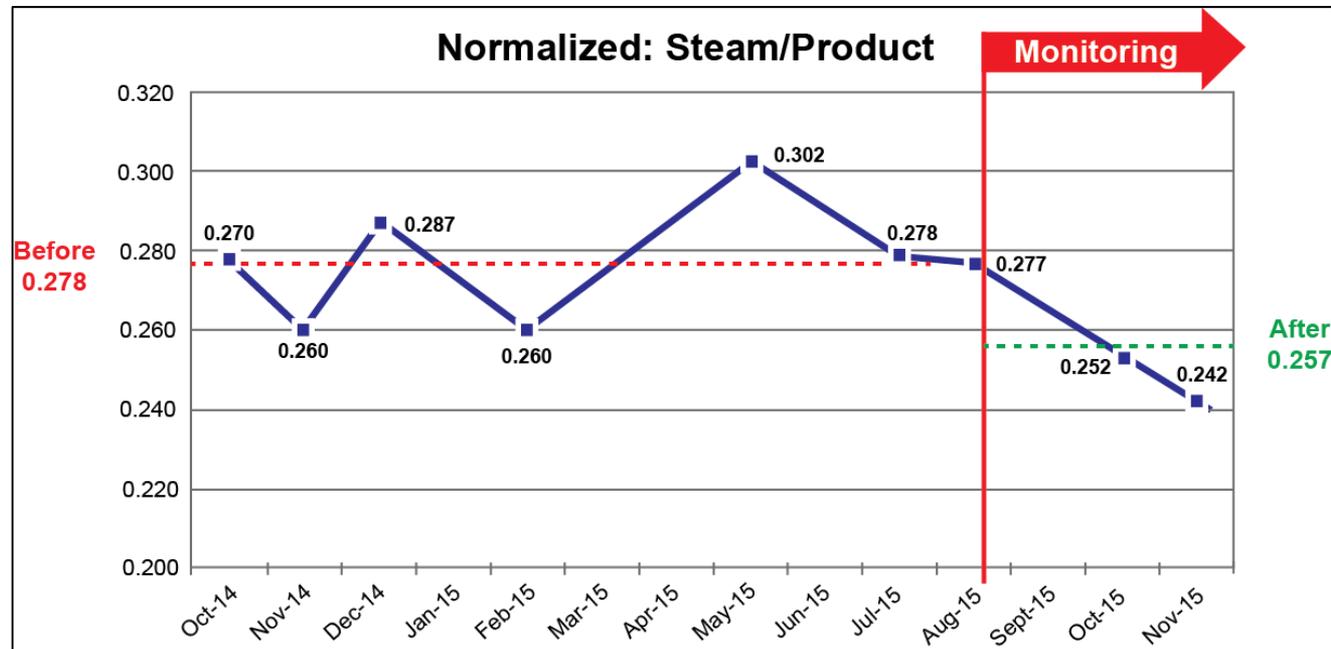
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Deployment

Phased Approach to Deployment
- Do This in Your Plant Before 2016 is Up

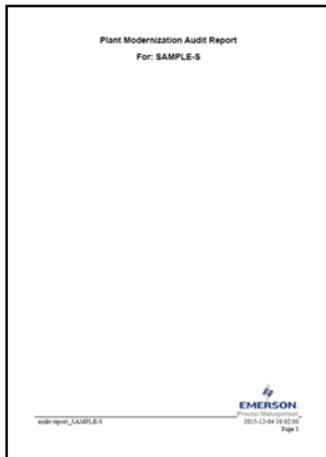| Digital Sensor Networks	Instrument Assets	On-premise Analytics Software	Review Work Processes	IntRAnet of Things	IntERnet of Things

- Step 1 Plant-wide Digital Sensor Networks
- Step 2 Instrumenting Assets
- Step 3 Deploy Predictive Analytics Software On-premise
- Step 4 Review Work Processes
- Step 5 Enable Private IntRAnet of Things
- Step 6 IntERnet of Things Business Models

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Plant Modernization Audit

- **No site walk down required**
- **Areas reviewed**
  - Reliability & Maintenance
  - Energy Efficiency & Loss Control
  - Health, Safety, & Environmental (HS&E)
  - Process Operations Productivity
- **Report generated**

Plant Modernization Audit Report
For: SAMPLE-S

EMERSON
Process Management

esdsr report_SAMPLE-S   2015-12-04 18:02:00
                                              Page 1

Description Available

• How many pumps are critical and should be monitored?   • Are mechanical seals monitored as per API standard 682, edition 2014 (using transmitters)?
• How many fans/blowers are critical and should be monitored?
• How many ACHEs are critical and should be monitored?
• How many compressors are critical but not yet monitored (e.g. compressed air)?
• How many cooling towers are critical and should be monitored?
• How many pipe lines experience corrosion and should be monitored?
• How many maintenance round (portable) vibration, temperature, steam trap, valve leak, and corrosion test points should be automated?

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Conclusion

Summary

- Solve plant challenges; automate data collection
  - Reliability & maintenance
  - Energy efficiency & loss control
  - HS&E
  - Productivity
- Gain new abilities with IIoT
  - Condition monitoring
  - Performance monitoring and energy management
  - Enjoy remote monitoring service
- IIoT deployment requires:
  - Industrial strength and interoperability
  - Separation
  - Remote monitoring service; teleco-cloud connection
  - Real-time analytics

Let's Stay Connected

- Jonas Berge

jonas.berge@emerson.com

Linked in.

http://www.linkedin.com/in/smartdigital
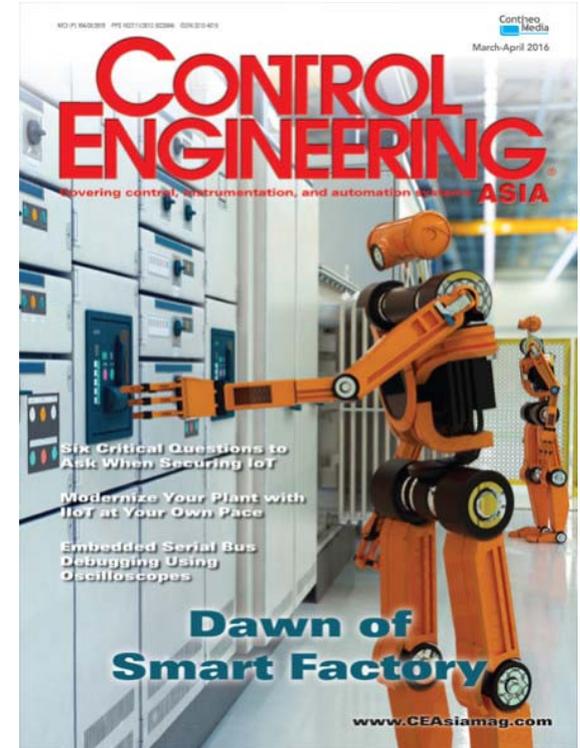

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