ISA101, Human Machine Interfaces

Applying ISA101 Concepts to Your HMI Projects
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What is published?

- ANSI/ISA-101.01-2015, Human Machine Interfaces for Process Automation Systems
- Technical Report Workgroups are just starting as of October 2015. The workgroups are:
  - HMI Philosophy, Style Guide & Design Guide
  - HMI Usability and Performance
  - HMI for Mobile Platforms
Purpose of today’s talk

• Discuss how to use the ISA standard and HMI concepts with your existing systems
• This presentation is *not* intended to define
  – How your HMI should be designed, what colors to use, what furniture to use in your control room, etc.
  – How to administer your HMI change control process, including management of change and training
  – How to implement HMI changes and best practices
Our Challenge

Existing HMI issues

• Configured by multiple system implementers
• Designed with P&IDs as the lone design criteria
• Not designed to a common style guide
  – Color usage is not consistent
  – Process objects not from a common toolkit
• No contextual information
  – Embedded trends, etc.
Existing HMIs are not carved in stone

- ISA101 has an HMI life cycle
- System owners and end users should be familiar with similar life cycles
  - Safety system life cycle (ISA84)
  - Alarm management life cycle (ISA18.2)
HMI Life Cycle

CONTINUOUS WORK PROCESSES

MOC  Audit  Validation

ENTRY

SYSTEM STANDARDS
- Philosophy
- Style Guide
- Toolkits

Continuous Improvement

ENTRY

New System Major Changes

DESIGN
- Console Design
- HMI System Design
- User, Task, Functional Requirements
- Display Design

Continuous Improvement

New Display Display Changes

REVIEW

IMPLEMENT
- Build Displays
- Build Console
- Test
- Train
- Commission
- Verification

OPERATE
- In Service
- Maintain
- Decommission

Continuous Improvement

from Section 4 of ANSI/ISA-101.01-2015
Starting an HMI upgrade

- Begin process by defining your
  - Philosophy & Style Guide
- Focus on how a “new” HMI would operate
- Engage system users and owners
  - Know what works well with your system now
  - Look for source of continuous improvement
- Improvement can be incremental
  - Use of Color, Navigation, and Object Animation
Use of Color, Example
Use of Color, Example
Use of Color

Proposed Guideline for Use of Color

• Gray backgrounds are used to minimize glare and provide a low-contrast depiction
• Bright colors are used to highlight alarms and abnormal situations
• Colors that are used for alarms should not be used elsewhere
Navigation, Example
Navigation, example
Proposed Navigation Guidelines

• Techniques are employed to facilitate quick and efficient navigation
• Consistent navigation techniques are used throughout the system
Object Animation, Example
Object Animation, Example
Object Animation

Proposed Animation Guidelines

• Highlight only abnormal situations
  – E.g. change color when in alarm

• Gratuitous animation should be avoided. Refrain from having
  – Spinning motors
  – Moving conveyors
  – Splashing liquids
  – Fire breathing burners
Creating the HMI You Want

How to Run an HMI Project

• Where does every HMI project start?
  – With a set of P&IDs
  – Some are very dense; some should not be graphics

• P&IDs can be a good start; can be used to
  – Introduce situational awareness concepts
  – Define HMI philosophy for the project
  – Group graphics into Functional Areas
Know Your Levels

ISA 101 Documents Four Levels

• Level 1: Overview of entire responsibility
• Level 2: Primary operating display
• Level 3: System/Subsystem detail displays
• Level 4: Diagnostic displays

• Your project needs to determine how to implement these levels for your system
Situation Awareness

What does situation awareness mean?

• Being aware of what is happening in the process
• Understanding the process state now
• Understanding the likely process state of the future
Use Your Tools

Toolkits can be used as a Style Guide

• At the project kickoff meeting, present a sample screen using the tools from your HMI package

• Present topics to be a part of the system
  – Color conventions
  – Navigation philosophy
  – Use of contextual information
  – Minimizing static information to better highlight abnormal situations
Review Early and Often

Develop and Build Level 3 Graphics

• Conduct an early HMI Review
• Discuss topics present at the project kickoff
• Give each participant a copy of the screens
• Engage multiple levels of system users
  – Operators
  – Supervisors
  – Engineers
Focus on the System / Plant

Introduce Level 2 Graphics

• Should be the primary operating displays
• During the Level 3 Screen reviews, implementers and system owners captured
  – Key Performance Indicators
  – What makes the plant run well
  – What makes the plant spiral out of control
  – What an operator always needs to see
Level 2 Graphic
What Is Missing?

Level 2 Graphics

• Immediate knowledge of the system’s state
• No knowledge of details that are not important
• What is not important?
  – If a valve is opened or closed
  – Where a valve and its piping are located
  – Watching an agitator spin in a tank
• What is important is a matter of opinion
Level 2 Graphic

[Image of a Level 2 Graphic showing process views and data for Reactor Feed, Inhibitor Feed, Scrubber, and Gas Supply.]
Operators need information

- Current values do not tell a story
- Analog bars can show
  - Process contextual information (e.g. at SP)
- Trends can show where a value
  - Has been
  - Is likely going
Where Do We Begin?

Upgrading existing HMIs

• Produce results
  – Start small; show value
  – Continuous improvement

Creating new HMIs

• Create sample graphics
  – Use them as your style guide or create a document

• Introduce Levels
  – Know which screens should always be displayed
References

• ANSI/ISA-101.01-2015, Human Machine Interfaces for Process Automation Systems


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