ISA108 Intelligent Device Management (IDM)
Intelligent Digital Devices - Have Self-Diagnostics and More

- Eight-channel two-wire temperature transmitter
- Fully integrated gas chromatograph
- Intelligent two-wire inventory intrinsically safe tank gauging system
- Intelligent two-wire on/off valve
- Electric actuators / Motor Operated Valve (MOV) with two-wire control
Intelligent Devices

- Intelligent devices are pervasive, but are not used properly
  - Most diagnostics are not prioritized or utilized
- ISA108 is needed
  - Technology and products are widely available
  - Work processes and best practices are the key

Installed Base

- Smart, Microprocessor Based
- Conventional or Pneumatic

Source: ARC Advisory Group

Most only use 4-20 mA and handheld
Most Diagnostic Alerts Go Directly to a “Black Hole”

- Diagnostics may need to go to engineering, maintenance, or operations

http://en.wikipedia.org/wiki/Black_hole
Topics Covered

- Intelligent Device Management (IDM)
- Engineered solution and deployment
- ISA108 standard
Intelligent Device Management (IDM)
Intelligent Device Management is Part of Plant Asset Management (PAM)

- Intelligent Device Management (IDM) software is one of many parts in a Asset Management System (AMS)

### Plant Asset Management System

#### Rotating Machinery
- Turbine
- Compressor
- Pump

#### Process Equipment Management
- Heat Exchanger
- Pump
- Blower
- Air cooled exchanger
- Cooling tower
- Compressor

#### Instrumentation
- Transmitter
- Analyzer
- Control valve
- On/off valve
- Motor drive
- Gas Chromatograph

ISA108
Intelligent Device Management (IDM)

- Device Diagnostics
  - Device diagnostic alarm management
- Device Configuration
  - Device configuration management
- Device Calibration
  - Calibration management
- Device Information
  - Device information management
- Internal Variables
  - External monitoring
Types of Diagnostics

1. Signal Diagnostics
   - Communication Errors
   - 4-20 mA integrity
   - Wireless signal strength

2. Device Diagnostics
   - Electronics (memory etc.)
   - Internal mechanical parts
   - Supply

3. Process Connection Diagnostics
   - Valve
   - Actuator
   - Impulse line

4. Process Equipment Diagnostics
   - Heat exchanger
   - Pump
   - Blower
   - Air cooled exchanger

ISA108
Device Diagnostics
Detail Diagnostics and Troubleshooting Guidance

Failed - Fix Now

Primary Value Failure - Sensor 1 is Open

Sensor 1 is open.

Recommended Actions:
1. Verify the sensor connection and wiring. Refer to the wiring diagrams found on the terminal cover to ensure proper wiring.
2. Verify the integrity of the sensor and sensor lead wires. If the sensor is faulty, repair or replace the sensor.
Device Diagnostics Alarm Summary

- View all device diagnostic alarms in one location
  - Schedule daily maintenance and turnarounds
- Prioritized
Device Audit Trail – Status Alerts

![Audit Trail Window]

A screenshot of the Audit Trail window showing a table with columns for Date, Time, AMS Tag, User, Event Type, and Reason. The table is populated with entries indicating various status alerts, such as 'FAILED: Primary Value Failure', 'FAILED: Primary Value Failure', 'Alert Monitor configuration changed for AMS Tag: TT-345', and others. The table includes specific dates and times, users, andAMS tags, providing a detailed view of the device audit trail.
Device Configuration
Device Configuration – Guided Setup

- **Initial Setup**
  - Zero
  - Change Damping
  - Local Display Setup

- **Plugged Line Diagnostics and Statistical Process Monitor**
  - Plugged Line Diagnostic Setup
  - Statistical Process Monitor Setup

The image shows a software interface for configuring a device. The primary features include options for zeroing, changing damping, local display setup, and plugging line diagnostics. Each setup has a description indicating its purpose. For example, zeroing eliminates pressure offset due to mounting or installation effects, while changing damping sets the pressure damping. The local display setup configures the LCD display, allowing up to 4 values to be displayed. The plugging line diagnostic setup and statistical process monitor setup are also provided for specific diagnostics and monitoring functions.
Device Audit Trail - Configuration
Configuration Templates

- Default configuration for a device or loop
- Must contain reasons for deviation from default
- Specific to a device revision level
- Used by
  - Host configuration tools
  - Bulk configuration tools
  - Maintenance replacement
  - Audits
Calibration Made Easy: Sensor Trim Wizards

Zero This Transmitter!
Calibration Management - Scheduling

1) Create a new Test Scheme

2) Create a new Calibration Route
Calibration Reports

Calibration Status

- AMS Tag: PT-450
- Device: Rosemount 3051S 0011513051122504113917-01
- Last Calibration: 8/25/2009
- Calibration Result: Pass
- Next Calibration Due: 9/15/2009
- UnSchedule

Calibration History - PT-450

Graph showing % Max Error over time with "As Found" and "As Left" lines.
Documenting Calibrator Docking

- Paperless Calibration Records
  - As-found as As-left
Device Audit Trail - Calibration

![Device Audit Trail](image)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>AMS Tag</th>
<th>User</th>
<th>Event Type</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/9/2009</td>
<td>9:08:38 AM</td>
<td>TT-345</td>
<td>FS.usrtc-plantweb1</td>
<td>Status Alerts</td>
<td>FAILED: Primary Value Failure</td>
</tr>
<tr>
<td>5/9/2009</td>
<td>9:08:38 AM</td>
<td>TT-345</td>
<td>Local SSADMIN</td>
<td>Application</td>
<td>Successful login of user: Local SSADMIN</td>
</tr>
<tr>
<td>5/5/2009</td>
<td>3:37:11 PM</td>
<td>FT-405</td>
<td>PS.USRTC-PLANTE...</td>
<td>Application</td>
<td>Ams Device Manager has been shutdown</td>
</tr>
<tr>
<td>5/5/2009</td>
<td>3:37:06 PM</td>
<td>Local SSADMIN</td>
<td>Application</td>
<td>User logged out: Local SSADMIN</td>
<td></td>
</tr>
<tr>
<td>5/5/2009</td>
<td>3:26:08 PM</td>
<td>Local SSADMIN</td>
<td>Application</td>
<td>Successful login of user: Local SSADMIN</td>
<td></td>
</tr>
<tr>
<td>5/5/2009</td>
<td>3:26:01 PM</td>
<td>FT-405</td>
<td>PS.USRTC-PLANTE...</td>
<td>Application</td>
<td>Ams Device Manager has been started</td>
</tr>
</tbody>
</table>
| 5/5/2009   | 3:25:03 PM| admin   | Application      | Successful login of user: admin with permission: Device 
| 5/5/2009   | 3:24:27 PM| Local SSADMIN | Application | Scan New cancelled on USRTC-PLANTEWEB1\DeltaVNe |
| 5/5/2009   | 3:20:28 PM| Local SSADMIN | Application | Scan New started on USRTC-PLANTEWEB1\DeltaVNe |
| 5/5/2009   | 3:20:22 PM| 8LOGIC  | FS.usrtc-plantweb1 | Status Alerts  | FAILED: No I/O Power                        |
| 5/5/2009   | 3:20:22 PM| 8LOGIC  | FS.usrtc-plantweb1 | Status Alerts  | FAILED: Broken glass                         |
Online Device Information
- From Device

- Identification
- Materials of construction
- Valve and actuator
Device Documentation – Drawings & Notes

- Open links documentation
  - Device manual
  - Procedures
  - Drawings
Internal Variables
Third-Party Software Monitoring
- Through OPC
Engineered Solution and Deployment
Traditional Maintenance Work Processes

- Waste effort on poorly defined problems ("broke")
- Maintenance is often deferred for non-critical devices
- Scheduled inspection and testing is wasteful but necessary
Traditional Maintenance Methods Result in Wasted Effort

63% of maintenance labor results in no action!

Source: Shell Global Solutions
Work Practices with Intelligent Device Management

- Allows maintenance on devices that actually need work, only when they need work.
- Can give detailed information on problems before a field visit.
- Can significantly reduce (or eliminate) the need for periodic testing.
- Can reduce impact on operations by advance warning of failure:
  - a significant but underutilized opportunity
  - biggest incentives on control valves
IDM Work Process Life Cycle Activities

- **Feed**
  - Criticality ranking
  - Vendor qualification & templating

- **Design / FAT**
  - Work process selections and design
  - Initial system configuration (build tools)
  - Training

- **Install, commission, loop check**
  - Device and system integration
  - Initial use of diagnostics

- **Pre-startup safety review**

- **Routine maintenance**

- **Turnaround management**

Work Processes and Procedures are required for all Life Cycle Phases.
Intelligence Device Management

- Use and priority of diagnostics are determined by application criticality
  - Criticality ranking should be established in FEED
  - Alert priority depends on impact severity – not likelihood
  - Send alerts to operator and well as maintenance only if operator action is required (becomes an alarm, see ISA18 clause 3.1.46)
  - Log all alerts regardless of priority
  - Different from process alarm management

- Needs definition before configuration activities
Automated Use of Diagnostics

- Diagnostics must flag data quality
  - Data quality (PV status) must propagate to all applications and graphics in host systems for automated failure handling

- Data quality should include:
  - Active alerts (follow NAMUR NE107)
    - Good, bad, advisory, somebody is working on it
    - Full support by FOUNDATION fieldbus devices and hosts
  - Configuration mismatch with host
  - Excess communication errors
  - All device and loop blocks in normal mode

- Utilization of data quality in control schemes
  - Full support by FOUNDATION fieldbus function blocks
The ISA108 Standard
ISA108 Scope and Purpose

- **Purpose**
  - Define standard templates of best practices and work processes for implementation and use of diagnostic and other information provided by intelligent field devices in the process industries

- **Scope**
  - Recommended work processes and implementation practices for systems that utilize information from intelligent field devices and the people who use them
  - Work process templates by worker roles (such as maintenance or operations)
  - Best practices for implementation will be developed
  - Models for the flow of information from devices through the various systems that use the information

[https://www.isa.org/isa108/](https://www.isa.org/isa108/)
ISA108 Proposed Content

- Models and Terminology
  - We need unambiguous names and terms
- Implementation Guidelines
  - Cover the Life Cycle
- Work Processes
  - Configuration Management
  - Automated Diagnostic Handling
  - Diagnostics Based Maintenance
  - Auditing
  - Commissioning, Calibration, Troubleshooting, and Failure Analysis?
Conclusion
Conclusion

- **Large incentives for intelligent device management**
  - Most efficient system for maintenance utilizes diagnostics for on-line maintenance
  - Reduced impact of failures including unplanned outages and events
  - Reduce work during planned turnarounds

- **Barriers are significant**
  - Changes in engineering practices
  - Culture change for maintenance
  - Management ownership

- **Standards will help**