Jeff England & Dal Vernon Reising
Successes & Challenges for Designing Effective Level 1 and Level 2 Displays
Presenter

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<table>
<thead>
<tr>
<th>Senior partner, Human Centered Solutions LLC</th>
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Human Centered Solutions
Helping People Perform
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Dr. Peter Bullemer, on behalf of Dal Vernon Reising

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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

Confirmation Step

Menu appears on Click

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

Primary Loop Selected

Associated Loop Highlighted
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 - 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

Right Click context menu to Detail(L3)
Display Hierarchy – Task Specific and Popup
“Control” Displays (Level 2)

- Starting with Control (L2) display design first, can best set the framework 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

Detail of BFW too close to other detail

Excessive Pipe detail

Key H2 information missing
“Control” Displays (Level 2) – Creative Style
“Control” Displays (Level 2) – Alignment Issues

- Excessive Pipe detail
- Detail out of context
- Missing key information
- Key Variables not aligned
“Control” Displays (Level 2) – Better Aligned
**“Control” Displays (Level 2) - Validation**

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

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<th>Column 3</th>
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<tr>
<td>Crude Train Control display</td>
<td>Crude Debut Detail display</td>
<td>Air Preheat Detail display</td>
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<tr>
<td>Crude Col Control display</td>
<td>Crude Debut Detail display</td>
<td>Vac OH Detail display</td>
<td>Vac Heater Control display</td>
</tr>
<tr>
<td>Crude 2nd Stg Detail display</td>
<td>Preflash/Heater Control display</td>
<td>Or ** What needs attention **</td>
<td>Or ** Used for Operating **</td>
</tr>
<tr>
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Or ** What needs attention **

Or ** Used for Operating **
Console Overview Displays (Level 1)

- Key Process Indicators - Survey Work
- Leading Indicator Selection – Trend Identification
- “Panes 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

Key Level, but Outflow better Leading indicator
Console Overview – Navigation to Overview
Console Overview - “Canvas” of Console

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<th>Control Display</th>
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<td>Routine Work Station</td>
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Trends or KPI

Trends or KPI

Control Display

Control Display

Control Display
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