

Setting the Standard for Automation™



ISA101: From Philosophy to Operation

Standards

Certification

Education & Training

Publishing

Conferences & Exhibits

About the Presenter

Nicholas Sands, CAP, PE

- **ISA Fellow**
- **Technology Fellow at DuPont**
- **Alarm management and HMI best practice leader**
- **25 years of experience in chemical plants**
- **Co-chair of ISA18 standard committee**
- **Secretary of IEC 62682 standard committee**
- **ISA Vice President of Standards and Practices**



The miracles of science™

- Background
- HMI Lifecycle
- HMI Philosophy
- HMI Style Guide and Tool Kit
- User Requirements
- Testing
- Training
- Support
- Questions

Background: The Last Panel Board



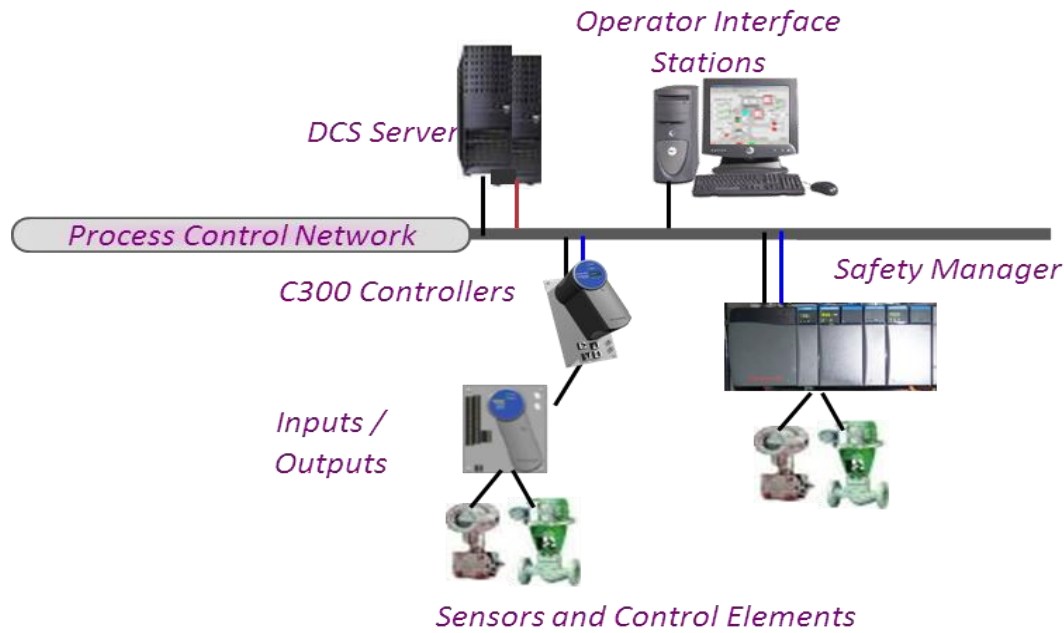
- Plant originally built with pneumatic controls
- Controls migrated to Single Loop Controllers (SLCs) in 1986
 - Panelboard HMI (Human Machine Interface)
 - Hardwired SIS (Safety Instrumented System)



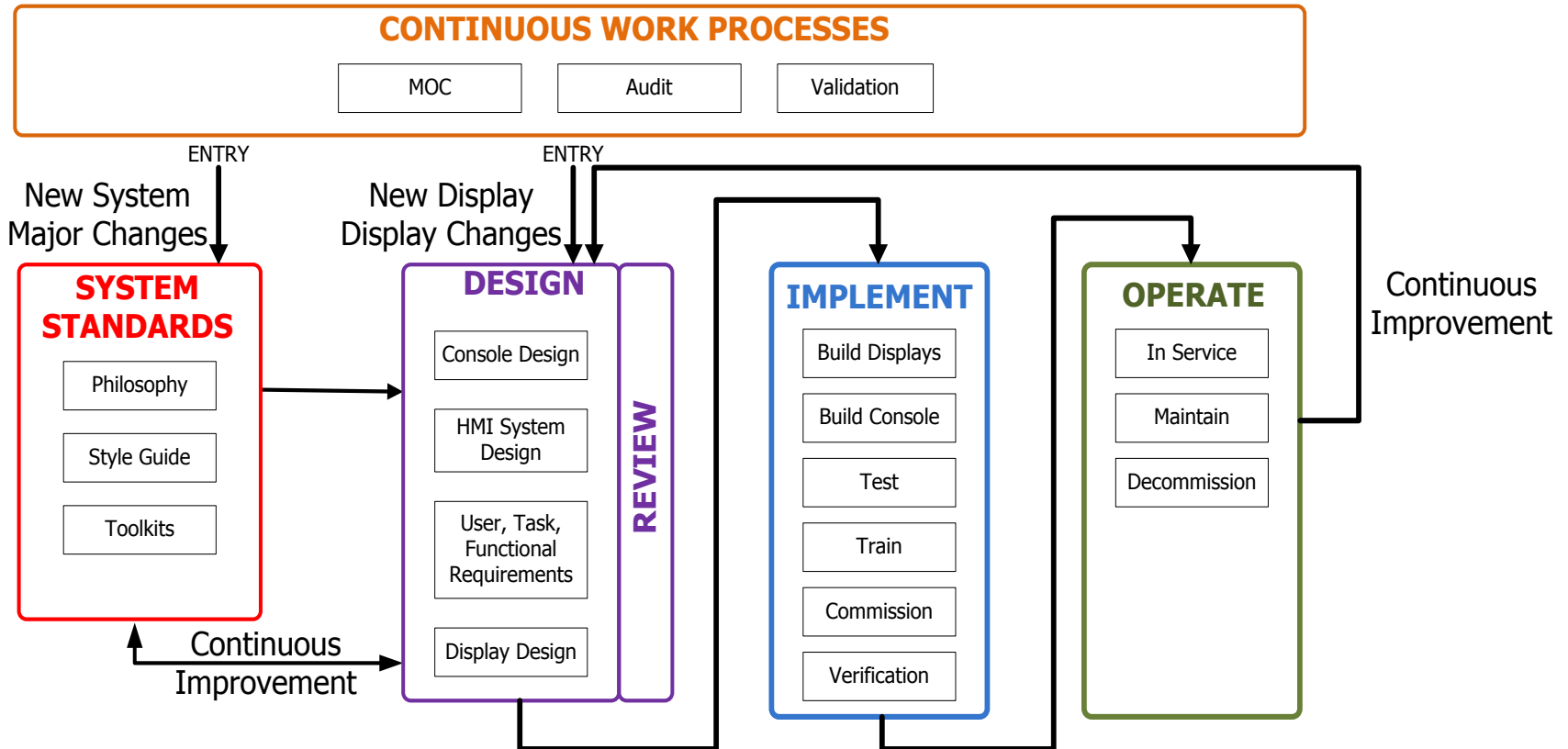
Background: The Replacement



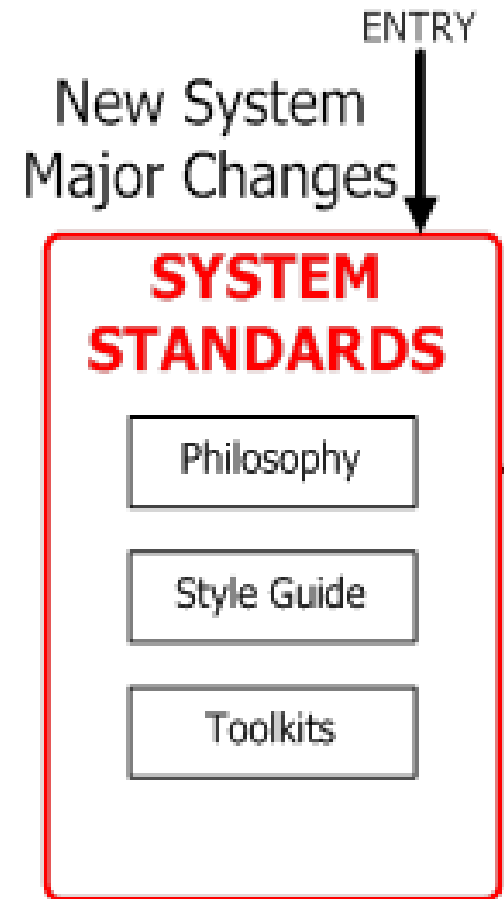
- New Control System
 - DCS Controller
 - DCS HMI
 - SIS



- 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



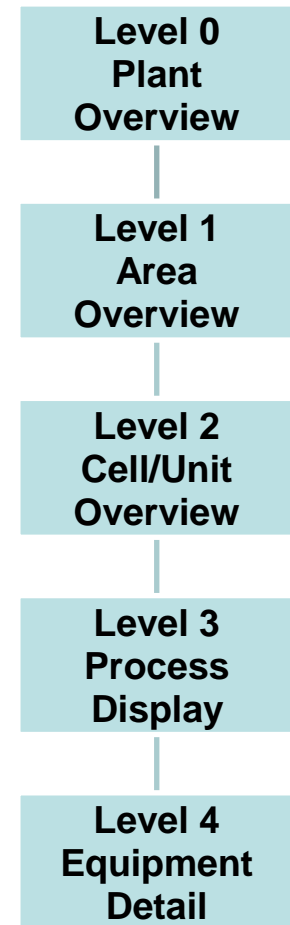
- Philosophy
 - Overall guiding document for HMI design and management
 - Emphasizes ergonomics and performance
 - Document objectives around situation awareness
 - Documents requirement for MOC
 - Document other processes (task analysis)
 - Document “rules”
 - Defines terms



HMI Philosophy Example – Level 3 Rules

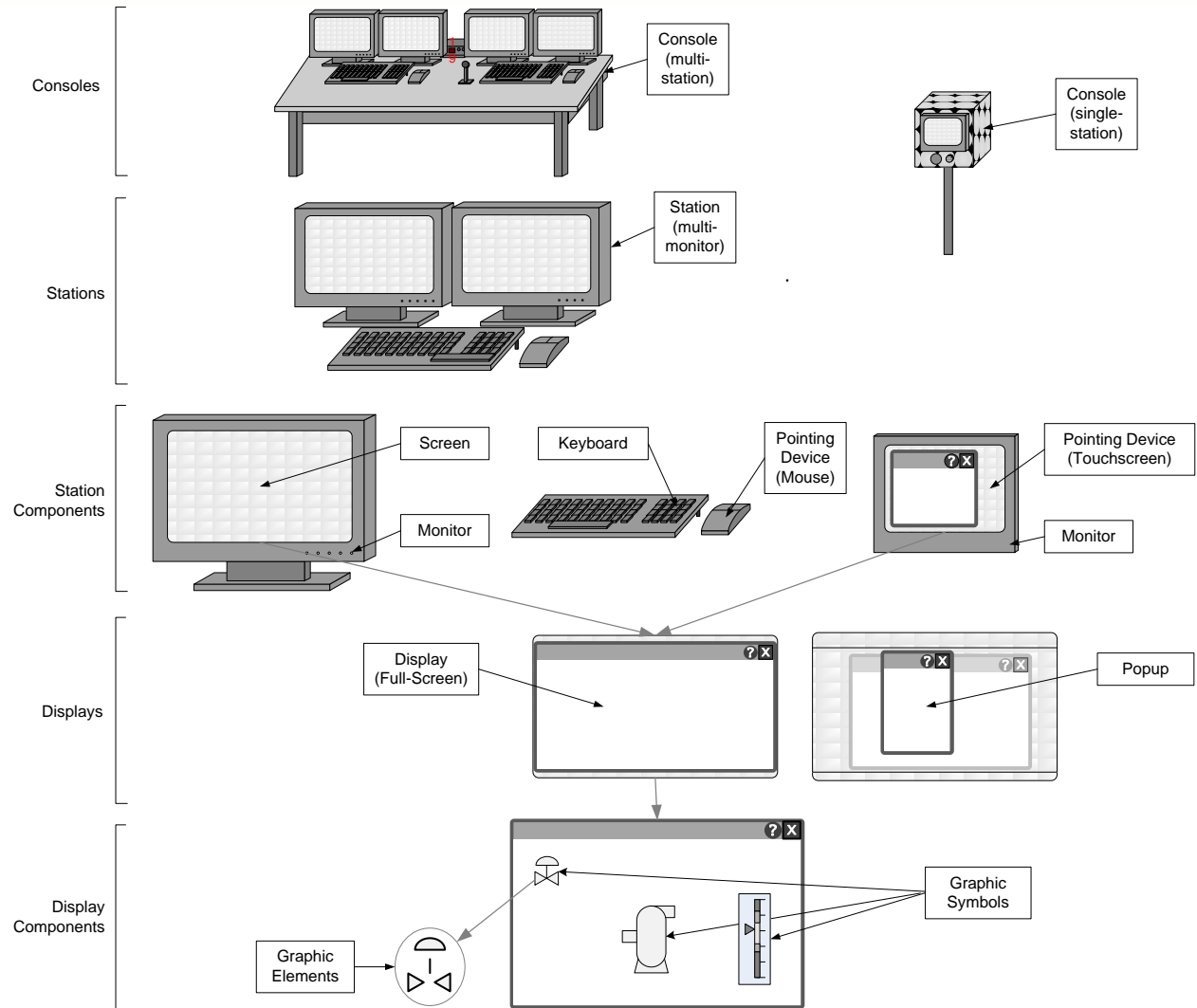


- The Process Display shows all important Process Variables, Alarms, and Controls related to a given Process or subsystem.
- The purpose of the Process Display is to provide Operator access to operate individual objects for a process or subsystem.
- Many common operating tasks are performed from Process 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.



HMI Terminology

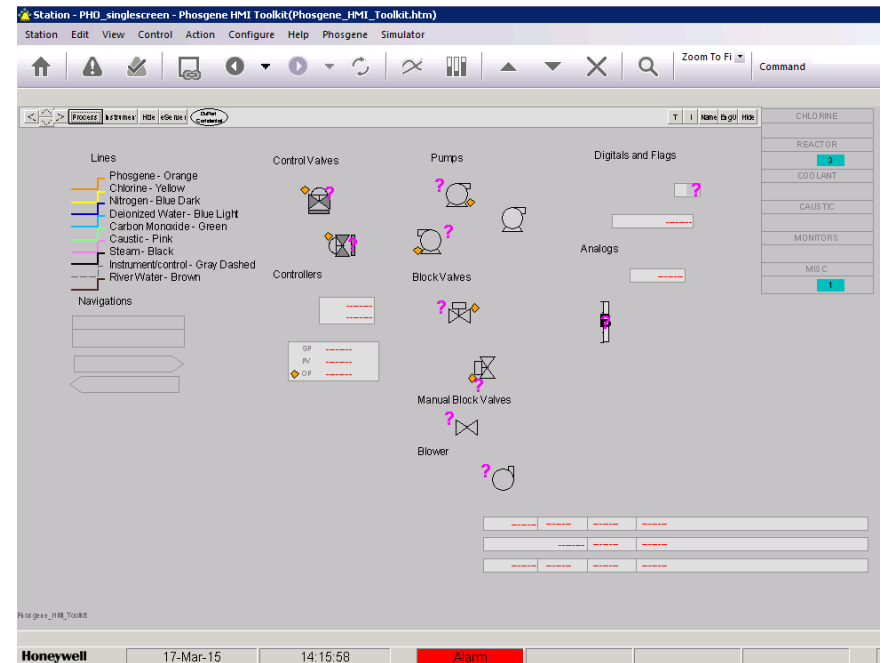
- From ISA101.01



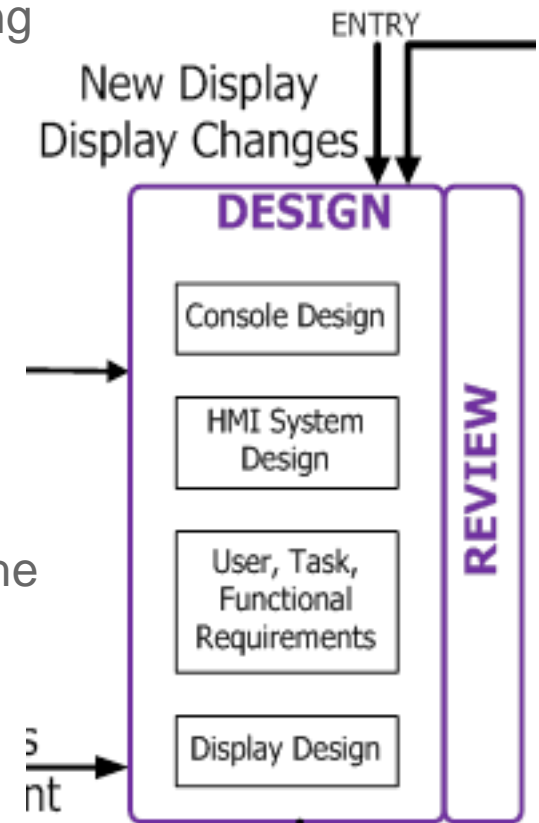
HMI Style Guide & Toolkit



- 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



- 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



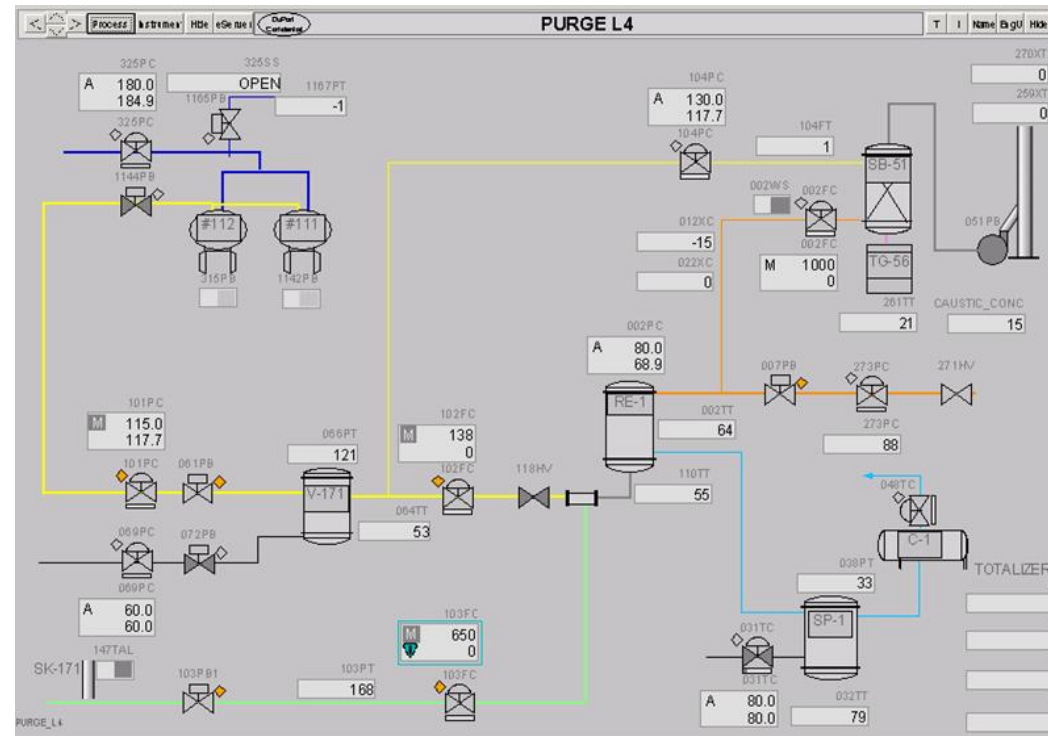
Console and System Design



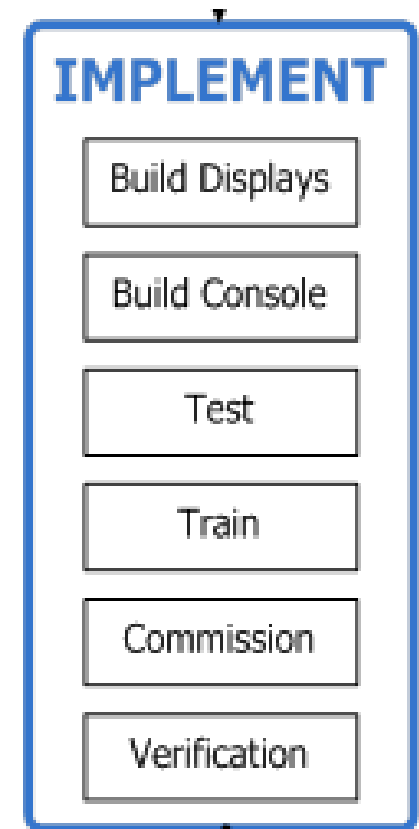
- Console Design
 - Mostly vendor standards
 - Single area
 - Two stations on a desk
 - Mouse issues
- System Design
 - Mostly vendor standards
 - User groups
 - Some modifications for user requirements
- Display Design
 - Template display
 - Display and font size



- 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



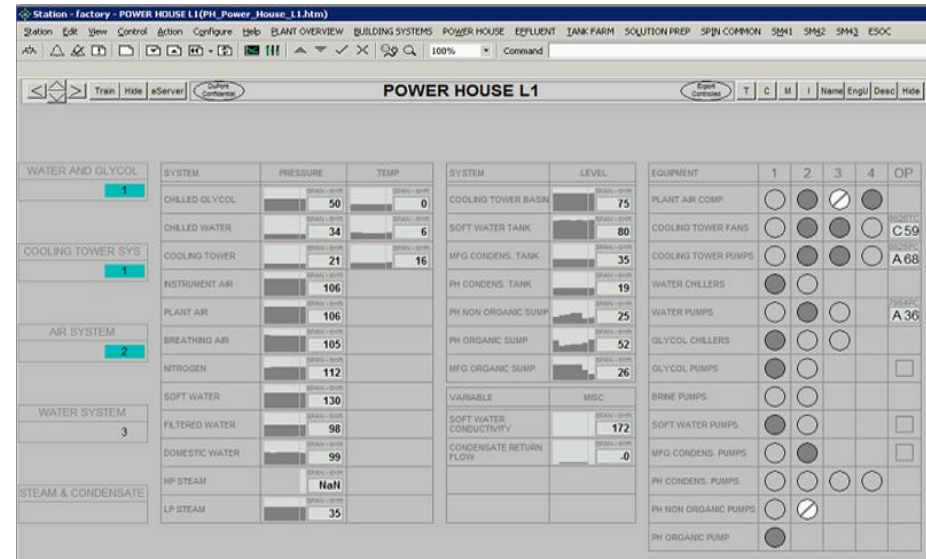
- Build Displays
 - Complete construction of displays and supporting items. (User review occurs in the design stage, which include prototypes).
- Build Console
 - Complete construction of console hardware and software. Test viewing angles, screen elevations, keyboard and input device placement and location 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

Section 3 Navigation 38

- ❖ **Navigation** refers to the methods of moving from one **Graphic** to another within the **Graphic Hierarchy**.
- ❖ Because of the number of **Graphics** and the structure of the **Hierarchy**, **DCS Graphic Navigation** is an important **DCS** skill.

Section 3 Parent Navigation 42

- ❖ The **Navigation** to another **Graphic** up one **Level** in the **Hierarchy** is to a **Parent Graphic**.
- ❖ The **up arrow** navigates to the **Parent Graphic**, if one exists.

Testing, Commissioning & Verification



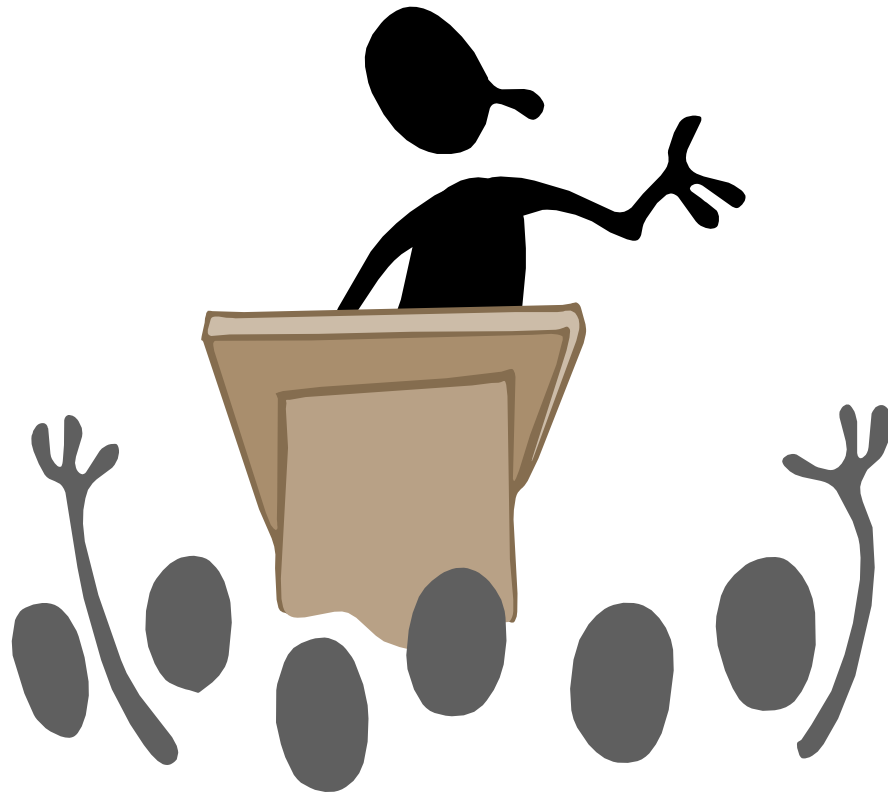
- Testing
 - Completed with dynamic simulation
 - Real configuration in simulated controller
- Commissioning & Verification
 - Done during shutdown
 - Completed with DCS controller commissioning
 - Released for operation



- 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!

