OSIsoft®

USERS CONFERENCE 2016

April 4-8, 2016 | San Francisco

TRANSFORM YOUR WORLD

How the Industrial Internet of Things is Changing Operations

Presented by **Peter Reynolds**

ARC Advisory Group

PReynolds@arcweb.com
1.506.343.4683
www.industrial-iot.com
@PeterDReynolds

© Copyright 2016 OSIsoft, LLC

Research & Consulting

Peter D. Reynolds
Industry Analyst
20 Years in Process Control & IT, Downstream Refining
5 Years as Analyst and Consultant

ARC Advisory Group

- Unique research company, focused on Industrial Automation
- Senior people with IT- OT experience and expertise
- Global Presence: US, Canada, Germany, France, Japan, China, India, Brazil, Argentina, Middle East
- Established in 1986

© Copyright 2016 OSIsoft, LLC

Some of ARC's Research Clients

© Copyright 2016 OSIsoft, LLC

Agenda

- What is Industrial IoT?
- The Future of Applications are in Cloud Deployment Models
- Digital Transformation Comes To Process Data
- Servitization and Analytics Drive New Outcomes With Data
- IoT Proof Points

© Copyright 2016 OSIsoft, LLC

What Do These Companies have in Common?

© Copyright 2016 OSIsoft, LLC

They Failed to Adapt to Digital Transformation…

© Copyright 2016 OSIsoft, LLC

Industrial Internet of Things, Industrie 4.0

Digital Disruption

Digital Transformation

There is no digital strategy anymore, it is about strategy in a digital world

© Copyright 2016 OSIsoft, LLC

How Visionaries see the Internet of Things

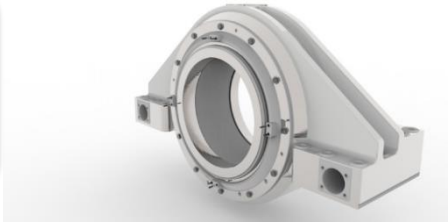
© Copyright 2016 OSIsoft, LLC

Video by Jason Silva, Shots of Awe, Nov 2014

© Copyright 2016 OSIsoft, LLC

Digital Transformation comes to Industry

You can collect data from Anything / Everything



SKF Insight wind sensor for spherical roller bearing (SRB)

You Can Collect Data More Frequently

Jet Engine, 5000 data points/second

You Can Store Data Cheaply

Windows Azure

amazon web services

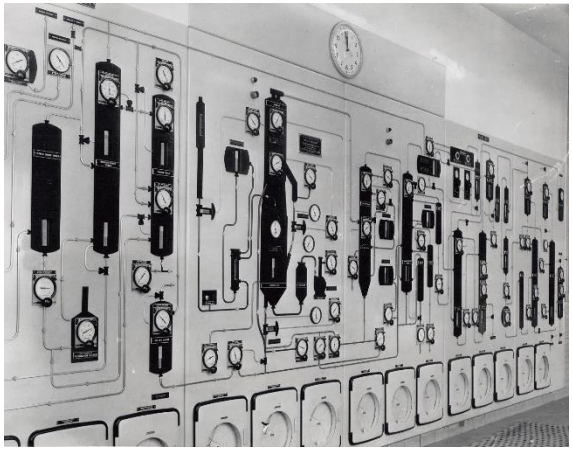
Google

Simple storage 3.9 cents / month

More Sensors and Analytics Enable Operational Insights and Service Transformation

© Copyright 2016 OSIsoft, LLC

The First Sensor Wave: Electro-Pneumatic

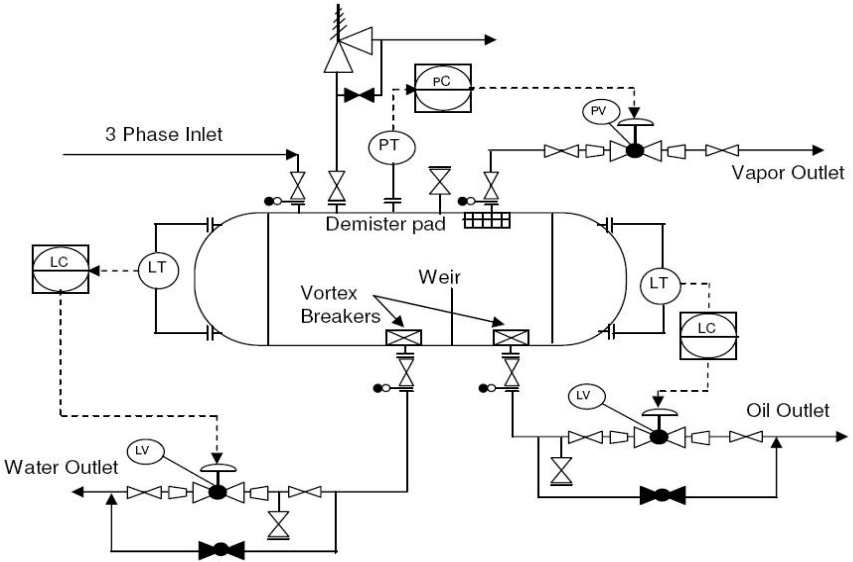


The Second Wave: DCS-Centric

The Third Wave: Cloud-Enabled Sensor Apps

© Copyright 2016 OSIsoft, LLC

IIoT Outcomes: Beyond the Plant P&ID - The Third Wave of Sensorization



Plant Control Systems do this well

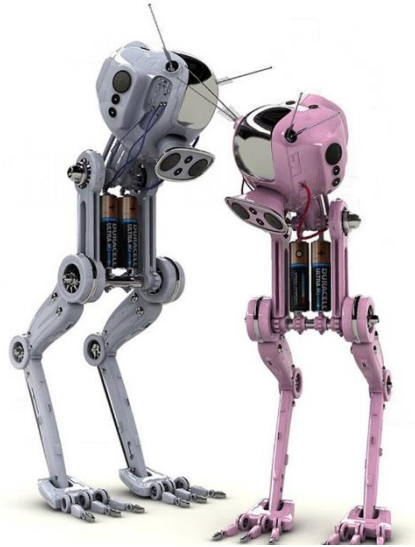
The Scope of Connectivity to Real-time Data Unfolds Outside of Traditional Automation

- Remote Monitoring Service
- Asset Health & Uptime
- Production Optimization
- Worker Safety
- Work Process Optimization
- Real-time Logistics Tracking
- Energy Management
- Employee Engagement

© Copyright 2016 OSIsoft, LLC

IoT is About Thinking 'Different'

- New Uses of Process Data and Outcomes
- New Service Models
- Refined Work Processes
- New Production Techniques
- Efficient Business Processes
- New Service Partners
- New Workers and Expectations
- New Approach To Boots On The Ground



IIoT ***is*** significantly changing the manufacturing production for First-movers.

You *won't* benefit with conventional thinking and an incremental approach's.

© Copyright 2016 OSIsoft, LLC

The Future of Applications are in Cloud Deployment Models

© Copyright 2016 OSIsoft, LLC

Complexity of Manufacturing IT & OT Organizations

High cost of the "IT" services

IT Infrastructure is a commodity

ROI of IT not well understood

Security and availability of apps

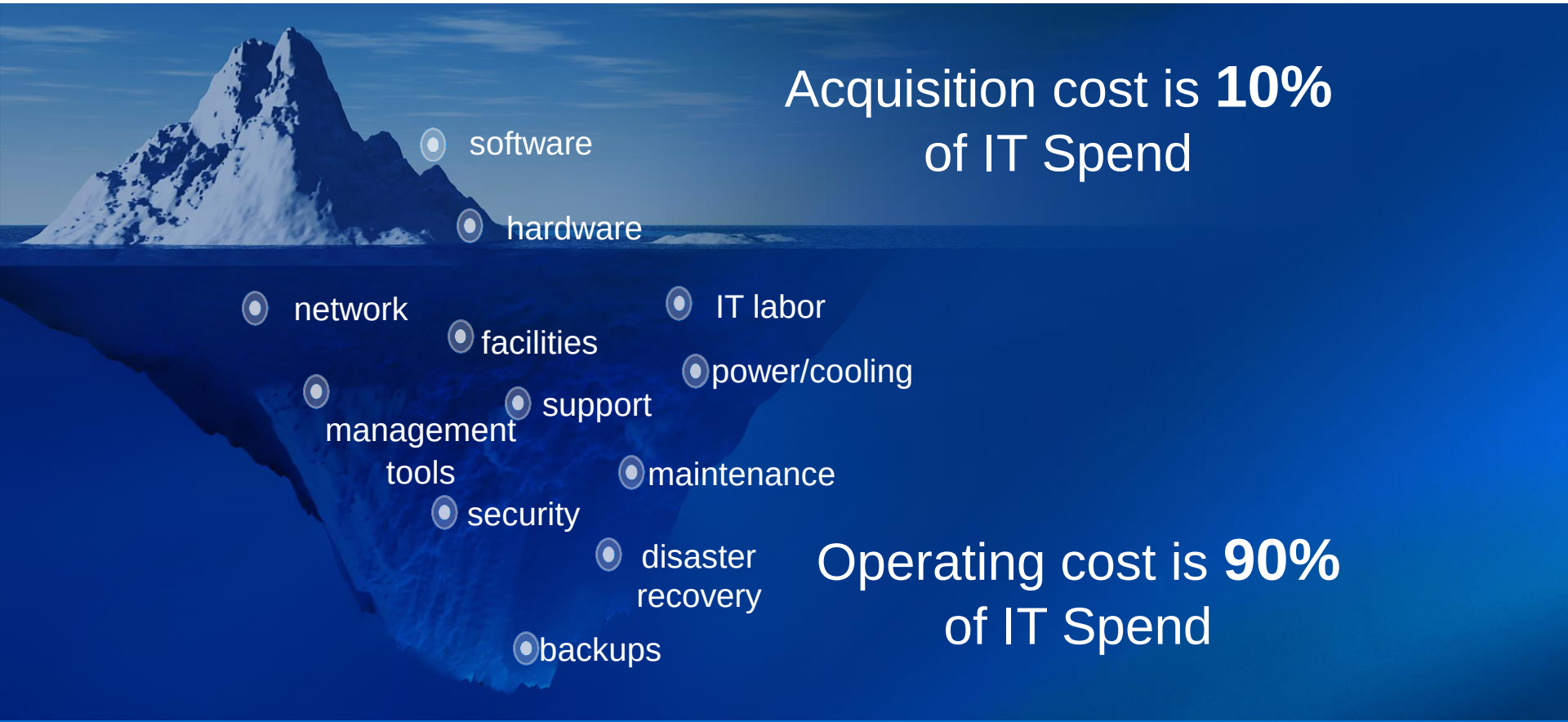
"Operations and supply chain are core competencies

Technology only enables the business

IT is not always perceived as value added work

© Copyright 2016 OSIsoft, LLC

IT Infrastructure Deployment and Cost



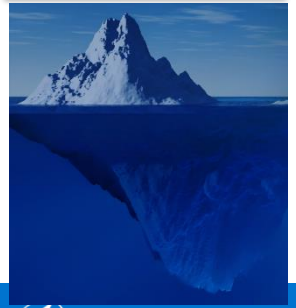
© Copyright 2016 OSIsoft, LLC

IoT Deployment Options: Changing the scope of Tech Organizations

Higher Cost Lower Agility

Lower Cost & Higher Agility

You own everything & manage it



Your Data Center

- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

amazon web services™

Google

Windows Azure

Cloud Services (Public or Private)

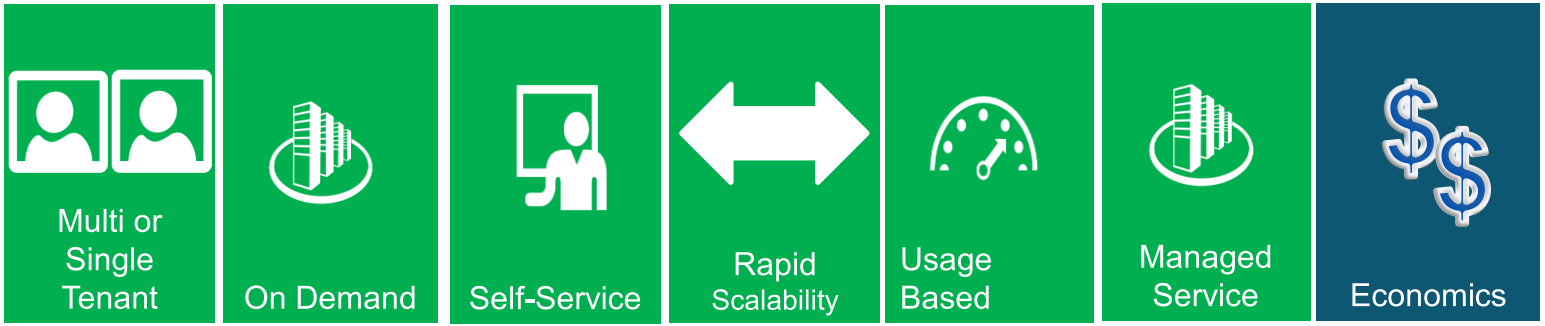
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Service Level Agreement 99.95% (5 min outage per week)

Your Vendor Manages it – You Configure it!

© Copyright 2016 OSIsoft, LLC

Cloud Services Definition



Cloud Computing is about Increasing the Speed of Delivery for Plant IT solutions and delivering value faster to the business

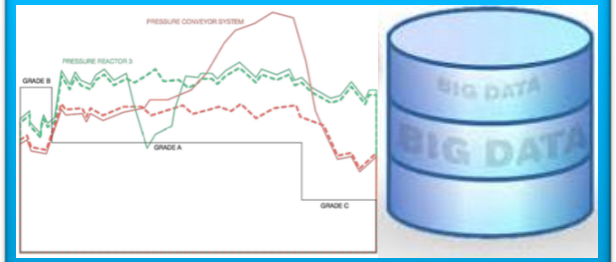
© Copyright 2016 OSIsoft, LLC

Digital Transformation Comes To Process Data

© Copyright 2016 OSIsoft, LLC

Digital Transformation comes to Process Data

Process Industries Do Not Make Use of The Data Currently Collected

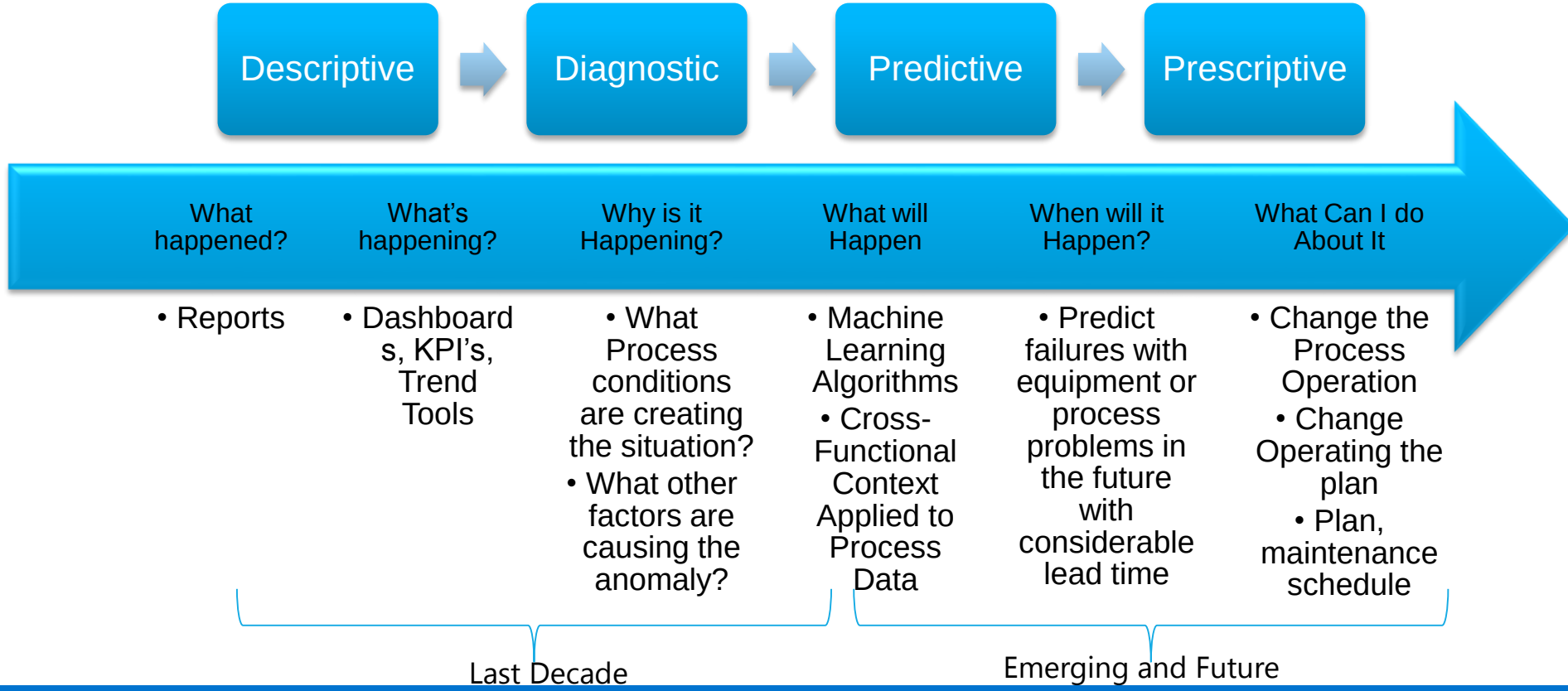


Process Knowledge Capture and Erosion of Talent is a Series Issue

Machine Learning and Analytics Can Predict Process and Equipment Failures

© Copyright 2016 OSIsoft, LLC

Process Analytics Provides Answers to More Questions



© Copyright 2016 OSIsoft, LLC

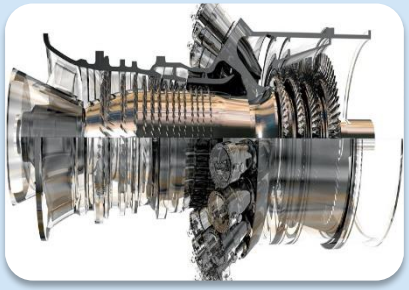
Predictive Analytics for Process and Machines

Process Variability

- Low Production
- High Energy Consumption
- Process Trips

Process Quality

- Customer Impact
- Reruns
- High Operating Cost
- Waste



Asset Health

- Predictable Behavior
- Asset Performance
- Workforce Utilization

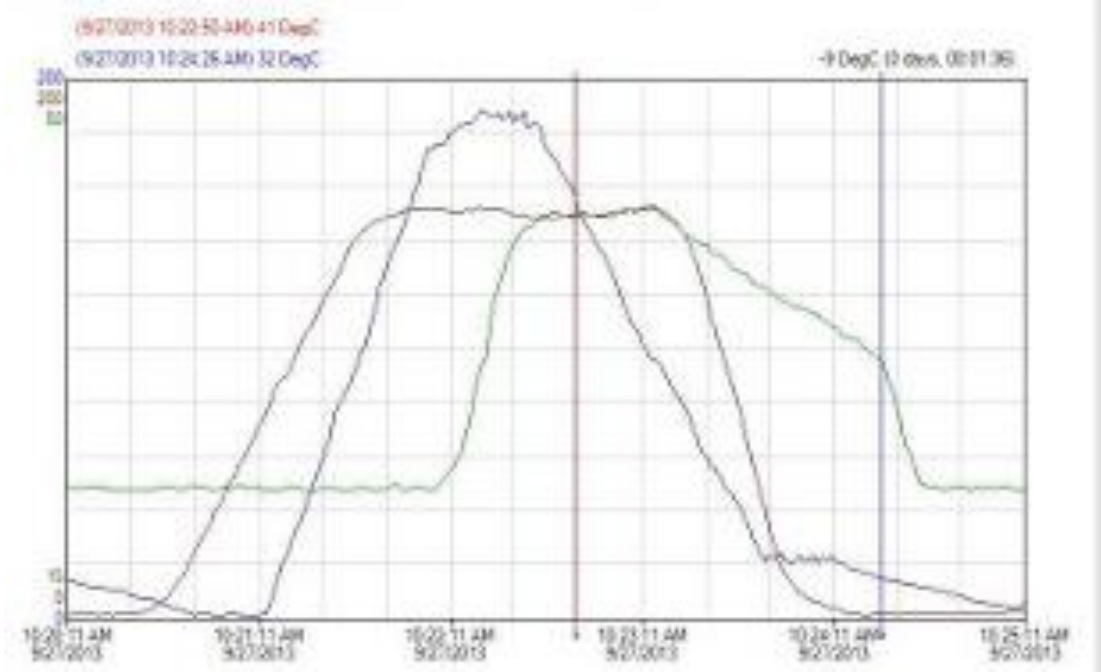
Incident Prediction

- Reduce Unplanned Downtime
- Lower Operational Risk
- Worker Safety

© Copyright 2016 OSIsoft, LLC

The Current Tools For Process Data – “Infrastructure”

- Proprietary Database
- Good at collections and write optimized
- DB Not Easily Searchable
- Integrate via EMI Solutions, OPC etc.
- Difficult to Apply Context
- Most process companies keep decades of data and rarely leverage data
- The Process Engineer and Operator Tool For Data
- Rear view looking
- Most context is applied in Excel



© Copyright 2016 OSIsoft, LLC

What is Machine Learning?

- Pattern recognition and computational learning in Artificial Intelligence
- Goal is to have a machine mimic a human mind or behavior
- ML Closely related to data mining and statistics
- Machine learning or AI (Artificial Intelligence) is a method of teaching computers to make predictions based on some data
  - Leverages big data and predictive algorithms
  - Determines a set of attributes to predict performance
- Supervised
  - Regression, Classification
- Un-Supervised
  - Clustering Data, Recommender

© Copyright 2016 OSIsoft, LLC

Getting Holistic Process Insights is Difficult

Disconnected Systems of Record to Tap Into

Converging diverse data difficult and time consuming

Rigid BI Dashboards / Reports

Built for 'IT experts', relied on predefined questions, restricting insights

Offline Analysis in Spreadsheets

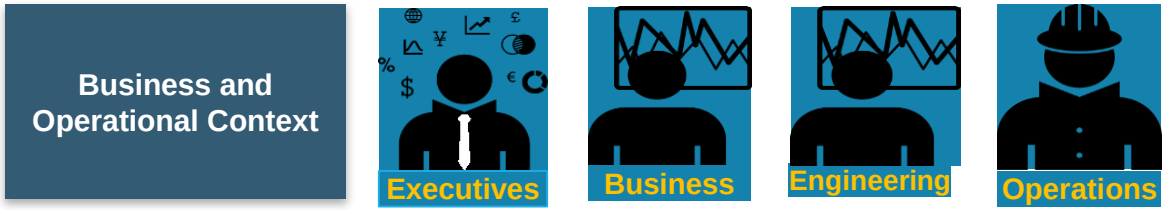
Proliferating analysis, stale data, difficult data blending

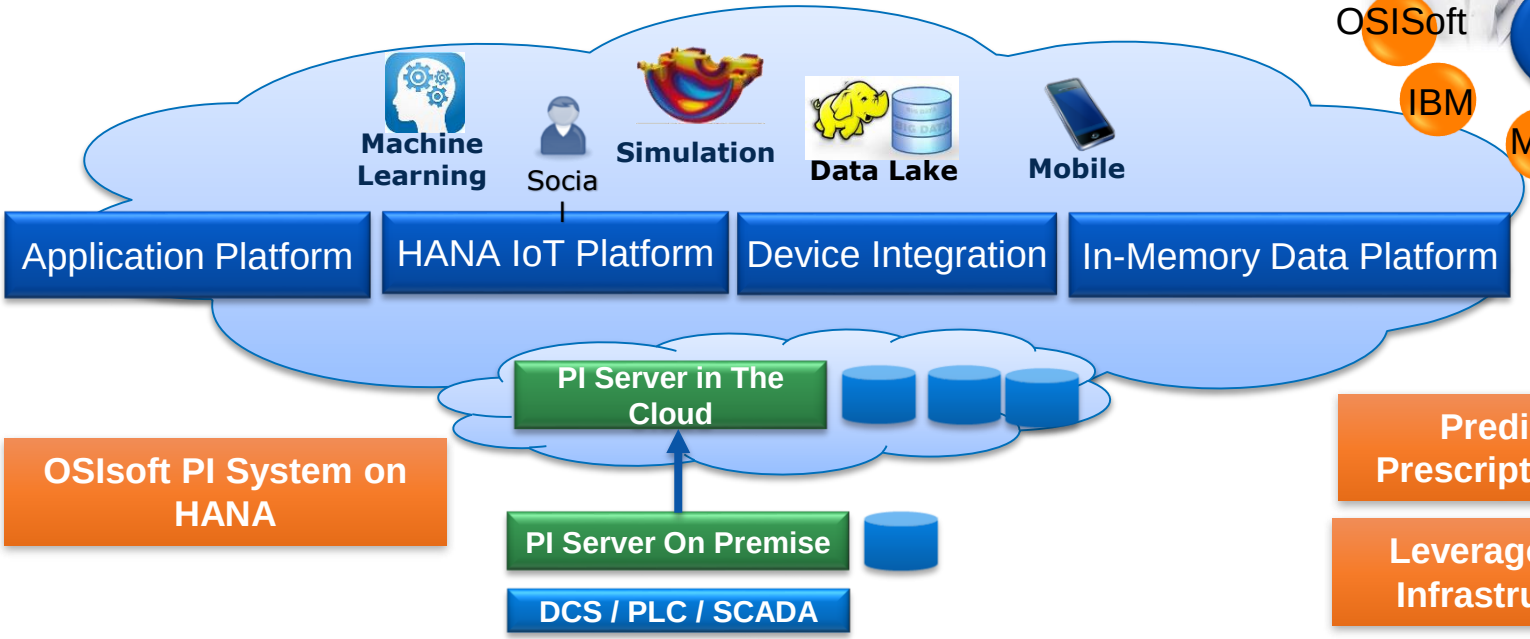
Long Delays to Insights

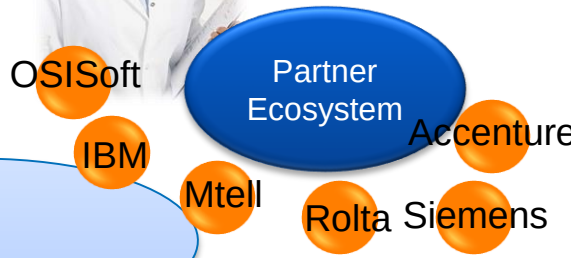
Dissemination of insights takes too long, impacting decisions

© Copyright 2016 OSIsoft, LLC

The Era of Platforms: SAP and OSIsoft Industrial IoT Partnership







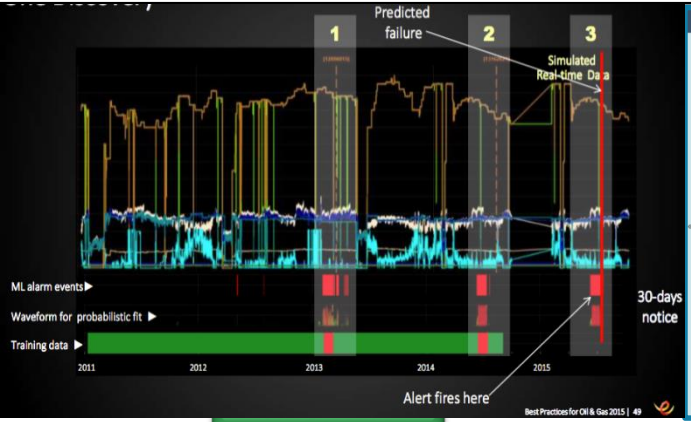
OSIsoft PI System on HANA

Predictive and Prescriptive Analytics

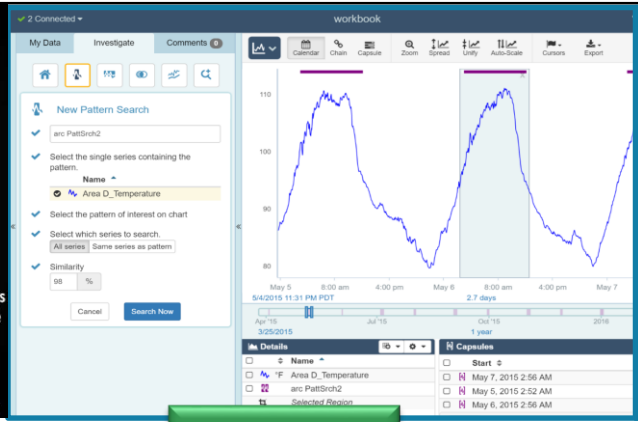
Leverage Your Data Infrastructure Now

© Copyright 2016 OSIsoft, LLC

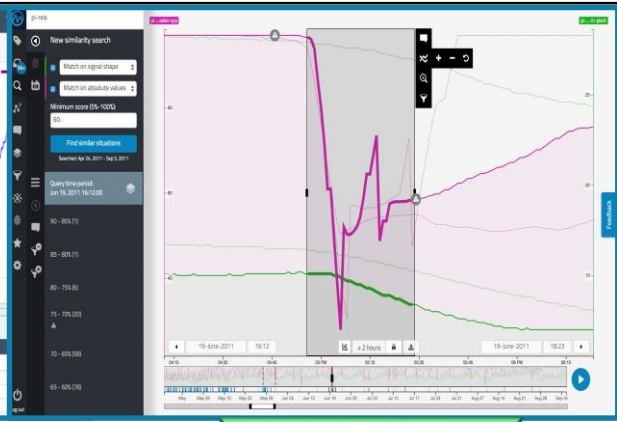
The Analytics Platform: Next Gen IoT or “Try-and-buy”



Mtell



Seeq



TrendMiner

Historian EAM Logs etc.

- Agile bolt-on “try and buy” solutions
- Quick Wins
- Nom-Full Stack Solutions, Short Projects

- Non-Generic
- Non-Hadoop
- No Data-Scientist Required

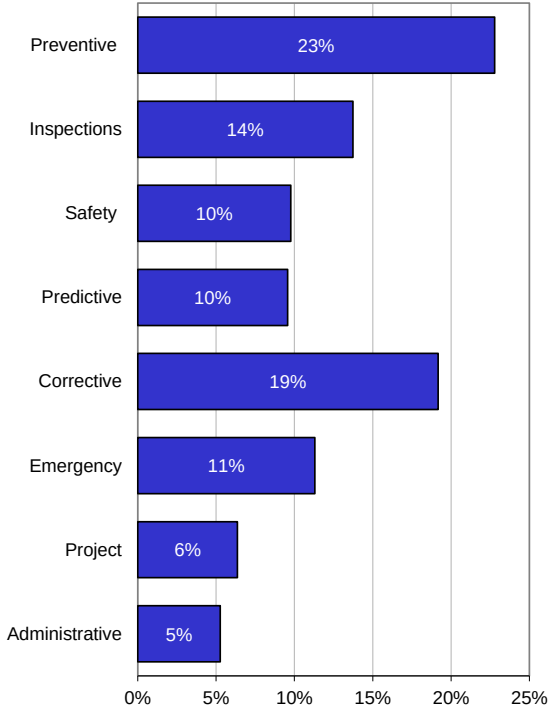
© Copyright 2016 OSIsoft, LLC

Servitization and Analytics Drive New Operations and Maintenance Outcomes

© Copyright 2016 OSIsoft, LLC

Maintenance Approach Drives Process Data Usage

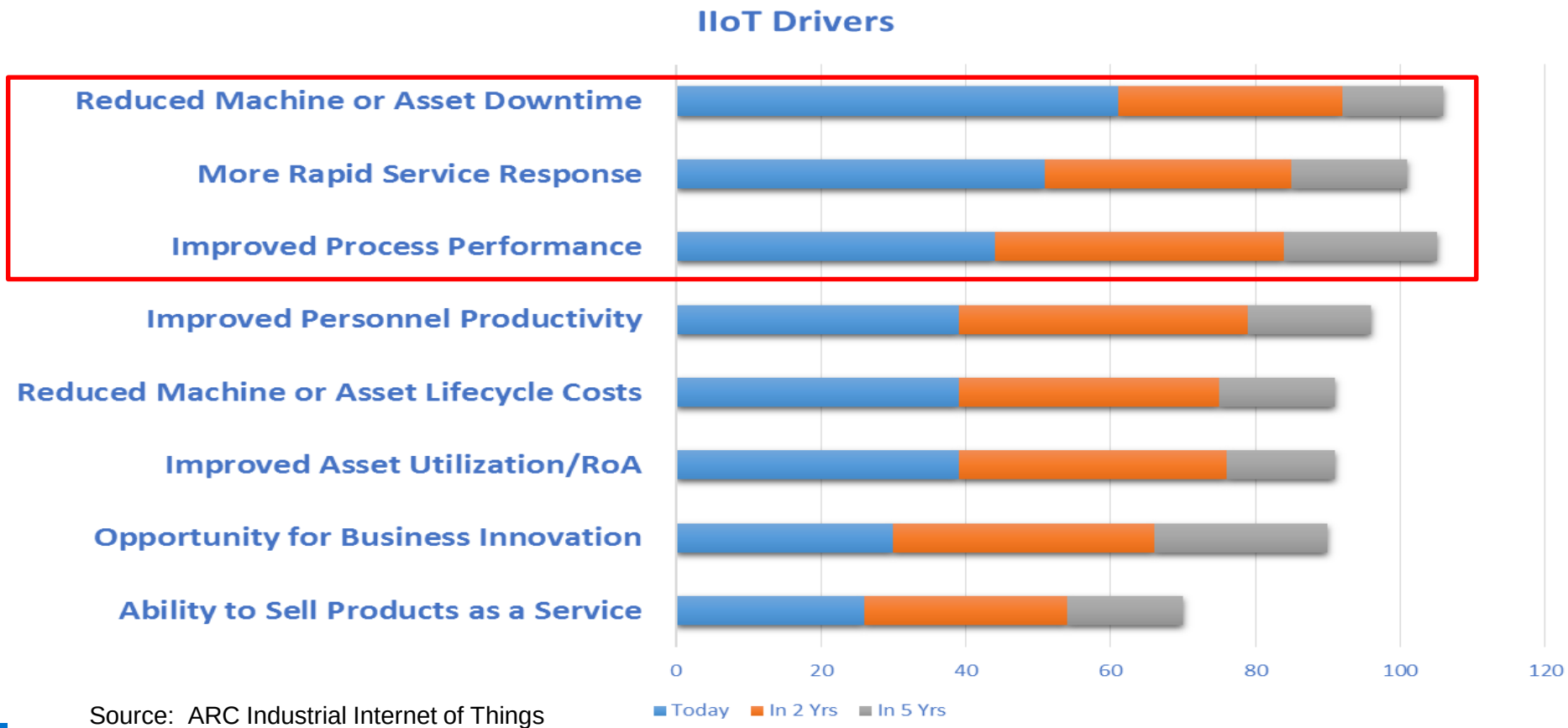
Approach	Method	Cost Impact	Operations Impact
Corrective or break-fix maintenance	Run to failure and then repair	$$$	Hard to Meet Plan, highest risk to production ops
Preventive or scheduled, interval maintenance	Service in a fixed cycle or time interval	$$$$	Introduce unnecessary work, New Failures, frequency of unplanned downtime
Condition-based monitoring	Monitor single process variable, identify bad trends, & alert prior to failure, automatic work order generation	$$	The Vibration or alert is too late, highest false positive
Predictive	Analytics with multi-variable time series data contextualized with unconventional data. Equipment-specific algorithms, analytics and machine learning. Minimum false positives.	$	Trust Assets and Predictable Operations, Downtime reaches zero
Prescriptive	Describe the Fix or Repair Fix the Process	$	



ARC Survey with 141 user responses March 2015

© Copyright 2016 OSIsoft, LLC

Business Drivers for IIoT



Source: ARC Industrial Internet of Things Survey

© Copyright 2016 OSIsoft, LLC

Servitization: The Model For Asset Improvement

Historian Archives

Sensor Data

Asset Information Network

Historian, Analytics

Machine Learning

Analytics 0% False Positive

Influence Design

OEM Service

Is am seeing an abnormal "pattern" operations.

Operators

Can I change the Operations Plan?

Maintenance

We have 180 days before a failure will occur

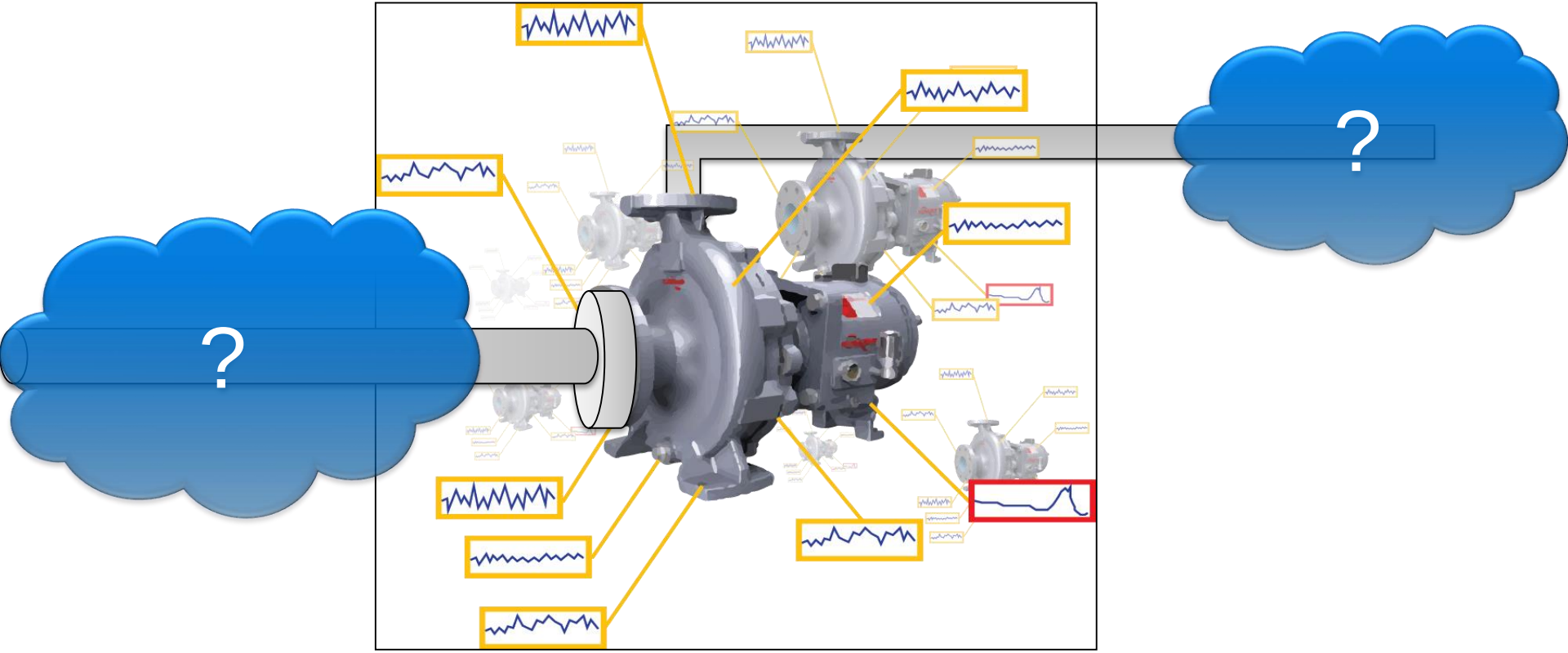
Plan / Schedule WO

Execute Work Order

© Copyright 2016 OSIsoft, LLC

Predicting Asset Failures Needs Context Beyond Both Process and Discrete

The Vibration Alarm Means It Is Too Late



© Copyright 2016 OSIsoft, LLC

Servitization And Control Valves the IoT Way

Digital Positioner Skills

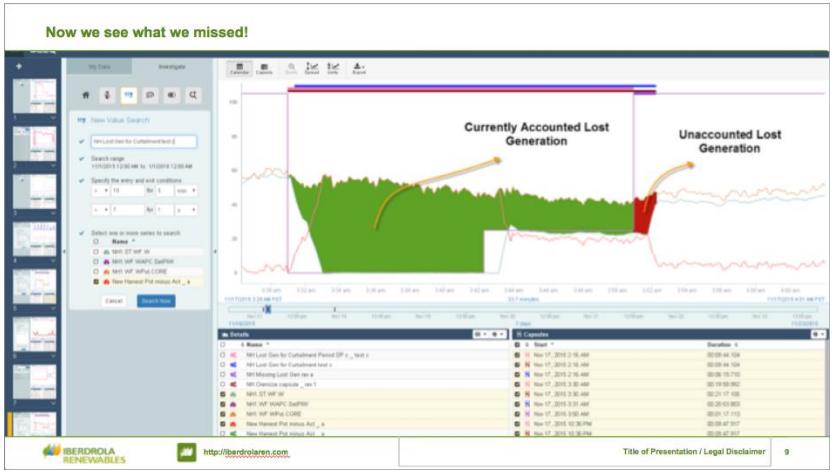
Process Variables Skills

Wetted Parts Skills

OEM

Process Engineer

Instrument Mechanic



Source: Seeq Process Analytics

Contextualization of Valve Diagnostics + Time Series Data

Seeq

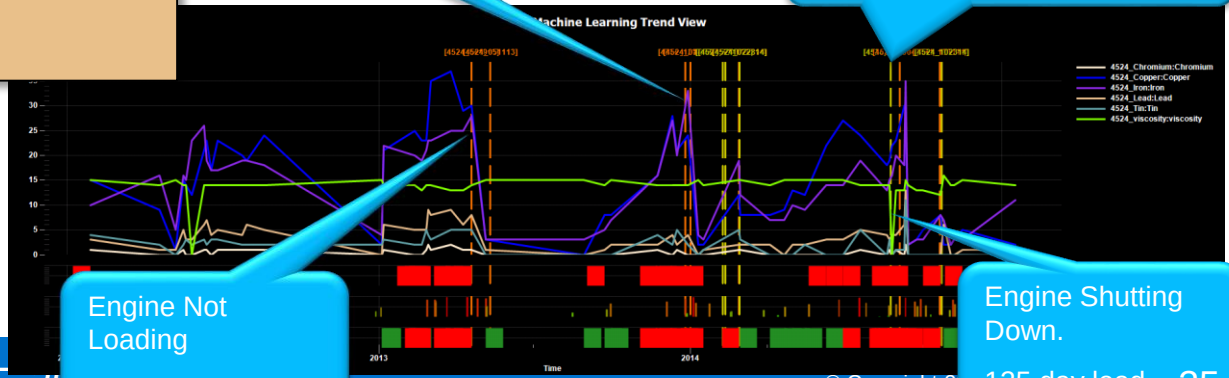
FISHER

Remote Services

© Copyright 2016 OSIsoft, LLC

CSX Predicting Machinery Failures using IoT

- **Problem**
  - Lost production from unplanned downtime
- **Solution**
  - Monitoring: 600 EMD engines
  - 499/600 actively monitoring
  - 111 have had corrective actions applied
  - 60 saves/good fixes
  - Re-applying corrective actions, or sending locos for rebuild/program work
- **How**
  - Predictive Analytics
  - Mtell
  - Outsourced Infrastructure
- **Benefit**
  - Combined Lead time detecting failure-570 days



© Copyright 2

Owner Operator Barriers to Industrial IoT Adoption

- IT vs OT Organizational barriers.
- Lack of understanding of Cyber Security
- Fear of letting data leave the enterprise
- Company Culture
- Intellectual Property Ownership
- Legacy Infrastructure and Complexity
- Legacy Thinking

© Copyright 2016 OSIsoft, LLC

Summary

- Cloud Enable Your Process Data Apps For Greater Agility
- Servitize the Assets That are Not Core
- Make Process Data Part of Your Analytics To Shift Your Outcomes
- Add Context To Data Where it Can Count
- Build Data Science Competency
- Train Non-Process Disciplines About Process Data
- Be A Change Agent In Your Company
- Develop Stronger Cyber Security Competency

© Copyright 2016 OSIsoft, LLC

Questions

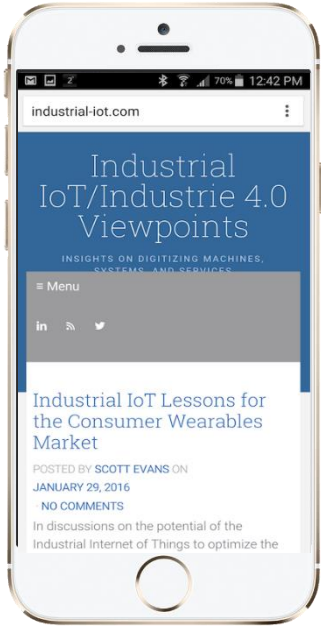
Please wait for the **microphone** before asking your questions

State your **name & company**

Please don't forget to…

Complete the Survey for this session

Subscribe To ARC Newsletter



http://ddut.ch/osisoft

© Copyright 2016 OSIsoft, LLC

감사합니다

谢谢

Danke

Gracias

Merci

Thank You

ありがとう

Спасибо

Obrigado

© Copyright 2016 OSIsoft, LLC

OSIsoft®

USERS CONFERENCE 2016

April 4-8, 2016 | San Francisco

TRANSFORM YOUR WORLD