ISA101: From Philosophy to Operation
About the Presenter

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- 25 years of experience in chemical plants
- Co-chair of ISA18 standard committee
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Outline

- Background
- HMI Lifecycle
- HMI Philosophy
- HMI Style Guide and Tool Kit
- User Requirements
- Testing
- Training
- Support
- Questions
Background: The Last Panel Board

- Plant originally built with pneumatic controls
- Controls migrated to Single Loop Controllers (SLCs) in 1986
  - Panelboard HMI (Human Machine Interface)
  - Hardwired SIS (Safety Instrumented System)
Background: The Replacement

- New Control System
  - DCS Controller
  - DCS HMI
  - SIS
ANSI/ISA-101 lifecycle to develop and maintain an HMI
- ISA-101.01 HMI for Process Automation Systems
For projects, start with system standards

- HMI Philosophy document
  - Provide guiding principles and conceptual foundation for HMI design (includes details on how HMI is designed and used)

- HMI Style Guide
  - Apply guiding principles and concepts of the HMI Philosophy to provide implementation examples and guidance

- HMI Toolkits
  - Generate all graphical symbols and other supporting elements as required to implement the HMI Style Guide
HMI Philosophy

- Philosophy
  - Overall guiding document for HMI design and management
  - Emphasizes ergonomics and performance
  - Document objectives around situation awareness
  - Documents requirement for MOC
  - Document other processes (task analysis)
  - Document “rules”
  - Defines terms
The Process Display shows all important Process Variables, Alarms, and Controls related to a given Process or subsystem.

The purpose of the Process Display is to provide Operator access to operate individual objects for a process or subsystem.

Many common operating tasks are performed from Process Displays.

Rules:

- Level 3 Rule: Every alarm, interlock and control point is shown on a level 3 graphic.
- Level 3 Corollary: If a point does not alarm interlock or control it is not shown on a level 3 graphic.
- Exceptions are allowed.
• From ISA101.01
HMI Style Guide & Toolkit

- **Style Guide**
  - Vendors offer style guides
  - Designed on ASM or HPHMI principles

- **Toolkit**
  - Display of selected and approved symbols
  - Started with vendor library
  - Modified or configured to meet user requirements
  - Control changes to the toolkit
Design

• Console Design  
  – To provide hardware and software design for the Console. This includes furniture and supporting systems.

• HMI System Design  
  – Identify design basis for the HMI system.

• User, Task, Functional Requirements  
  – Identify primary and secondary requirements supported in the HMI.

• Display Design  
  – Identifies conceptual design for displays and the navigation hierarchy. (This may include some prototype displays on complex applications or processes).

• Review
Console and System Design

- **Console Design**
  - Mostly vendor standards
  - Single area
  - Two stations on a desk
  - Mouse issues

- **System Design**
  - Mostly vendor standards
  - User groups
  - Some modifications for user requirements

- **Display Design**
  - Template display
  - Display and font size
User and Task Requirements

• Task Analysis
  – Informal method
  – Review each operating procedure against the displays
  – Verify each action can be taken
  – Look for ways to improve the execution by modifying display content
  – Where needed, develop task specific displays
Implement

- **Build Displays**
  - Complete construction of displays and supporting items. (User review occurs in the design stage, which include prototypes).

- **Build Console**
  - Complete construction of console hardware and software. Test viewing angles, screen elevations, keyboard and input device placement and location of other elements.

- **Test**
  - Integrated Test of HMI and Console.

- **Train**
  - Train Users.

- **Commission**
  - Final testing of HMI in Production Environment.

- **Verification**
  - Verify HMI Ready to Operate.
Build Displays and Consoles

- **Build Console**
  - Time consuming to work through system details

- **Build Displays**
  - Focus on flow and simplification
  - Built L3 displays first
  - Simple process with 6 main operating displays (L3)
  - Many more detailed displays (L4)
  - Built 1 overview display (L1/L2) last
  - Many iterations with toolkit changes
• Operator training in 4 stages
  – DCS and HMI Basics
    – Review of all features of symbols, menus, faceplates…
  – Screen by screen training
    – Review each loop on each level display
  – Loopback simulation
    – Practice basic interfacing with simple models
  – Dynamic simulation on tasks
    – Startup, shutdown, repeat
Testing, Commissioning & Verification

• Testing
  – Completed with dynamic simulation
  – Real configuration in simulated controller

• Commissioning & Verification
  – Done during shutdown
  – Completed with DCS controller commissioning
  – Released for operation
ISA 101 Results

• Much the same
  – Most steps are the same steps used in past projects
• But, a few differences
  – Use of toolkit vs library
  – Deeper task analysis than P&ID approach
  – Formalization of training on philosophy
• Benefits
  – Opportunity to standardize terminology
  – Opportunity to map activities to project phases
Questions?
Thank you for attending ISA PCS2015!