Benefits of Digital Communications in Field Instruments

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Digital Personal Devices

Image source: Manufacturer website
Function & Information's

- Heart Rate Monitoring
- Time / Date
- Alarm
- calorie Counter
- Step Counter
- Remote Control
- Call / Message / SNS Alerts
- Find Phone
- Logs
- Distance Tracking
- GPS
- Sleep Monitoring
- Sedentary Alerts
Results & Recommendations

Dashboards : - Data Summary : Decision Making : Motivation
Digital Communications & Instruments
Digital Communications & Instruments since 90’s!

How did we use them?

Foundation Fieldbus:
Utilization of Diagnostics, Extend for Control?

Any changes in the way we work, use and maintain?

HART: What was the most commonly used case?

Did we make the best of it?
Opportunities, Availabilities & Possibilities

- Improved Process Insight
- Simplified Maintenance
- Enabler for Digitalization
Improved Process Insight

- **Mass Flow / Volume Flow / Temperature**
- **8 Inputs**
- **Multi Function Indicator**
- **pH / SC / ISC / DO**
- **Vibration / Surface Temp**
- **Electronic Chemical Injection System**

**Multi Sensing / Function**

- **DP Flow / Line Pressure**
- **Level / Blanket Pressure**
- **Mass Flow / DP / Pressure / Temperature**
- **Not necessary**

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Improved Process Insight

### Traditional Faceplate

<table>
<thead>
<tr>
<th>Tag Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 bar</td>
</tr>
<tr>
<td>22 deg. C</td>
</tr>
<tr>
<td>800 mmWC</td>
</tr>
</tbody>
</table>

- **Secondary Value**: Tank Pressure
- **Territory Value**: Capsule Temperature
- **Primary Value**: Level

### Template - Multiple Information

- **Indication of the signal type**: analog = 4-20mA while HART = digital
- **Dual scales, labels and separate alarm limit indicators etc...**
- **With HART7 clicking the values should give you the current value status and timestamp etc...**

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Maximize Instrument Information
Opportunities, Availabilities & Possibilities

- Improved Process Insight
- Simplified Maintenance
- Enabler for Digitalization
Common Source of Instrument Failures

External Factors
- Process Upset
- Impulse line clogging
- Scaling / Deposition
- Corrosion / Pitting
- Water ingress into terminals

Ageing
- Cable / Cable Glands
- Connector / Wiring Terminal
- Electronic Components
Instrument Diagnostics

- Water in terminals, deteriorations of components or cable
- Impulse Line blocking detection (Including One side block detection)
- Heat Tracking system diagnostics
- Over pressure / Potential zero Drift alert

- Sensor failure (Open / Short)
- RTD Corrosion
- Sensor Drift
- Temperature Cycle Diagnostics

- Coriolis - Tube Integrity; In line meter verification
- Mag - Electrode deposition ; Low Conductivity ; Bubble / Slurry Detection; In line meter verification
- Vortex - Pipe line vibrations

- pH / Conductivity - Electrode Health check & Ageing ; Scaling Detection ; Calibration & Auto Cleaning Alert
- Zr - Cell life span check
- TDLS - Auto Cleaning ; Purge / Transmission Alert
- GC - Health Monitoring & Proactive Abnormality Reporting ; Calibration Alert
Descriptive Diagnostic Indication on Instruments

Alarm No.

Descriptive Diagnostic Message

Totalized Value
Diagnostic Message
Simultaneous Flow Rate
Integrating Diagnostics Data for Decision Making


Device Diagnostics
Field Asset KPI Report

### 1.3 Device Status Information (NE107 Message Categories)
#### 1.3.1 Device Status Summary

<table>
<thead>
<tr>
<th>Status Signal Icon</th>
<th>Meaning</th>
<th>Number of Devices [Qty (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>Check Function</td>
<td>176 (25.4%)</td>
</tr>
<tr>
<td></td>
<td>Out of Specification</td>
<td>142 (21.4%)</td>
</tr>
<tr>
<td></td>
<td>Maintenance Required</td>
<td>202 (28.8%)</td>
</tr>
<tr>
<td></td>
<td>Communication Error</td>
<td>40 (5.6%)</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>68 (9.9%)</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>328 (48.7%)</td>
</tr>
</tbody>
</table>

**Analysis Date:** 28-Jan-2018 8:51:30 AM

### 1.2 Device Status Information
#### 1.2.1 Device Status Summary

<table>
<thead>
<tr>
<th>Device Status</th>
<th>Meaning</th>
<th>Number of Devices [Qty (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Abnormal</td>
<td>164 (45.5%)</td>
</tr>
<tr>
<td>Yellow</td>
<td>Warning</td>
<td>165 (44.8%)</td>
</tr>
<tr>
<td>Grey</td>
<td>Communication Error</td>
<td>40 (10.6%)</td>
</tr>
<tr>
<td>White</td>
<td>Uncertain</td>
<td>36 (9.4%)</td>
</tr>
<tr>
<td>Green</td>
<td>Normal</td>
<td>200 (44.7%)</td>
</tr>
</tbody>
</table>

**Analysis Date:** 28-Jan-2018 8:51:30 AM

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Instrument Availability KPI Report

- Overall summary
- Device status Information
  - Asset status
  - NAMUR category
- Alarm & Events Information
- Device Availability Information

Overall Summary & Device Availability Information
Instrument Availability Report

1.4 Device Availability Information
1.4.1 Device Availability Summary

1.5.1 Alarm and Events Summary

1.5.2 Alarm and Events Frequency by Model

1.5.3 Alarm and Events Frequency by Type of Event

Device Availability Summary

Alarm & Events Summary
Maintenance Decisions from Diagnostics Data

Parts Management

Calibration

Maintenance
Market Specification of Pressure Tx Stability

What does this mean to a user?

Calibration Optimization Possibilities?
Opportunities, Availabilities & Possibilities

- Improved Process Insight
- Simplified Maintenance
- Enabler for Digitalization
Evolution of Technology and Maintenance Tools

- Pneumatic
- Analog
- Digital

Timeline:
- 1965
- 1970
- 1975
- 1980
- 1985
- 1990
- 1995
- 2000
- 2005
- 2010
- 2015

Technologies:
- 1965: Analog
- 1970: Analog
- 1975: Pneumatic
- 1980: Pneumatic
- 1985: Pneumatic
- 1990: Analog
- 1995: Digital
- 2000: Digital
- 2005: Digital
- 2010: Digital
- 2015: Digital

Tools:
- FieldComm Group
- HART communication protocol
- Profinet Foundation

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Digitalization of Maintenance Practices
Mobile Solution for Maintenance Management & Execution

- Real-time information exchange with actionable intelligence
Digitalization of Instrument Data Handover
Digitalization of Instrument Data – Mobile Apps

Easy viewing, registration of device by scanning QR Code indicates on products
Digitalization of Instrument Data

- Visualized and Digitalized data structure will help to interface users’ device maintenance system.

Transition from TBM to CBM / Prescriptive
Digital Technologies are Enablers

Options are ready & available for Use

Let's overcome the bottleneck together for a Digitally enabled future!
Thank You
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