



2013 Honeywell Users Group Americas

Jeff England & Dal Vernon Reising

Successes & Challenges for Designing Effective Level 1
and Level 2 Displays

Presenter

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Specializes in human performance in process
industry operations



Former Principal Investigator of Honeywell's
Abnormal Situation Management® (ASM®)
Consortium



Human Centered Solutions

Helping People Perform

www.applyHCS.com

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Contributors

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 - Controls Engineers, Marathon Petroleum, Detroit Refinery
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- **Daniel Chanis**
 - Honeywell (Houston), Americas HMI – ASM Discipline Leader
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 - Honeywell (Bulgaria), HMIWeb Solution Pack Designer Engineers
- **Roman Giraudo**
 - Honeywell (Houston), Project Engineer

Designing Effective L1 & L2 Displays

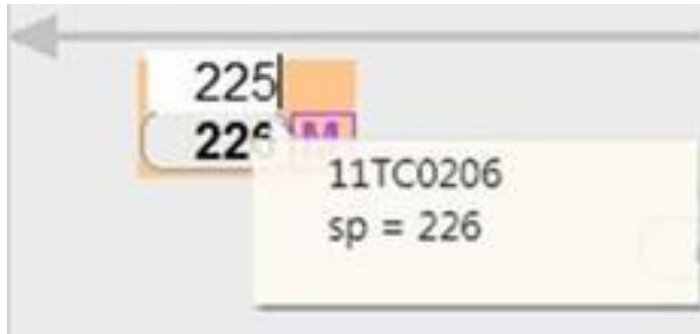
- Custom Shape Library
- Display Hierarchy Design Process
- “Control” Displays (L2) for key Chunks of Operation
- Scope Of Control Overview Display Canvas (L1)
- Lessons Learned

Custom Display Library

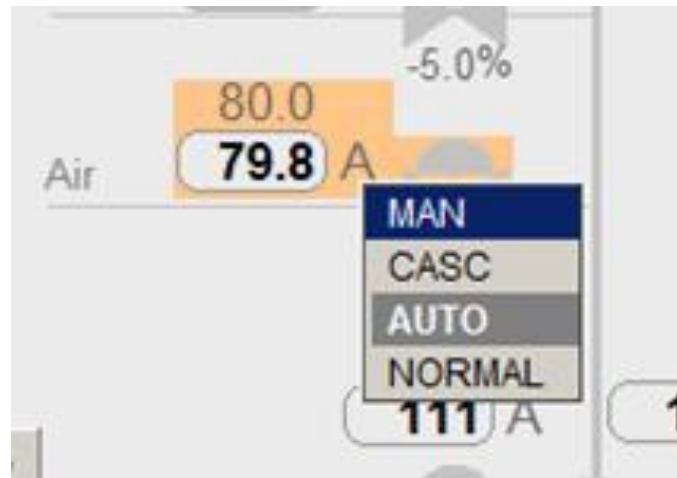
- Key Drivers for developing Custom Library
 - Desire to enable direct data entry interaction (No Face Plates)
 - Alarm Icon Presentation customization for dual coding and color salience control
 - Correspondence Coding for Associated Control Strategy Elements
 - Migration readiness support long term

Custom Display Library - Direct Data Entry

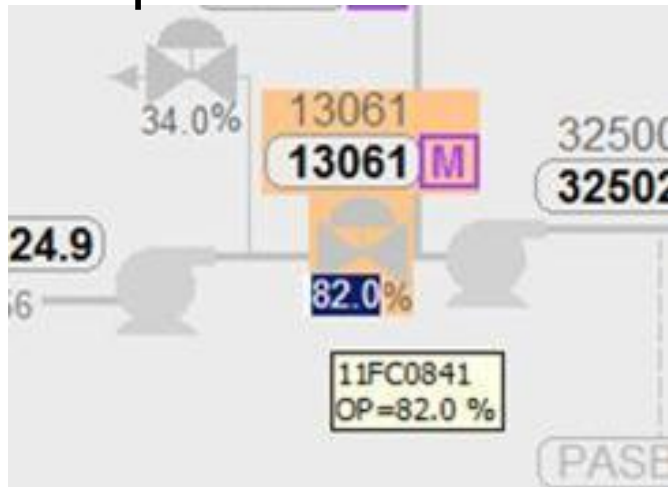
Set Point



Controller Modes



Output

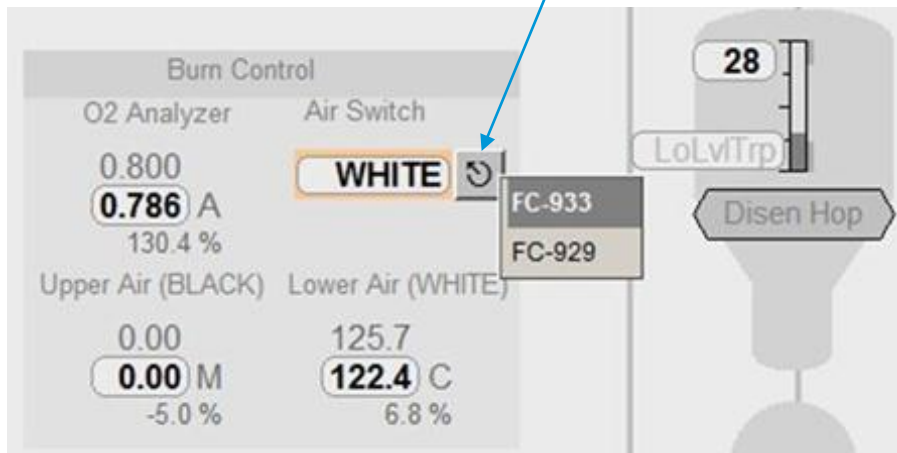


Custom Keypad

Custom Display Library - Direct Data Entry Discrete

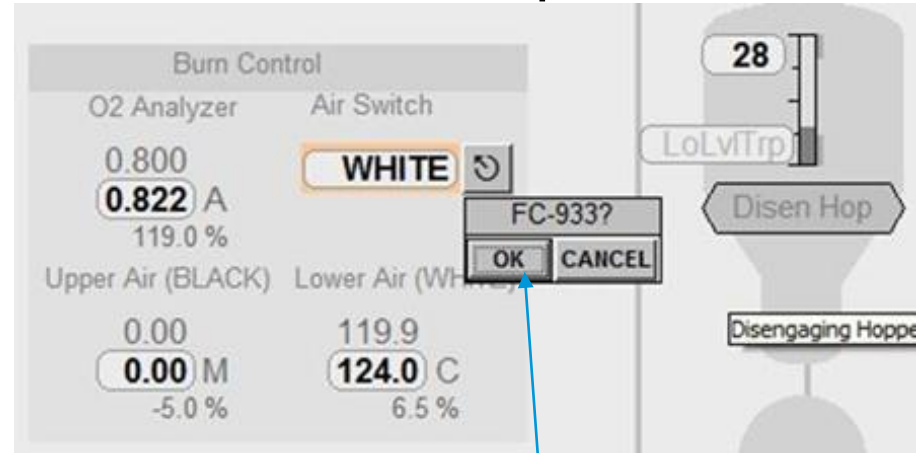
Select Menu

Menu appears
on Click

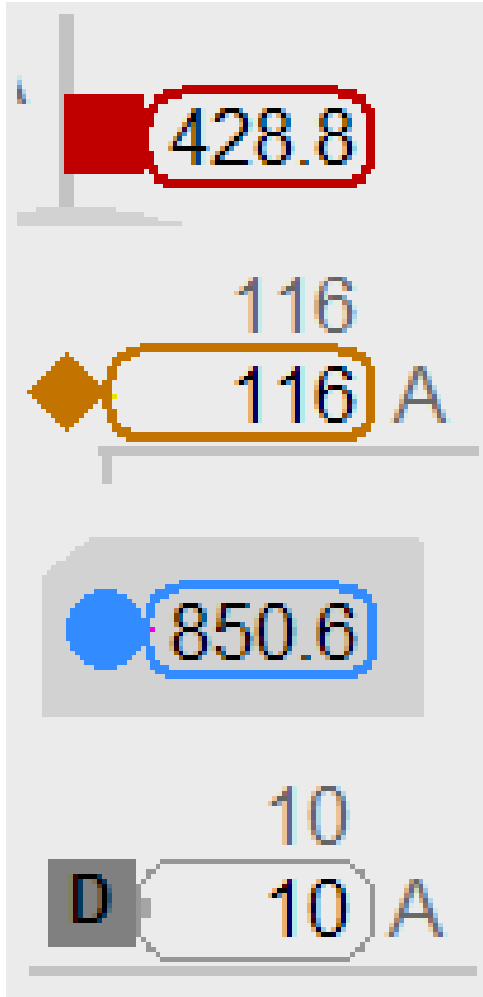


Confirmation Step

Confirmation
Req'd



Custom Display Library - Alarm Icon Presentation



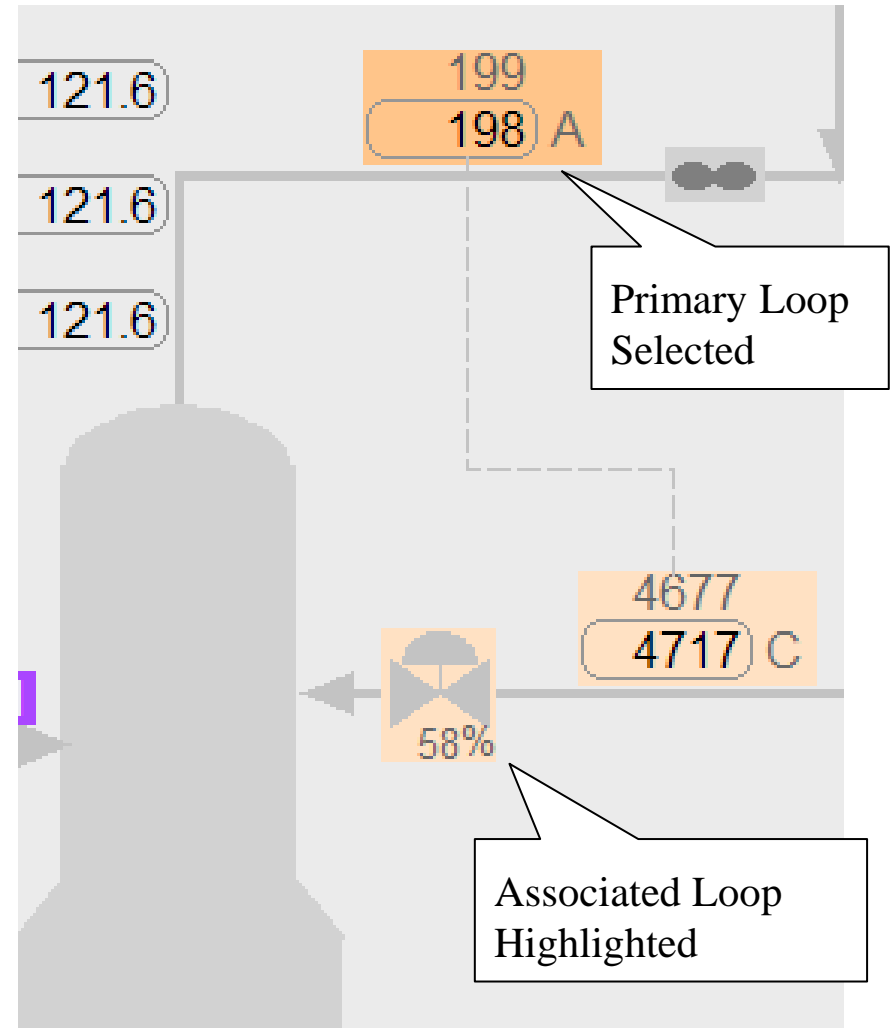
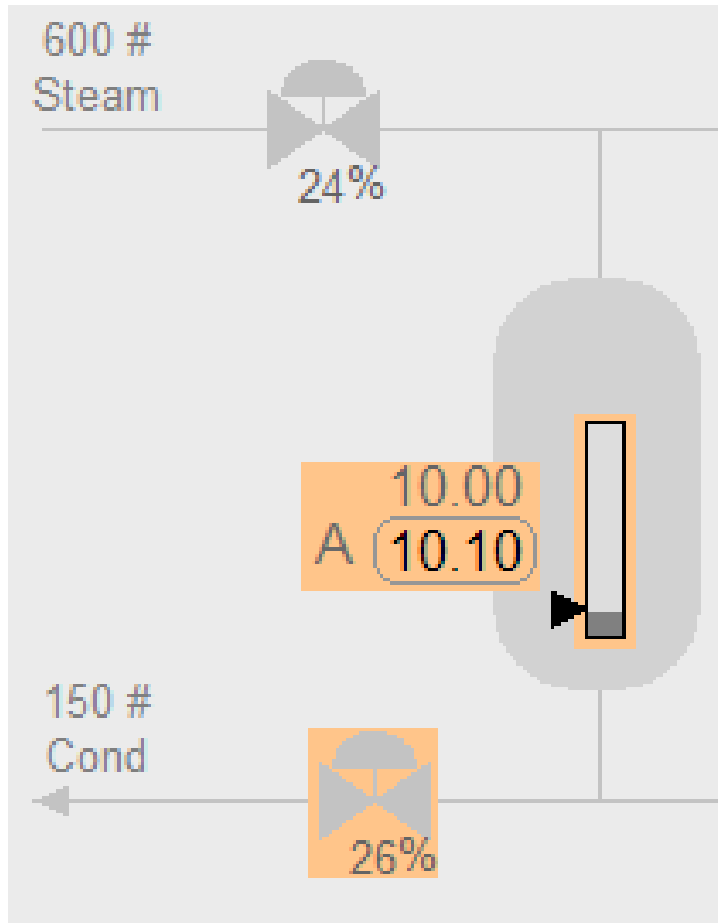
Priority 1 Alarm – “High-high” or Urgent alarm state

Priority 2 Alarm – “High” priority alarm state

Priority 3 Alarm – “Low” priority alarm state

Disabled alarms

Custom Display Library - Correspondence Coding

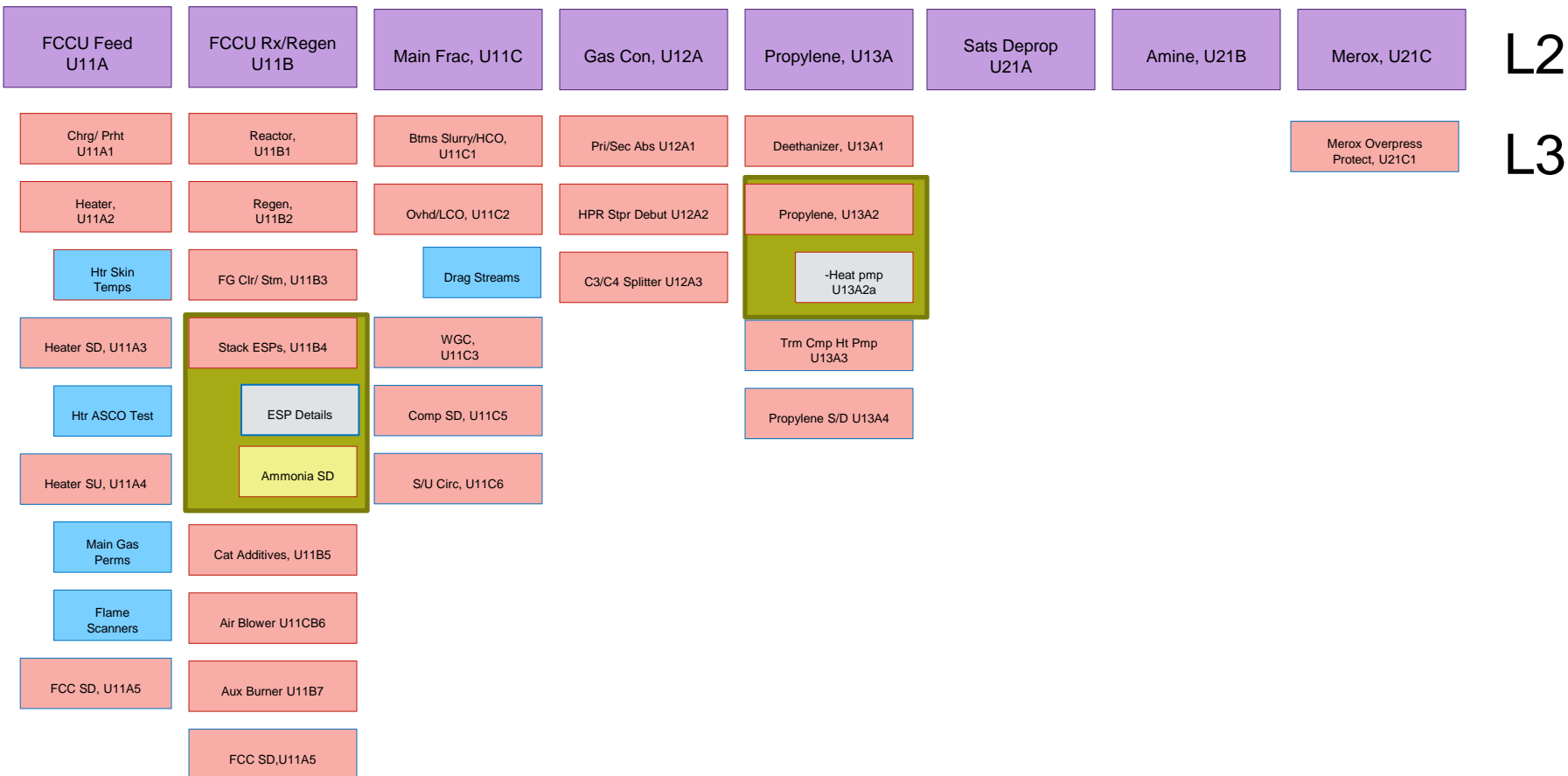


Display Hierarchy Design Process

- Workshops with subject matter experts
 - Operators, supervisors, engineers
 - Facilitator with prior HMI experience
 - Pre Work to layout first pass as starting point
- Specifying “Chunks” or key steps of operation (L2)
 - Approach focused on section of process that are “managed”
 - Avoid narrow focus such as Heater. (eg. Reaction section includes heater)
- Identify Task Specific requirements needing details
 - Managed Start Up systems, Special periodic batch operations

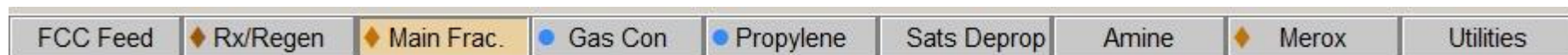
Lots of colored sticky notes

Display Hierarchy - Workshop results

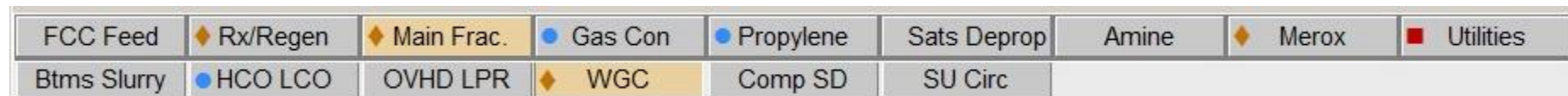


Display Hierarchy - Navigation Results

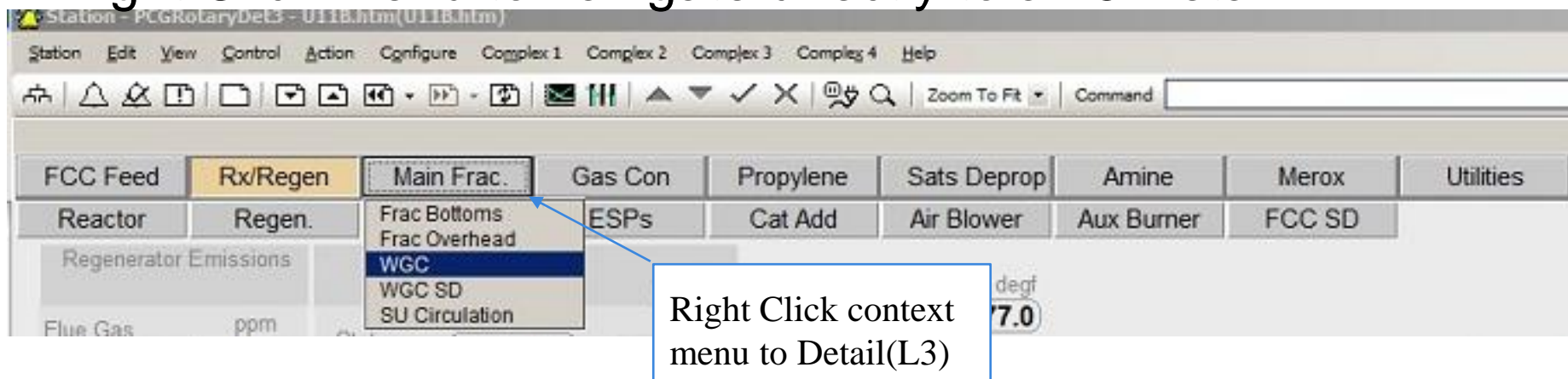
Graphic Navigation Bar (Top row contains ALL Level 2)



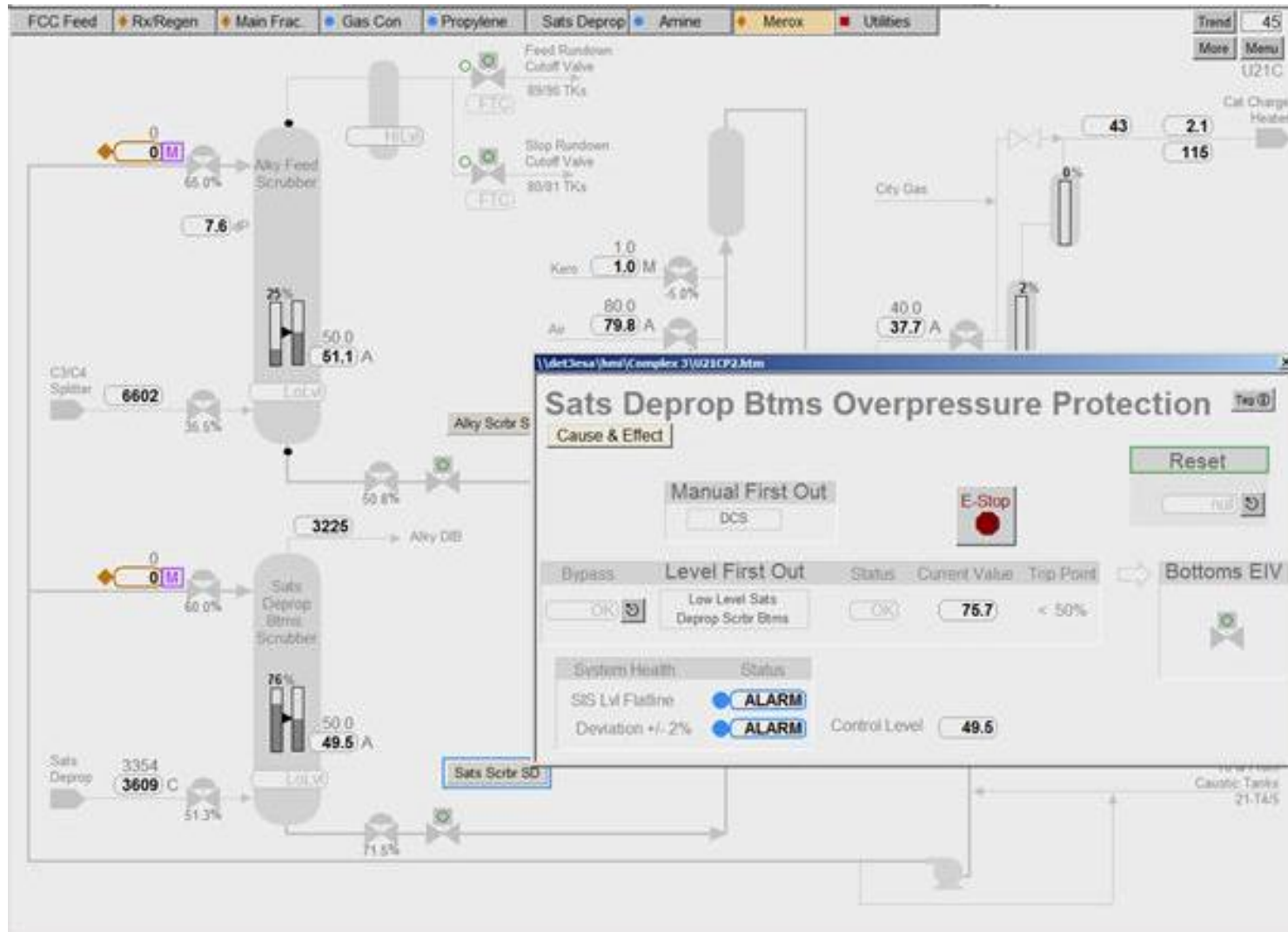
Navigation to Detail graphic within Level 2 Group



Right Click Menu to navigate directly to a L3 Detail



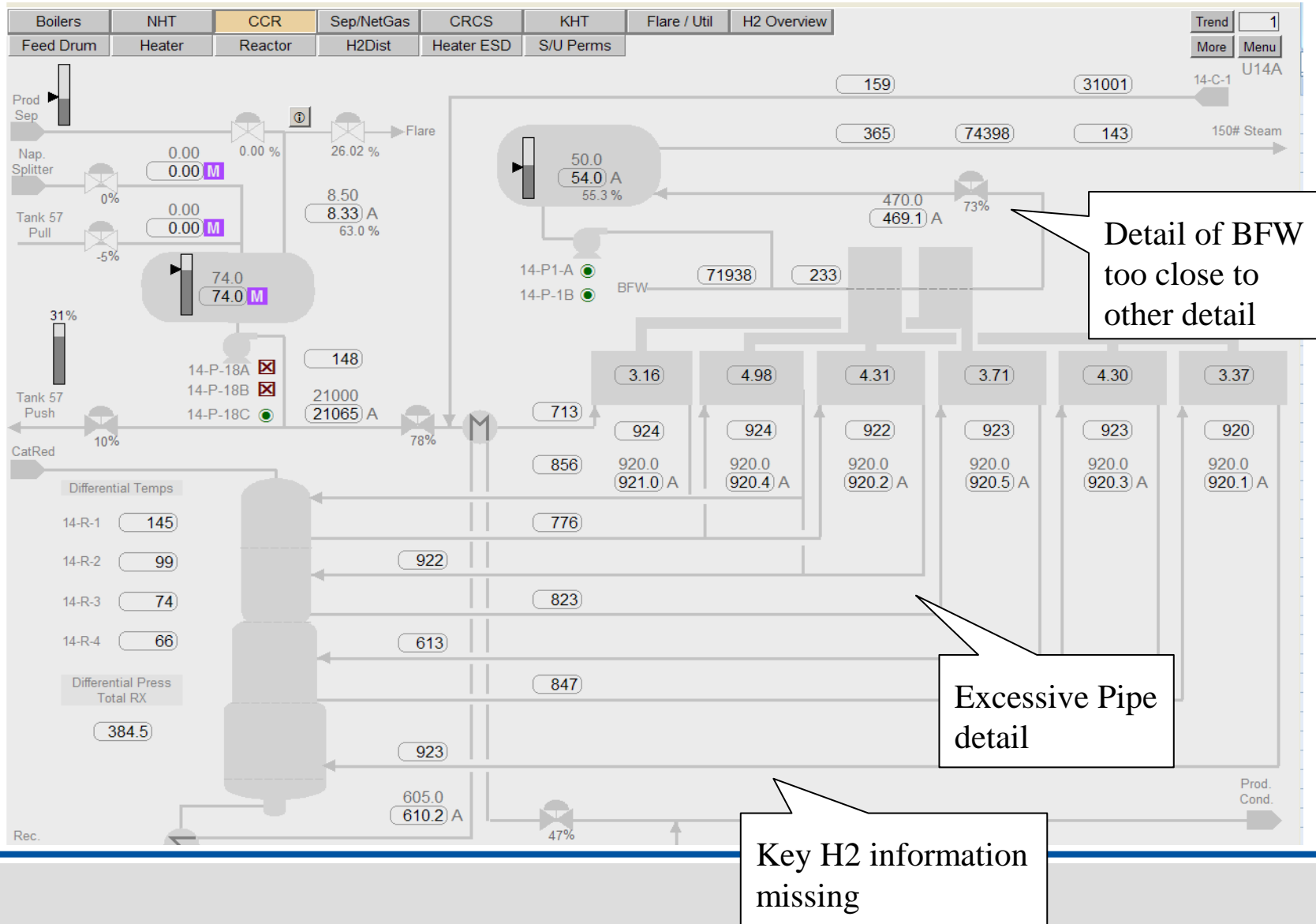
Display Hierarchy – Task Specific and Popup



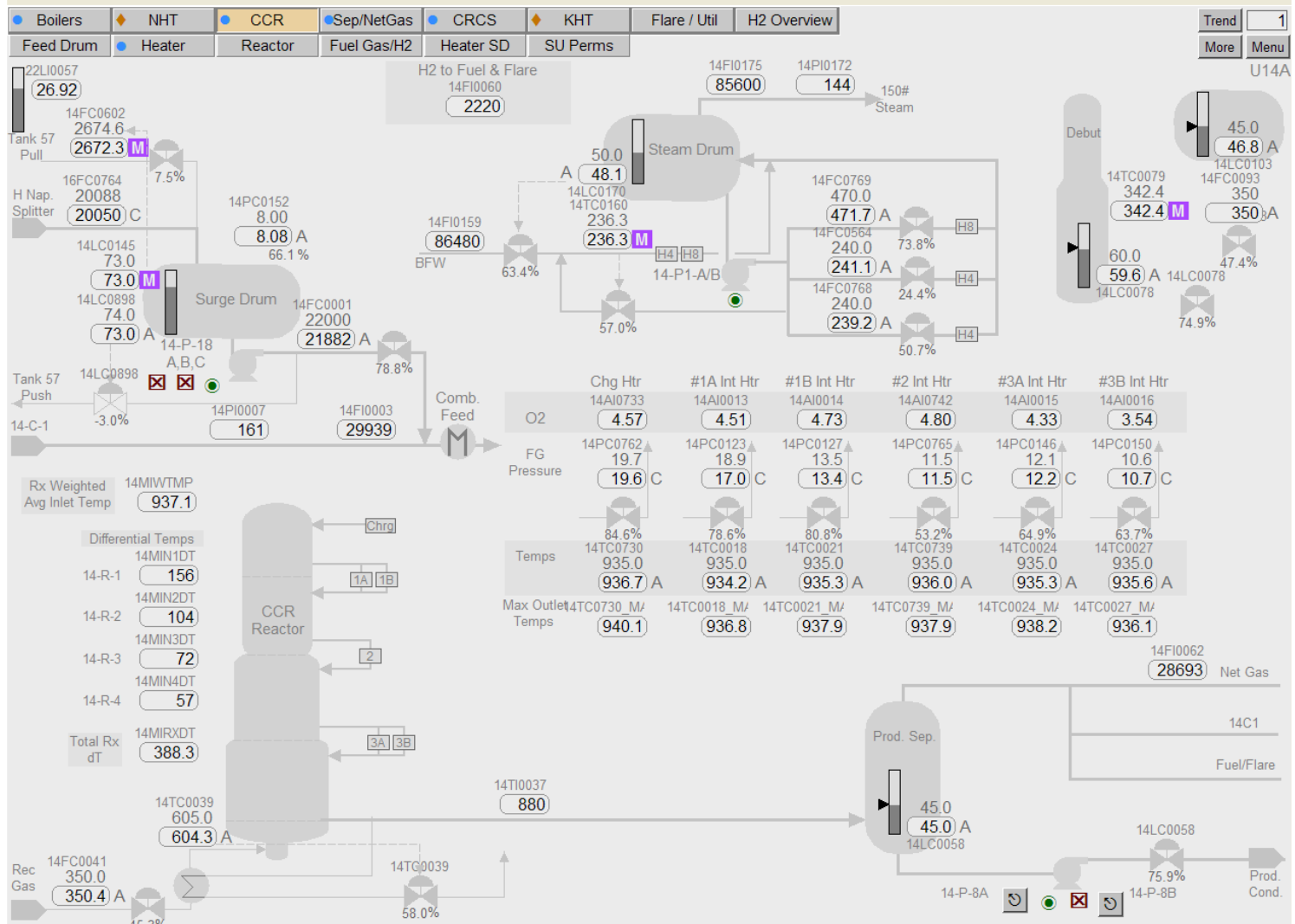
“Control” Displays (Level 2)

- Starting with Control (L2) display design first, can best set the frame work for Detail (L3) display design
- Iterative process between “Detail” (Level 3) and “Control” for consistent orientation will be minimized
- Creative License Required for Operations Specific Mental Model presentation on Control Display
- Review common activities with operators to ensure content requirements are captured
- Focus reviews on achieving proper mental model to “manage” this section of the process

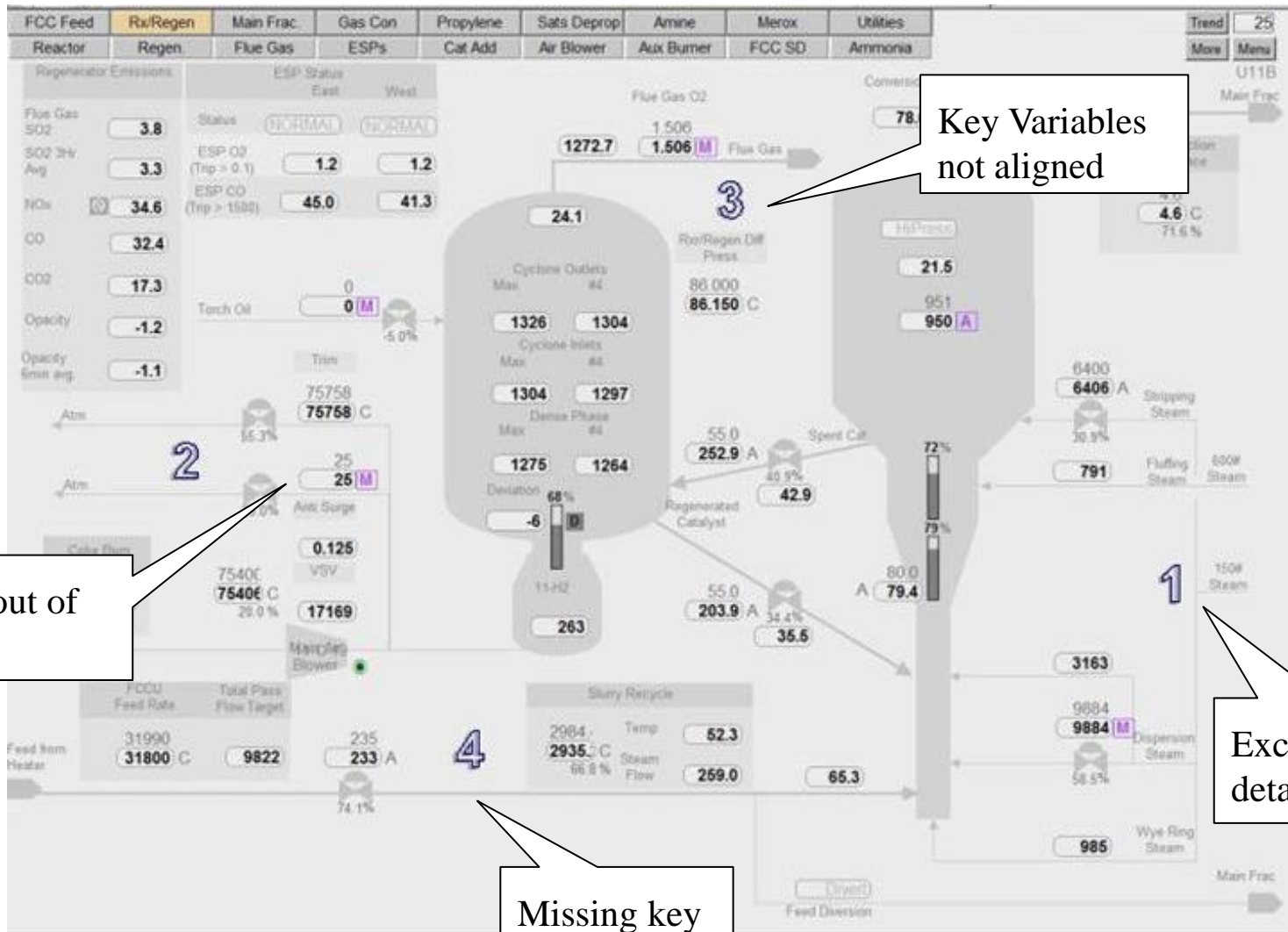
“Control” Displays (Level 2) – P&ID Style



“Control” Displays (Level 2) – Creative Style



“Control” Displays (Level 2) – Alignment Issues



[illegible]

“Control” Displays (Level 2) - Validation

- Follow up observation survey of screen utilization (L2/L3 common placement across all shifts)

<ul style="list-style-type: none">• Crude Train Control display	<ul style="list-style-type: none">• Crude Debut Detail display	<ul style="list-style-type: none">• Air Preheat Detail display• Vac OH Detail displayOr ** What needs attention **	<ul style="list-style-type: none">• Air Preheat Detail display• Vac Heater Control display
<ul style="list-style-type: none">• Crude Col Control display• Crude 2nd Stg Detail display	<ul style="list-style-type: none">• Preflash/Heater Control display	<ul style="list-style-type: none">• Crude Col Control displayOr ** Used for Operating **	<ul style="list-style-type: none">• Vac Col Control display

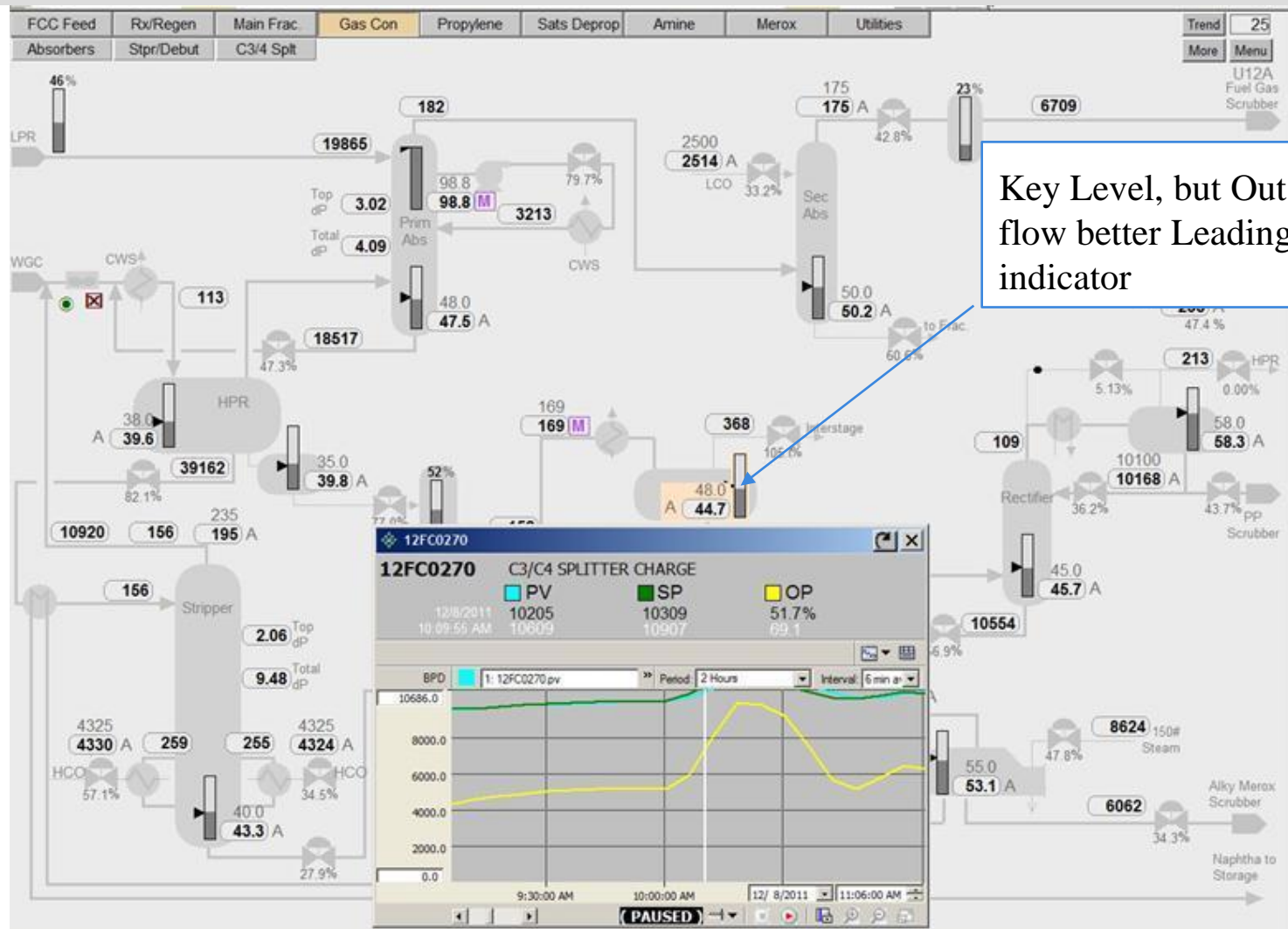
Console Overview Displays (Level 1)

- Key Process Indicators - Survey Work
- Leading Indicator Selection – Trend Identification
- “Panels of Glass” Required to create the “Canvas” for overview
- Always Up Situation Awareness objective
 - No plans to integrate L2/L3 navigation in L1 Displays
 - Large Overview Screens assumed for “Canvas”

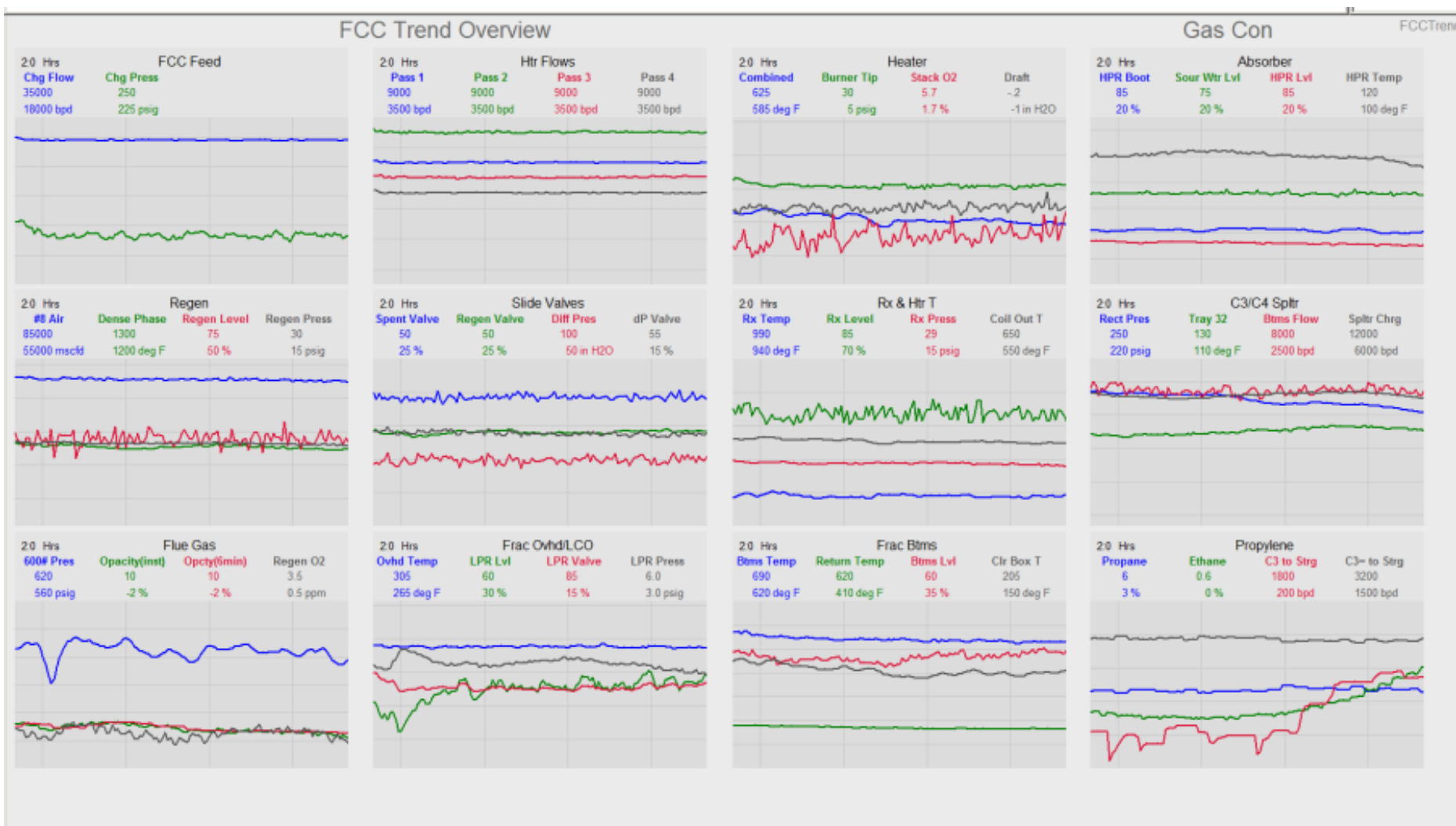
Console Overview - KPI Selection



Console Overview – Leading Indicators



Console Overview – Trend Overview



Console Overview – Navigation to Overview

The screenshot displays the Honeywell console interface. At the top, there is a menu bar with 'Station', 'View', 'Action', and tabs for 'Complex 1', 'Complex 2', 'Complex 3', 'Complex 4', 'Complex 6', and 'Help'. Below the menu bar is a toolbar with icons for a hierarchy view, a bell, a checkmark, an exclamation mark, and navigation arrows. A table below the toolbar shows the status of various components:

Boilers	NHT	CCR	Sep/NetGas
Reactor	Stripper	Heater SD	Heater SU

The main display area shows a process diagram with several data points: 19FC0159 6841 (6825 C), 19FC0159 (56.1%), 19FC0160 838 (838 M), and 19PC0101 40 (40 A). A 'Feed Surge Drum' is also visible with a value of 52.0 A. A context menu is open over the 'Complex 4' tab, listing the following options:

- KPI Overview
- CCR Overview
- NHT KHT Overview
- BoilerUtil Overview
- BEW Boilers
- NHT
- CCR
- Sep/NetGas
- CRCS
- KHT
- Flare / Util
- H₂ Overview
- C₃ Compr DR Menu
- Screen Resets

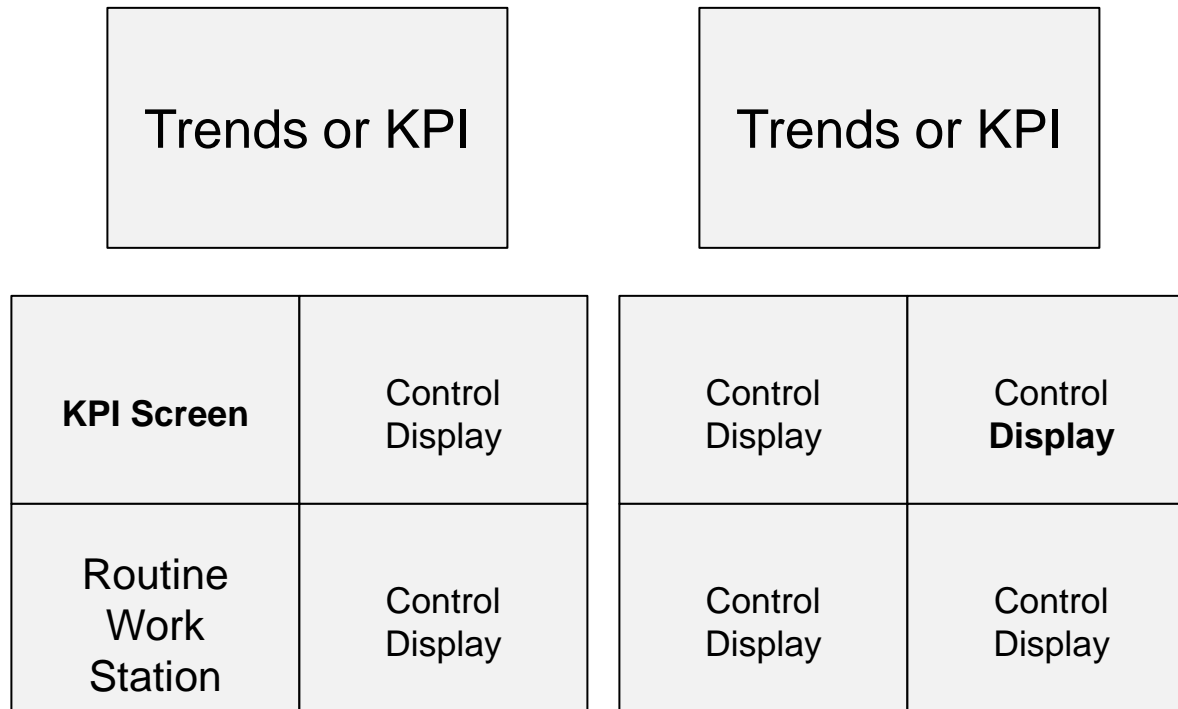
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- KPI Overview
- CCR Overview
- NHT KHT Overview
- BoilerUtil Overview
- Trend Summary
- Complex 3
- Complex 4
- InDevelopment

Console Overview - “Canvas” of Console



Console Overview – Alarm Table Option



Lessons Learned

- Correspondence coding in the shapes on process displays (Control and Detail) was very effective
- A good navigation organization that is “Always On Screen” is critical
- Control Displays require multiple reviews with operators
- Good communication and Education are critical to the success of implementing KPI and /or Trend overview displays.

Lessons Learned (cont)

- Evolving Process for KPI displays. Items to Consider
 - Salient Bands of operation on Bars
 - Direction of Change iconography historical sophistication
 - Matching Alarm coding to normal displays
- A complete HMI package should be rolled out at the same time.
 - L3 and L2 roll out without L1 displays leads to Screen use culture soak. Difficult to rewire use of screens to Overview approach.
- Opportunities for scientific analysis between Trends and effective KPI displays



HUG