IFPAC 2012

Bootstrapping Your Way to an Automated Sample System – Part I

Part I (Eastman Chemical)
- Introduction
- Application Overview
- Value Proposition

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NeSSI Gen I

- Early adopter
  - Few fluidics components
  - Platform design changes
  - Lack of compatible sensors
  - High capital cost
  - Push-back from maintenance personnel

- Attraction
  - Easy fabrication
  - Simple modification
  - Small footprint
  - Lower cost of ownership

- Payoff
  - Address many more applications
  - Lower NeSSI component costs
  - Significantly lower fabrication cost
  - Lower cost of ownership
Gen I
Same Application, Two Vendors
Gen I & Gen III
Adding Value
Adding Value
Adding Value
Why do I always pick the slow moving queue?
Functional & Administrative Requirements

- failsafe system for uninterrupted analysis
- real-time information
- verification of system health
- local visualization and control
- remote access and control
- easy to configure: don’t want to be a programmer; drop-down pick list, electronic data sheets
- non-proprietary
- capability to phase in additional systems as each production unit is converted
- both parties to have skin in the game
Hardware Block Diagram
Sample Flow Path
Key Components
Operational Requirements

- tight flow control with low inlet pressure
- tight temperature control
- verification of flow and temperature
- redundancy
- rapid response
Application Overview

NOTE: Only 1 cable connected to each sample system.

1. OXIDIZER
   - TRACE HTR x CTRL
   - SAMPLE SYSTEM
     - FAST LOOP
     - ANALYZER LOOP
   - Analyzer outputs
   - Control Room

2. OXIDIZER
   - TRACE HTR x CTRL
   - SAMPLE SYSTEM
     - FAST LOOP
     - ANALYZER LOOP
   - Analyzer outputs

6. OXIDIZER
   - TRACE HTR x CTRL
   - SAMPLE SYSTEM
     - FAST LOOP
     - ANALYZER LOOP

DeviceNet™

Qty=12, 4-20mA analyzer outputs

PLC

Qty=12, 120VAC alarms

HMI

System Tech/Eng

ENET

Field Tech

Control Room

Swagelok

EASTMAN
Value Proposition

- Reliability
- Safety
- Labor & Maintenance Costs
- Capital Costs
- Pay-back
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Bootstrapping Your Way to an Automated Sample System – Part II

Part II (Swagelok)
- Functional Specifications Collaboration
- Supplier Challenges & Implementation Hurdles
- Automation Theory vs. Reality
- Summary & Takeaways
Topics

- Overview/Review
- Functional Specifications Collaboration
- Supplier Challenges and Implementation Hurdles
- Summary & Takeaways
Steve Jacobs did a nice job describing the application and various critical requirements.

- 6 oxidizers, 1 “redundant” sample system per oxidizer serving 2 analyzers per oxidizer.

Needed to replace existing systems due to cost, reliability, and safety concerns.

Eastman willing to install and test the systems incrementally as key components were developed by Swagelok.
Functional Specifications Collaboration

- Swagelok started with a P&ID diagram from Eastman and the overarching requirements below:
  - failsafe system for uninterrupted analysis
  - real-time information
  - verification of system health
  - local visualization and control
  - remote access and control
  - easy to configure
  - ability to phase in systems over time
  - both parties to have skin in the game
  - tight flow control with low inlet pressure
  - tight temperature control
  - verification of flow and temperature
  - redundancy
  - rapid response
This information got Swagelok pointed in the right direction, but was insufficient for quoting and implementation.

- Eastman wanted a turn-key system, not just a sample system.
  - Delivered fully integrated with automation hardware and software.

- A user interface had to be defined along with control logic, exception handling, data presentation, ....

- Automation hardware had to be selected.
  - PLC, HMI, I/O cards, ....

- The interface with the control room (DCS) had to be nailed down and documented.
Documented Functional Specifications were needed.

- To ensure system capabilities were aligned with expectations.
  - Avoid as many “but I thought the system was going to do this and it does that!” moments as possible.

- To deal with the complexity and scale of the system.
  - Too much for email, vmail, etc…

- To provide clear completion criteria all parties could sign-off on.

- To manage scope creep.
  - “Its just software right?”
Swagelok wrote the Functional Specifications and reviewed them on-site at Eastman.

- Flushed out major disconnects – there were several.
- Helped Swagelok prioritize activities.

Weekly web meeting kept everyone on the same page.
Supplier Challenges & Implementation Hurdles

- Scope & coordination
  - Sophistication and completeness of the system was significant.
  - Gen II components were still being developed as the system was being integrated.
  - Multiple 3rd party components had to be customized
    - MFC
    - Proximity sensors
  - Many things had to happen in parallel to meet the agreed upon schedule
    - Control and HMI software
Supplier Challenges & Implementation Hurdles (cont)

- Planning for the future
  - Sample systems on each oxidizer would be upgraded over time - PLC would not.
  
- Designed user interface for all 6 oxidizers, but only implemented control logic for 1.
Managing exceptions during system operation

- Each sample system must always provide sample to the analyzer – no matter what happens (unless zero or span streams are selected).

Typical fast loop with sample/benchmark stream selection

Loss of electrical power and pneumatic pressure workarounds
Automation Theory vs. Reality

- The NeSSI Sensor Actuator Manager (SAM) is not always the right solution
  - SAM lacks the I/O necessary to properly interface with the sample system and control room.
  - Don’t need an IS barrier in all cases. SAM always includes one.
Summary & Takeaways

- Spending the extra time on the Functional Specifications up front paid off.
- Product features can be directly linked to an application need.
- In a pure NeSSI Gen II application all traditional I/O (e.g. 4-20mA, 0-10V, relays, …) is eliminated.
- A Div 1 intrinsically safe NeSSI-bus may not be required and would be overkill in this case.
Summary & Takeaways (cont)

- If a Div 1 intrinsically safe NeSSI-bus is required, perhaps a PLC and standalone intrinsically safe network barrier make more sense than a SAM.

- Carefully defining the system design, operational requirements, and work flow is critical to the success and implementation of the project.

- Define acceptance test early in the project.

- Deliver a fully functional data/control system.