Adoption of IIoT Technology for Superior Maintenance Practice of Plant Assets

Jonas Berge, Emerson Automation Solutions
A Digital Plant... An Intelligent Plant...

- Manual dyke valve open
- High-risk area intrusion
- Schedule bearing replacement
- Inject more corrosion inhibitor
- Close manual transfer valve
- Non-uniform temperature profile
- Schedule relief valve overhaul
- Fuel gas over-consumption
Topics Covered

**WHY:** Operational Excellence

HOW GREAT PLANTS USE STANDARDS TO GET DATA TO TAKE ACTION

**HOW:** Digital Transformation

**WHAT:** Digital Operational Infrastructure
### Plant Challenges: Achieve Operational Excellence - The Case for Change

<table>
<thead>
<tr>
<th>Reliability &amp; Maintenance</th>
<th>Energy &amp; Losses</th>
<th>HS&amp;E</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Greater</strong> Availability</td>
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<td><strong>Fewer</strong> Incidents</td>
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- Fewer Incidents
- Faster Response time
- Reduced Off-spec
- Reduced Non-compliance
- Reduced Operation cost
- Higher Productivity
- Greater Flexibility
- Greater Throughput
- Reduced Off-spec
- Reduced Non-compliance
Digital Transformation

The new way of running and maintaining the plant
Digital Transformation of Tasks
- Of How the Plant is Run and Maintained

Transformation

Manual Paper-based Tasks

Automatic Digital Software-based Data-driven Ways of Working
Digital Transformation: Reliability & Maintenance

- ISO 55000
- API 691
- API 570

Reliability & Maintenance

Greater Availability
Extend Equipment Life
Greater Integrity
Reduced Maintenance costs
Digital Transformation: Health, Safety, and Environment

- ISO 45001
- ISO 14001
- OHSAS 18001

**HS&E**

- Fewer Incidents
- Faster Response time
- Reduced Non-compliance

Digital safety checks

Digital distress calls

FieldComm Group
Connecting the World of Process Automation
Digital Transformation: Production

- ISO 9001
- ISO 29001

Digital operator rounds

Digital milk run

Production

- Higher Quality/Yield
- Greater Throughput
- Greater Flexibility
- Reduced Operation cost
- Higher Productivity
Digital Transformation: Energy Efficiency & Loss Control

ISO 50001

Energy & Losses

Digital energy management

Digital loss control

Lower Energy consumption and cost

Reduced Emissions and carbon footprint
Digital Transformation for Operational Excellence in Digital Plants - Internet and Cloud are Not a Must

**On-premises**
Using experts within the plant.
No Internet. No cloud

**Your Fleet Management Center**
Using experts in your own center or integrated operations. IIoT.

**Emerson Connected Services**
Emerson experts. IIoT
Digital Operational Infrastructure

A second layer of automation
NOA – NAMUR Open Architecture

Enhancement of existing approaches as a baseline for the efficient and flexible utilization of Industrie 4.0 within the process industry

- Additive to existing structures
- Open for new approaches within Industrie 4.0
- Based on existing standards
- Simple integration of fast changing IT components from field level up to enterprise level
- Significant improvements of cost per sensor due to open and integrative approaches
- No risk of availability and safety of installed base
Digital Operational Infrastructure

- Second Layer of Automation
- Integrated with Existing Operational Infrastructure and IT Infrastructure
<table>
<thead>
<tr>
<th>Layer</th>
<th>Functions</th>
<th>Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>L4</td>
<td>BI Reports</td>
<td>ERP</td>
</tr>
<tr>
<td>L3.5</td>
<td>Data Diode, Historian Cloud Connection, Physically Independent</td>
<td>DMZ</td>
</tr>
<tr>
<td>L3</td>
<td>Operational Notifications, Equipment Analytics, Operational Dashboards</td>
<td>Historian, CMMS</td>
</tr>
<tr>
<td>L2</td>
<td>Vibration Analytics, Valve Analytics, Corrosion Analytics</td>
<td>DCS Software</td>
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<tr>
<td>L1</td>
<td>Wi-Fi, Fieldbus, WirelessHART</td>
<td>DCS Hardware</td>
</tr>
<tr>
<td>L0</td>
<td>Position, Vibration, Acoustics, Corrosion, Power</td>
<td>Sensors &amp; Actuators</td>
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</table>
Mobility: Operations Dashboards - Putting Historian to Good Use

- KPIs based on roles and responsibilities
- Displays anywhere: on smartphone, tablet, laptop, and desktop...
- From underlying analytics; using historian as single platform
Mobility: Notifications

- Notifications based on roles and responsibilities
- Displays anywhere: on smartphone, tablet, laptop, and desktop...
- Based on underlying analytics
Platform Independent Equipment Analytics

Improve Reliability and Energy Efficiency

- Spot abnormal situations
- Recognize optimum maintenance times
- Reduce energy costs
- Identify and prevent failures before they occur
- Track asset health ISO 55000

Improve Safety and Compliance

- Comply with regulations
- Identify leaking and sticking situations
- Gain real-time visibility
- Avoid potential safety hazards
- Reduce fines and environmental impact
Predict Problems in Process Equipment

- Easy to use, platform agnostic, web-based, predictive
- Aggregates data from existing systems and additional sensors

Aggregate from Everywhere

Connect to Anything

OPC-UA

Virtual Machine

Edge Gateway

Existing Systems & Historians

Sense Everything

Deploy Anywhere

Web UI

Mobile

OPC-UA

OPC-UA

Visualize Anywhere

Wireless HART

Existing Systems & Historians

PHD

PHD

OPC-UA
Readymade Analytics That Require No Custom Programming
Purpose-Built - Easy Diagnostics Drives Maintenance Tasks

- Actionable information

![Image of Emerson Pumps Monitoring interface](image-url)
Ubiquitous Sensors on the Equipment

Up to 12 Sensors

- Discharge Pressure (existing)
- Mechanical Seal Flush Fluid Reservoir Pressure
- Bearing Temperature x 2
- Strainer DP
- Mechanical Seal Flush Fluid Temperature
- Vibration x 2
- (Flow)
- (Suction Pressure)
- Leak Detection

Vibration is a start but not enough
Infrastructure to Handle Missing Measurements

- Pressure
- Temperature
- Level
- Flow
- Vibration
- Valve Pass.
- Corrosion
- Trap Failure
- Temperature
- Power
FOUNDATION Fieldbus for Digital Transformation - Build on the Fieldbus You’ve Got

- Add instruments for equipment condition and performance monitoring
  - On premises or IIoT
- Fieldbuses usually not fully populated
- Add sensors for condition monitoring and energy management
WirelessHART for Digital Transformation - Build on the Wireless Infrastructure You’ve Got

- Add instruments for equipment condition and performance monitoring
  - On premises or IIoT
- Gateways usually not fully populated
- Add sensors for condition monitoring and energy management
Conclusion

Summary
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**WHY:** Operational Excellence

HOW GREAT PLANTS USE STANDARDS TO GET DATA TO TAKE ACTION

**HOW:** Digital Transformation

**WHAT:** Digital Operational Infrastructure
Experience the New Digital Ways of Working in a Digital Plant in the Emerson Solutions Center in Singapore

Digital plant visioning, Mobile notifications, KPI dashboards on tablets

Digital Twin, Digital logbook, Equipment Performance Analytics, Digital integrity management, Location Awareness (RTLS), Digital mustering and rescue locating, geofencing, Digital energy management, Predictive analytics, batch analytics, Big Data

Digital reporting, Digital inspection, Mobile operator, RFID, Wearable video conferencing, Wireless Infrastructure, Augmented Reality (AR), Non-intrusive wireless sensors, Edge Analytics

Operational Certainty Discovery Session, Design Thinking

Virtual Reality (VR), Success sharing

Industrial Internet of Things (IIoT), Fleet management, remote collaboration, and expert support, Cloud
I’m Listening...

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