Honeywell Process Solutions – Standard Builds

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HMIWeb Graphic Best Practices

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Agenda

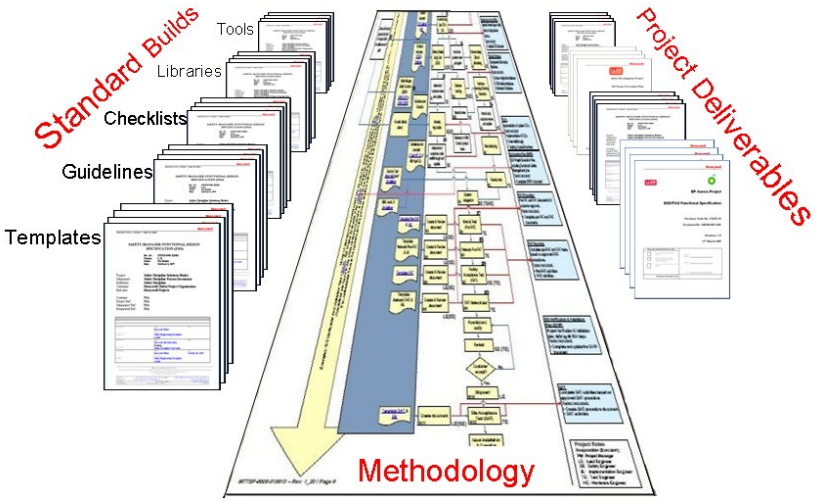
- Introduction HMI standards
- Effective Operator Display Design
  - Interaction Requirements Analysis
  - Display hierarchy
  - Qualitative Display Shapes and the impact on Operator Situation Awareness
- HMIWeb SP
  - Standard HMIWeb SP
  - Advanced HMIWeb SP

Why Standard Builds ?

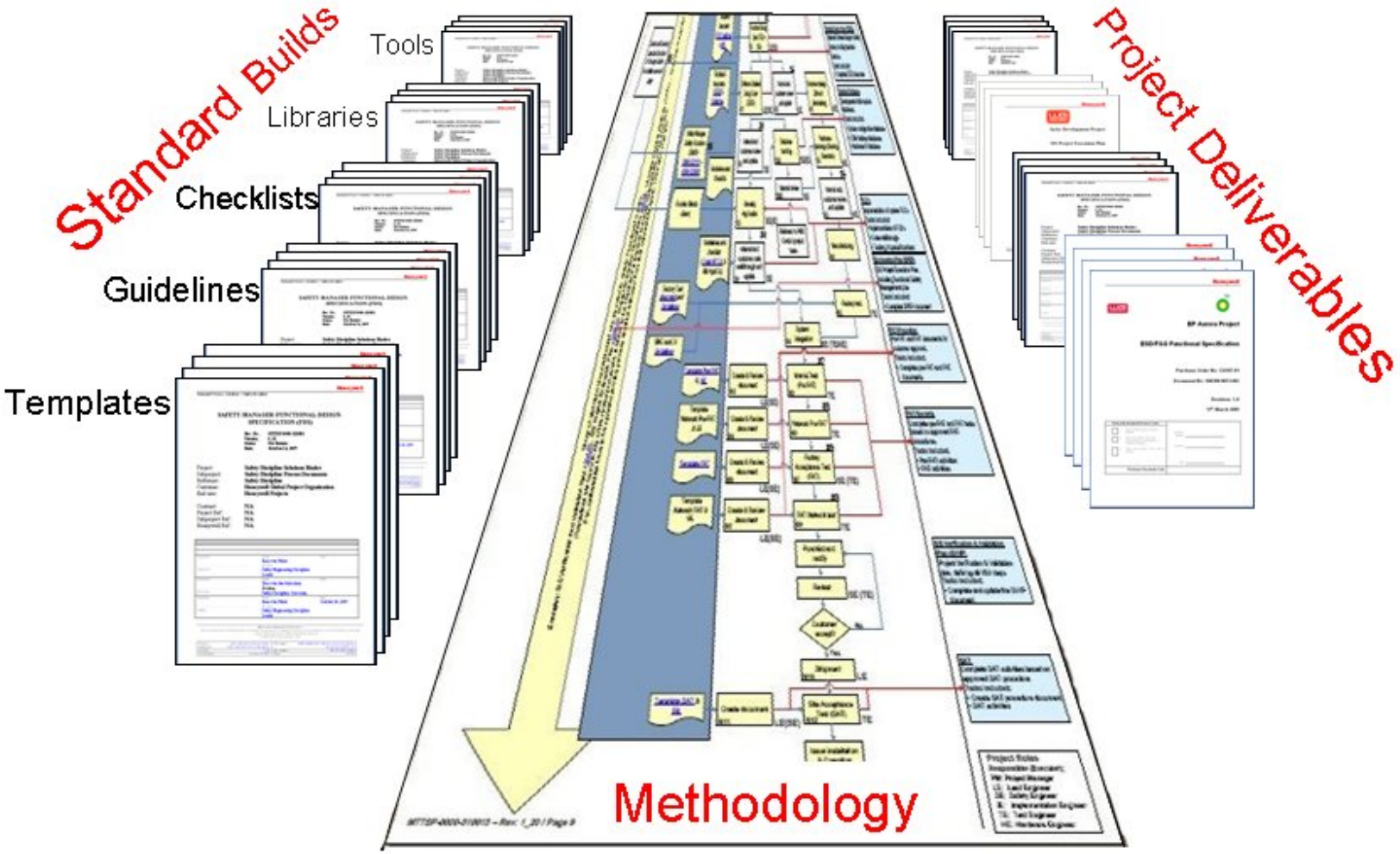
- Decrease Project Cost
- Reduction COPQ
- Standardize Project Engineering deliverables
- Global Customer requests for standardization
- For Mega projects multiple local standards is not working
- Open System Knowledge captures in Standards
- Utilization of global tools

Standard Builds content

- Standard Builds consists of:
  - **Templates**
  - **Guidelines**
  - **Solution Libraries**
  - **Checklists**
  - **Productivity Tools**
  - **Methodology**
- For the Disciplines:
  - **Hardware**
  - **Control application**
  - **Operator Interface**
  - **Safety Engineering**
  - **System Architecture incl. L1/L2 networks**



Standard Builds content



Operator Interface Concept

Objective

- Define ASM-based user interface concepts and features that **improve usability and effectiveness of the human-machine interactions** in the process control operations environment

Key Solution Concepts & Innovations

- Single, Integrated View of Multi-Level Hierarchy
- Mixed Initiative Approach
- Effective Window Management and Layout
- Effective Navigation Scheme
- Visual Coding Scheme
- Interaction Objects
- Contextual Menus & Information presentation
- Task View Organization

PROACTIVE versus REACTIVE

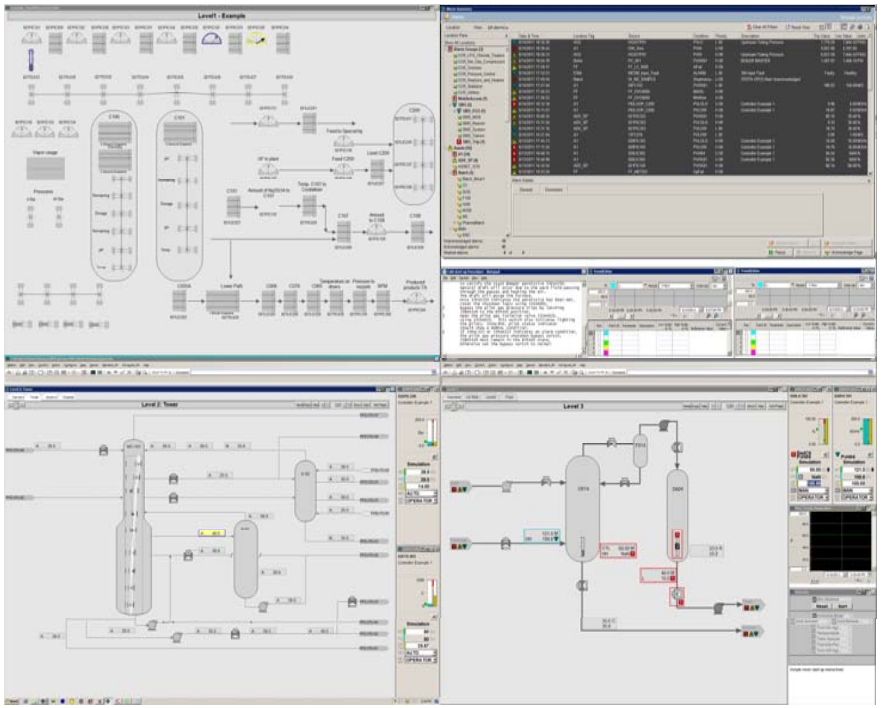
Operator Interface Concept

For Proactive Monitoring:

- Simultaneous, integrated view of increasing plant detail
- Integrated Trending
- Integrated alarm management into graphics and navigation tabs

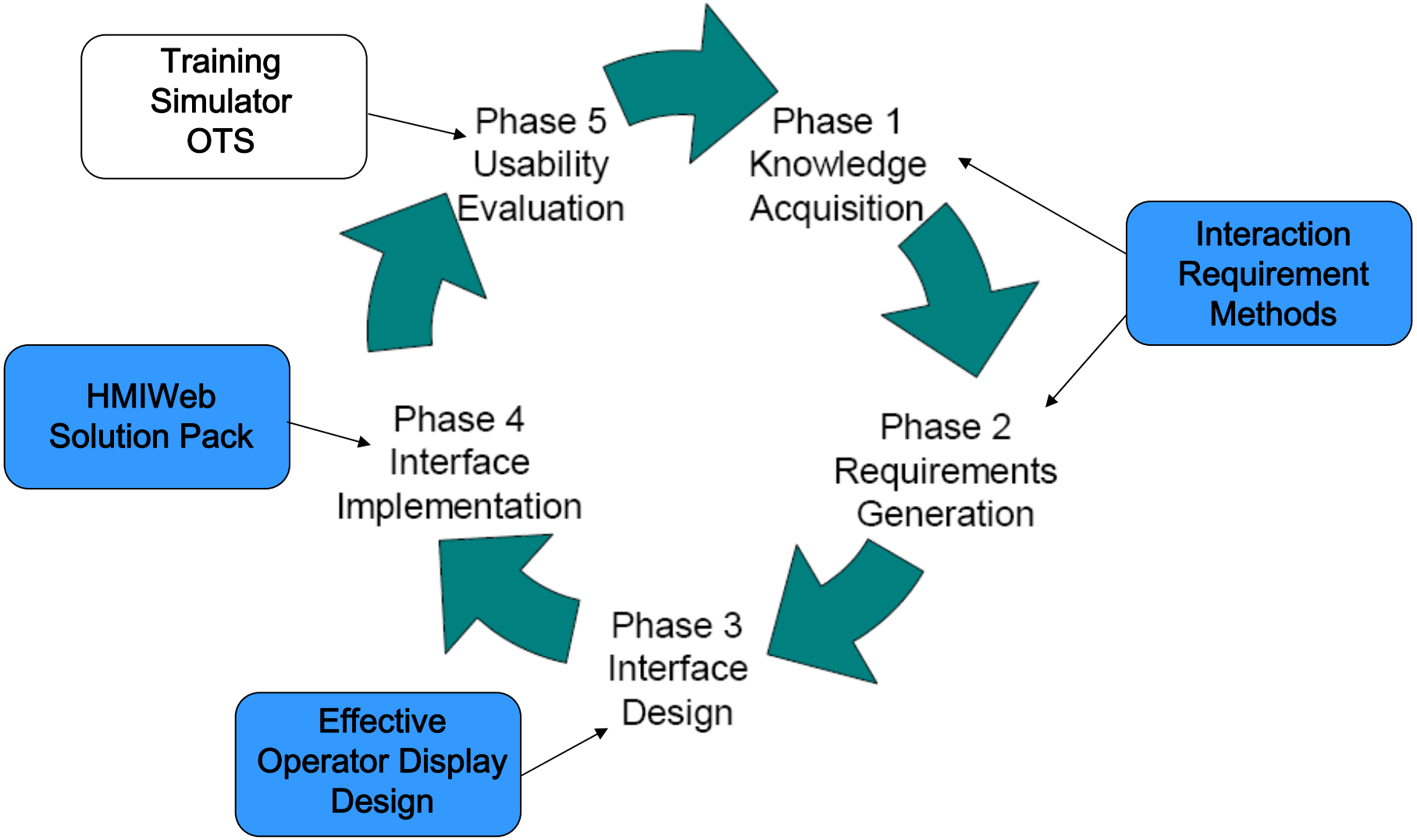
For Fast Response:

- Multi-windowing with controlled window management
- “Yoked” navigation between display levels
- Tabbed navigation within a display level



- **Graphics Design**
  - e.g., Color-coding only for critical information – like alarms, No 3D graphical objects, etc.
- Right-mouse click access to online documentation
  - e.g., Alarm Objective Analysis documents, procedures, etc.

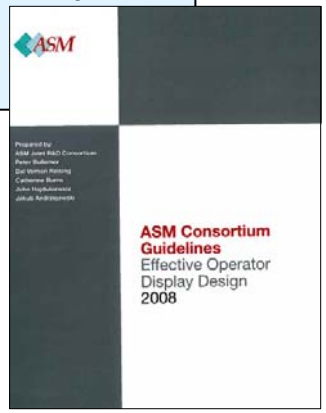
Process for developing operator interface design



User interface design

Human Factored Design

- Defining a visual language for consistent and effective human machine interaction.
- Design maximizes human capabilities and integrates methodology to handle human limitations, i.e., memory, selective attentions, calculation skills, reading skills
- Impacts appearance of information presentation and input protocol
- UI features
  - Screen Layout, Content and Density
  - Use of visual characterization to convey information to the user
  - Styles Conventions and Object Representation



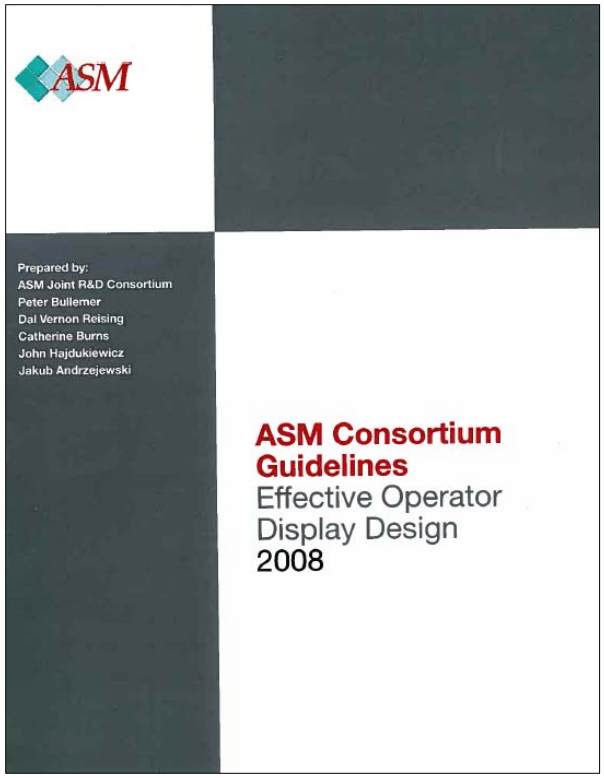
Human Centered Design

- Show right information in a display to optimized task performance effectively accurately and in a timely manner.
- Emphasis on operation tasks
- Design HMI structure to fit computer system limitations and boundaries by:
  - Creating functional groupings of information
  - Using proper Navigations schemes to allow for better data presentation (density)
  - Visualization techniques
  - Information content

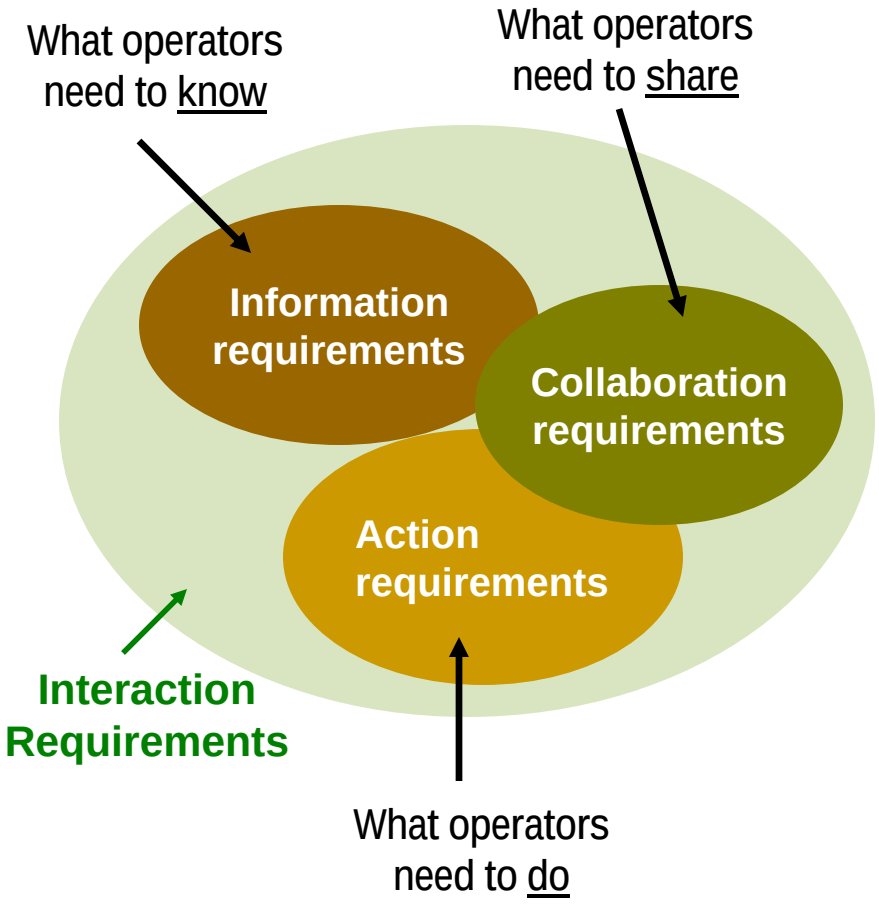
Effective Operator Display Design

- Sixteen Guideline Categories
  - Display Types, Display Content, Display Style, Display Layout
  - Color, Symbols and Process Connections, Text and Numbers
  - Navigation, Interaction and Displays
  - Alarm Configuration Scheme, Audible Annunciation for Alarms, Visual Annunciation for Alarms
  - Training Program, Online Guidance, Design Methodology, Management of Change

- 81 guidelines in total across these 16 categories Guidelines are prioritized
  - Priority “1” – rated as one of the minimum set of guidelines for achieving an ASM good quality practice.
  - Priority “2” – one of the comprehensive set of guidelines for achieving an ASM high quality practice.
  - Priority “3” – one of the advanced set of guidelines for achieving an ASM best practice

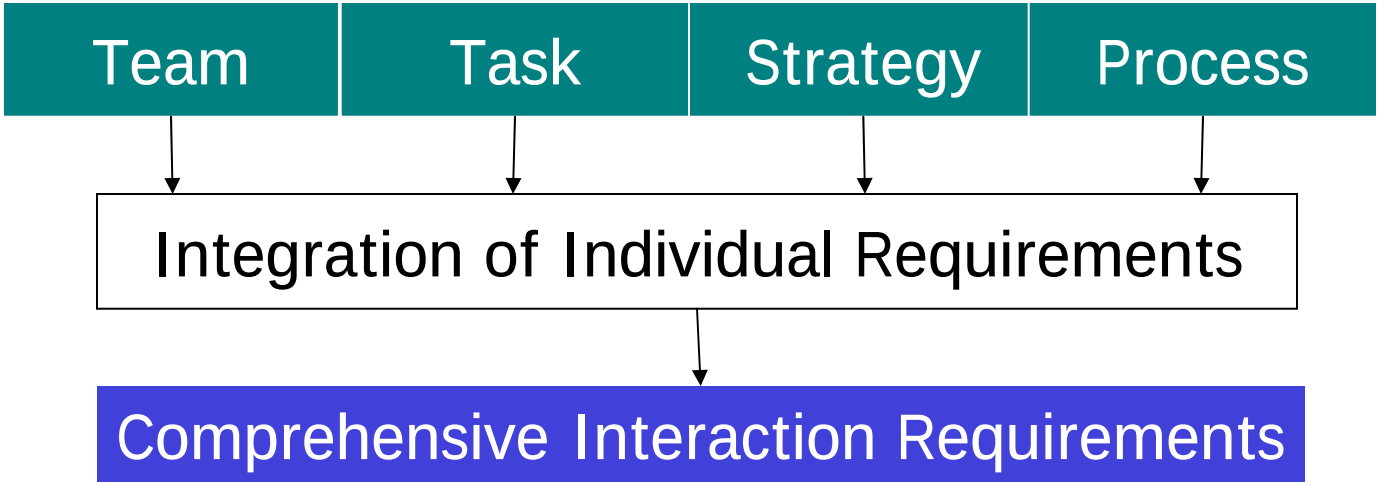


What is an *Interaction Requirement*?



- **Interaction** Requirements
  - The **combination of** information, action, and collaboration requirements for the various work processes that we ask an operator to perform
  - Information Requirements = The **data and information** needs of an operator to make decisions or perform specific tasks
  - Action Requirements = The software applications, procedures, or **DCS "control handles"** needed to perform specific tasks
  - Collaboration Requirements = **Communications** (e.g., telephone, radio, and verbal) needed to complete the work

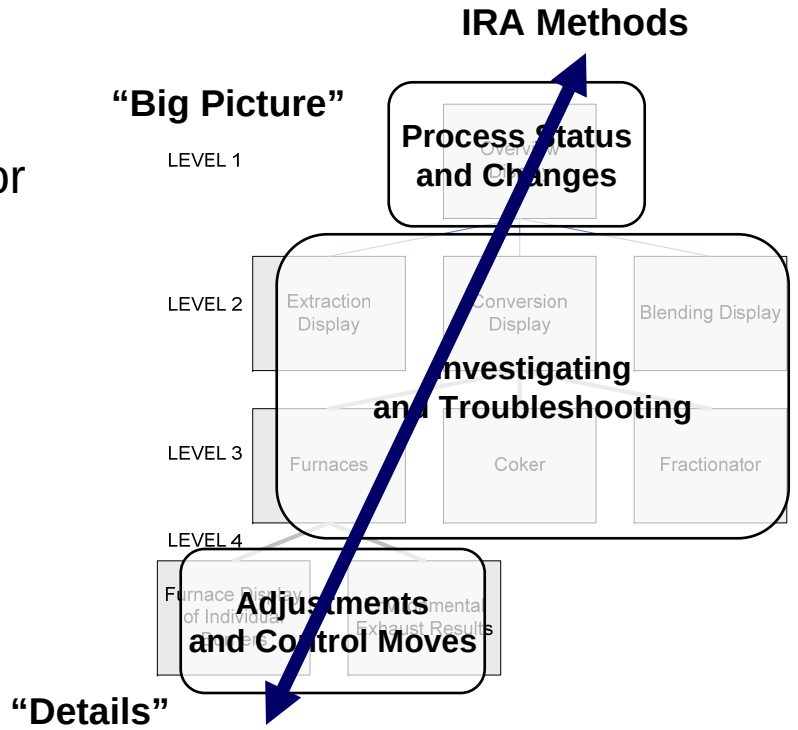
Sources of Interaction Requirements



- **Team**
  - Operations team structure
  - Team communication
  - Roles & Responsibilities
  - Coordination of work
- **Task**
  - Procedures (SOP / EOP)
  - Task structure & sequence
  - Work processes
- **Strategies**
  - Various ways of achieving job goals that are not explicitly documented
- **Process**
  - Process functions
  - Operating constraints / limits
  - Operating targets
  - Optimization objectives

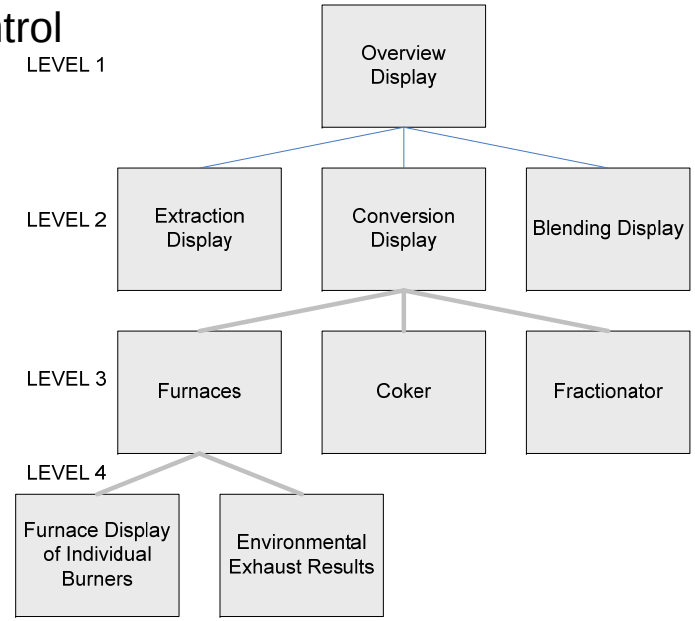
IRA Methods and the Display Hierarchy

- Purpose of the display hierarchy
  - Research in the area of human problem solving has found that people tend to use various levels of thinking when solving problems
    - From the “big picture” to the “details” and back and forth
  - Interaction Requirements Analysis supports this problem solving behavior by allowing an operator to move between the “big picture” of process plant status to the “details” around individual equipment areas, pieces of equipment and controllers as the task or situation requires



Display Hierarchy

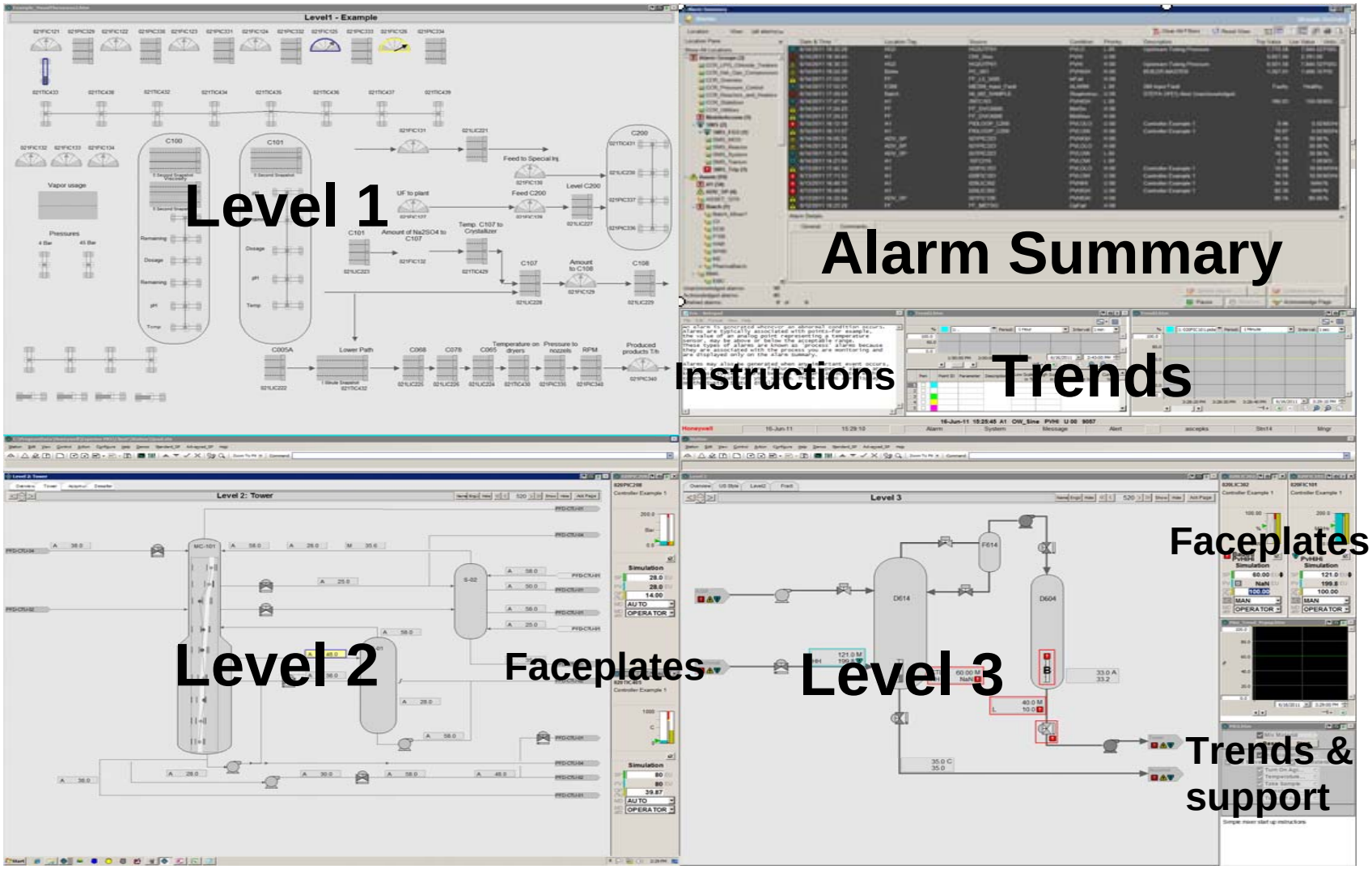
- The **display hierarchy** is made up of four levels:
  - Level (1) Overview
    - Dedicated display
    - Shows critical variables across span-of-control
    - Used for summarizing the “Big Picture”
    - Directs operator to areas of the plant for more details
  - Level (2) Summary
    - Display for each major process area (e.g., PFD level)
  - Level (3) Equipment
    - Display for each equipment with more detail information (P&ID level)
  - Level (4) Details
    - Selected details, help, or faceplate displays



Proactive Monitoring

- Proactive monitoring is defined as actively maintaining awareness of the current situation and status of the process unit
  - Proactive monitoring is achieved by regularly reviewing major process functions and corresponding critical variables in the overview display
  - When critical variables begin to deviate from normal, operators typically respond before alarms activate
  - Proactive monitoring and responding gives operators more time to act before major consequences occur
- Proactive monitoring contrasts with reactive monitoring where operators react to process deviations only after alarms annunciate and then deal with problems
  - Maintaining awareness of process status by having a display hierarchy that supports operator interaction requirements is a key aspect of proactive monitoring

Effective Monitoring and Control



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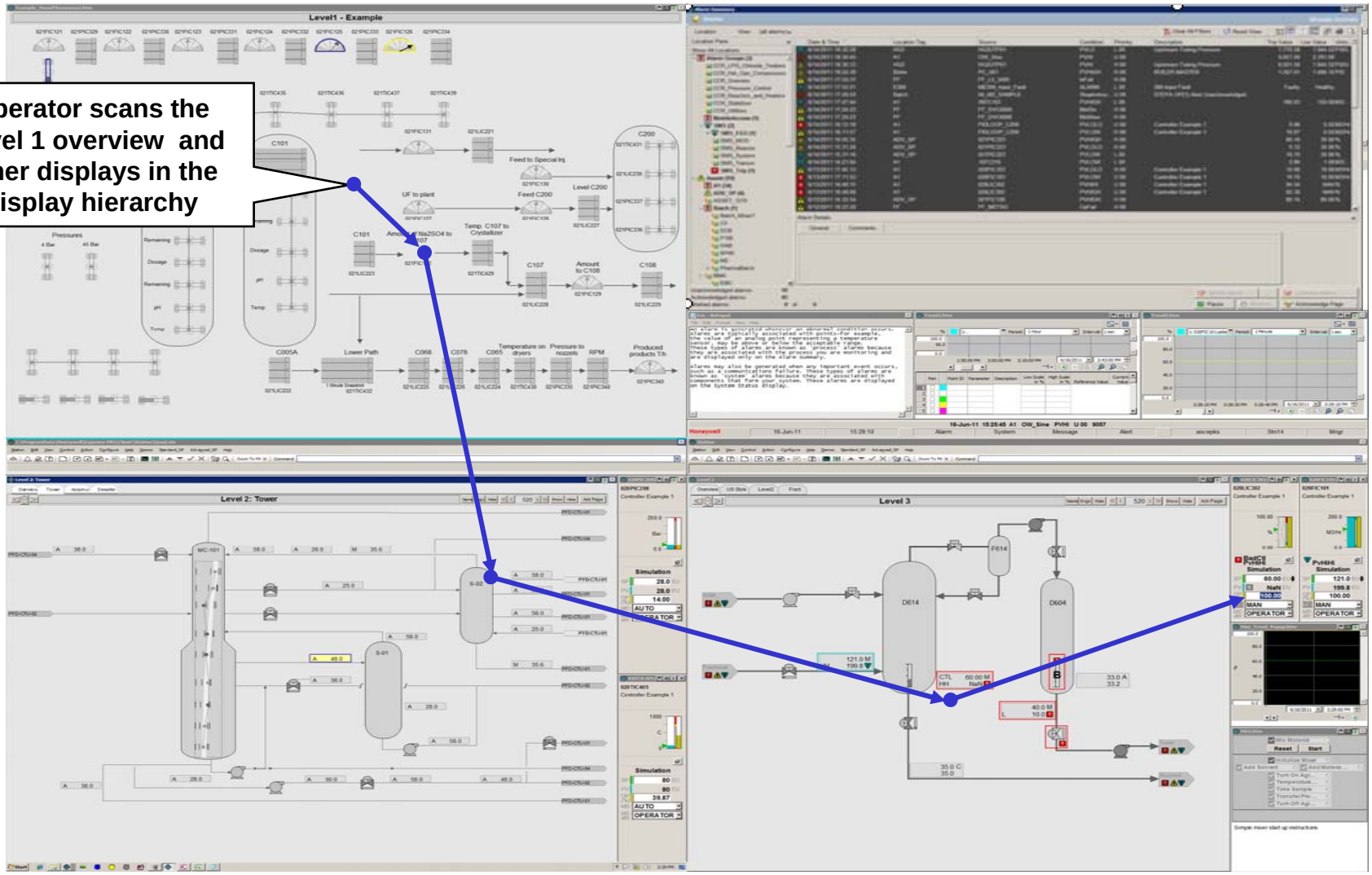
Effective Monitoring and Control

Operator scans the Level 1 overview and other displays in the display hierarchy



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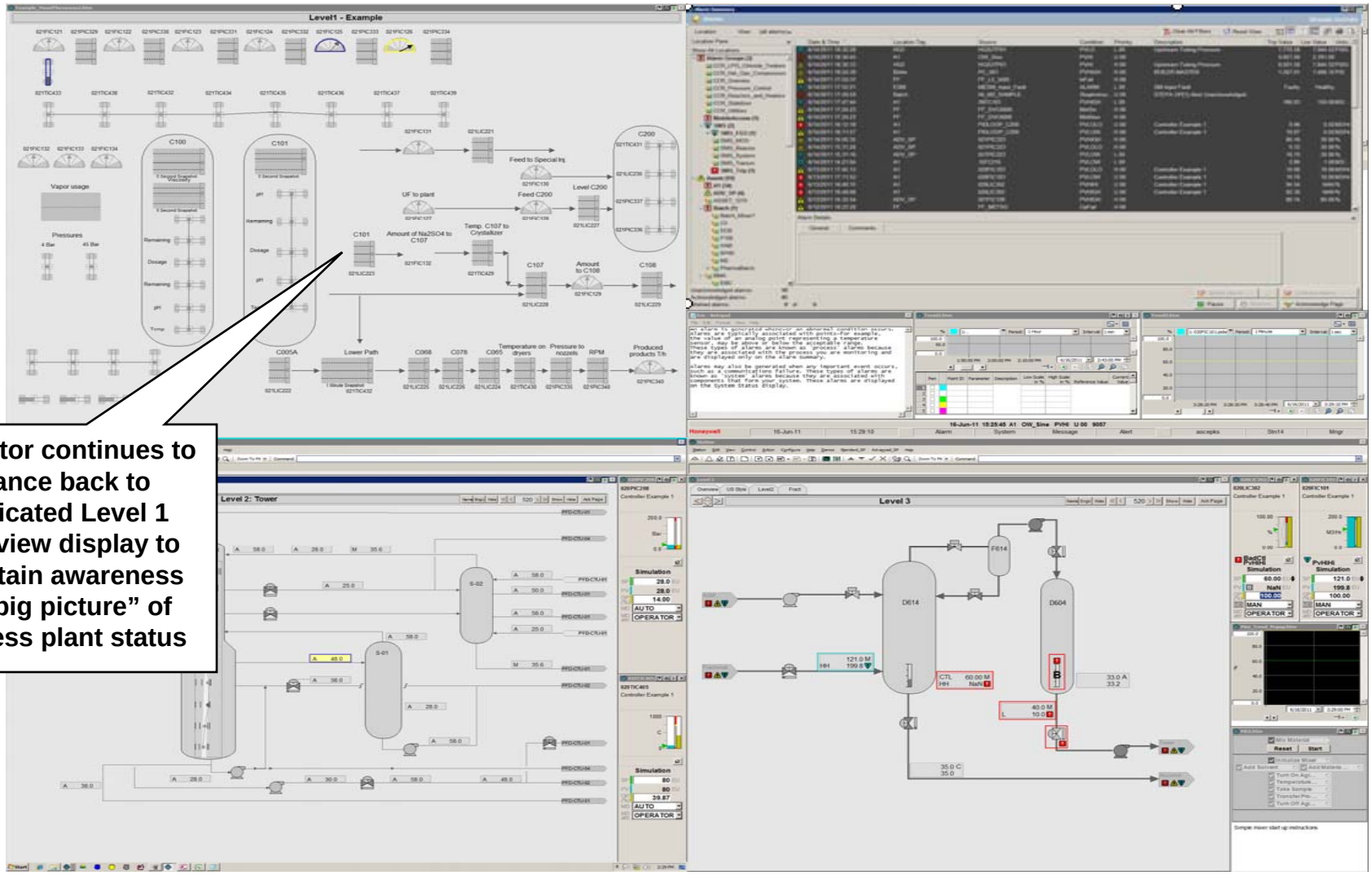
Effective Monitoring and Control



Operator continues to glance back to dedicated Level 1 overview display to maintain awareness of "big picture" of process plant status

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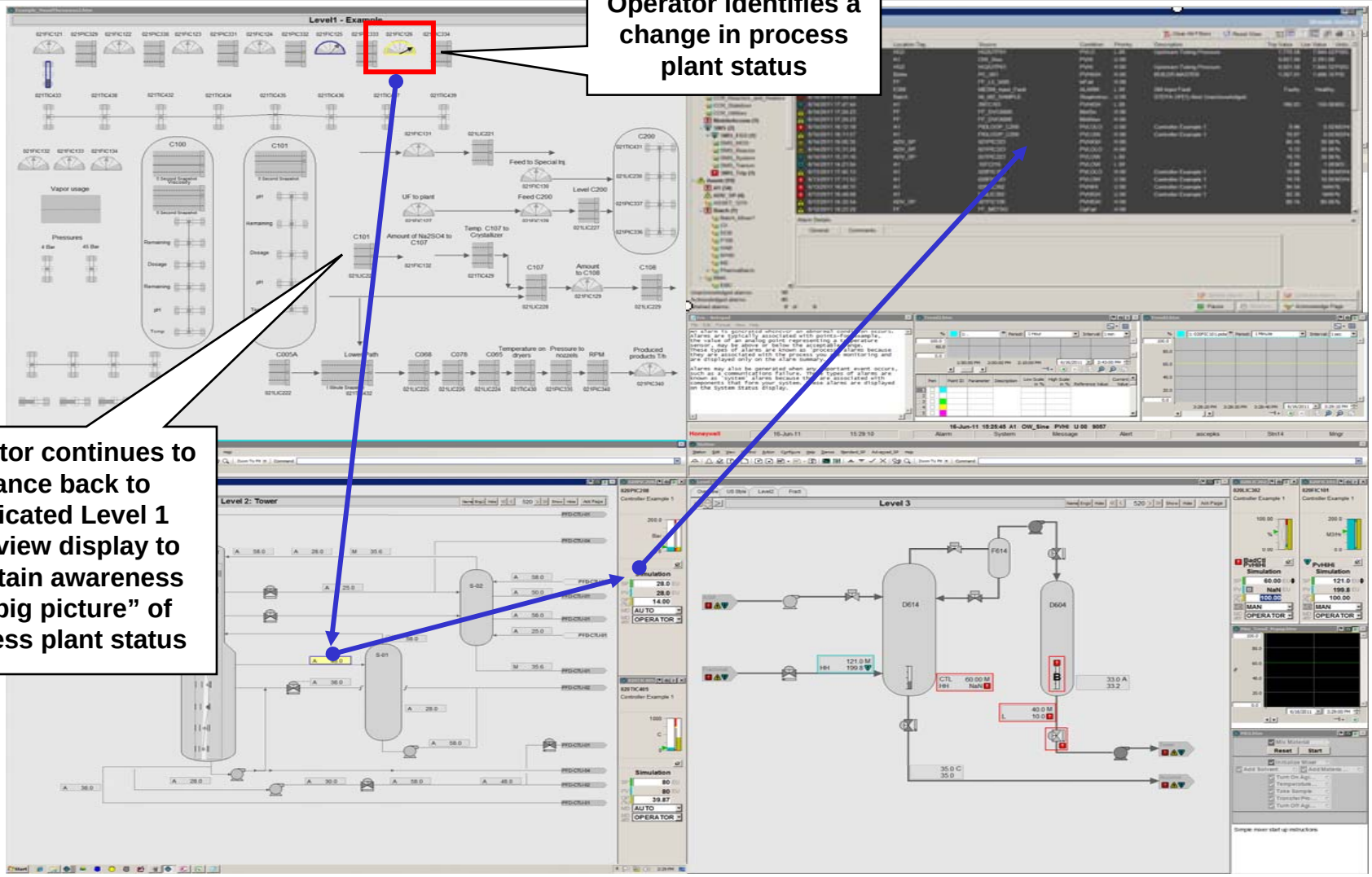
Effective Monitoring and Control



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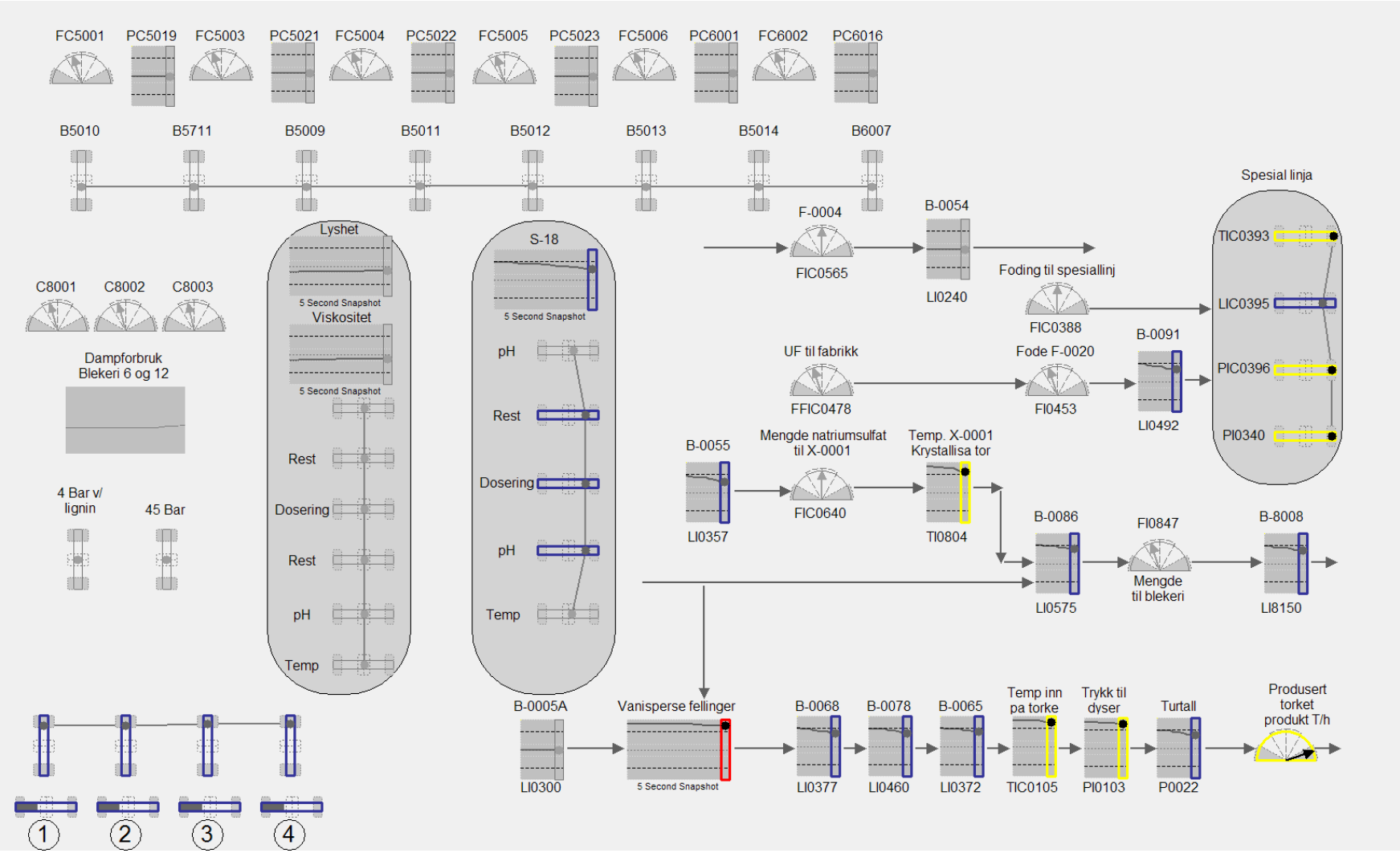
Level 1 example



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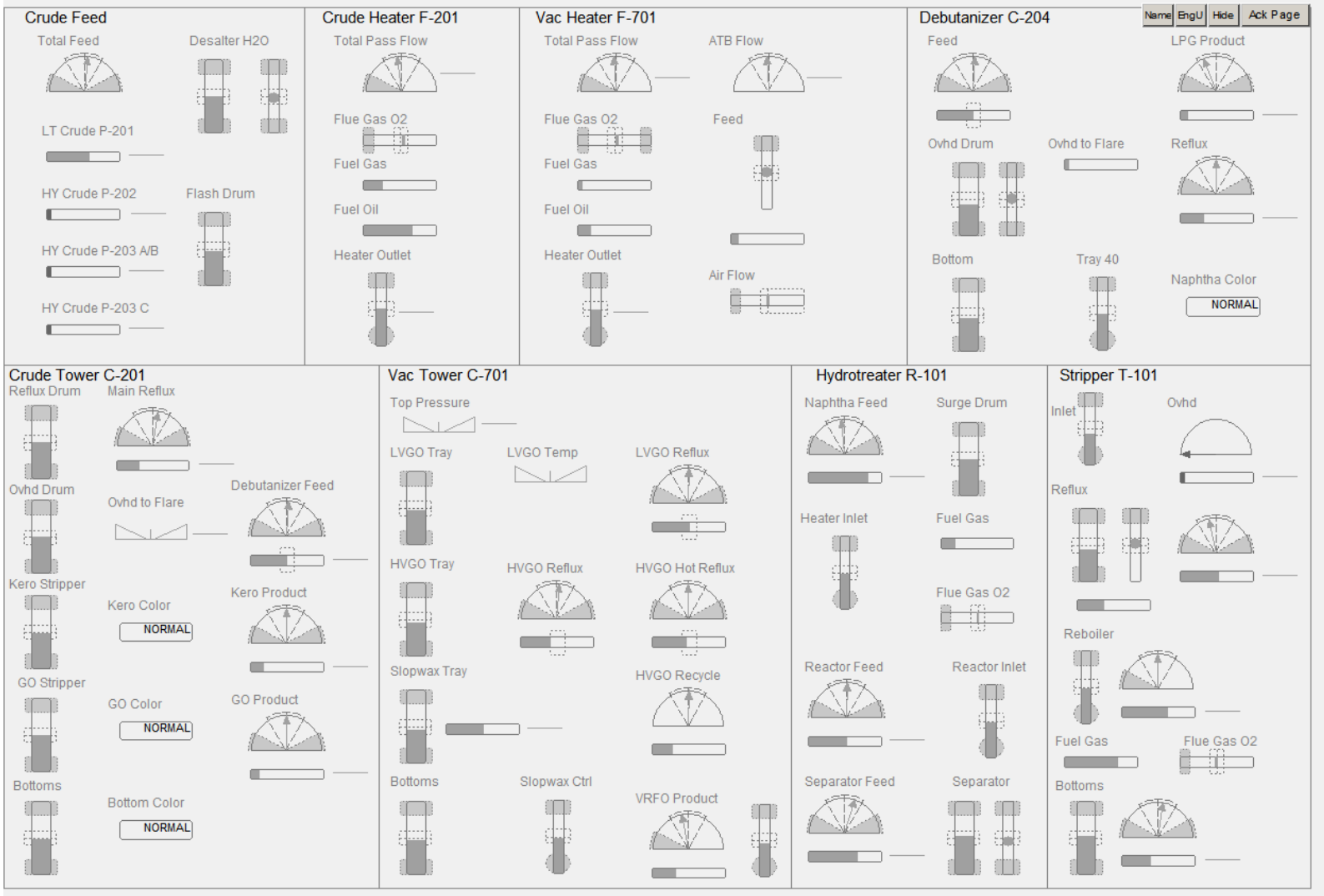
Level 1 example



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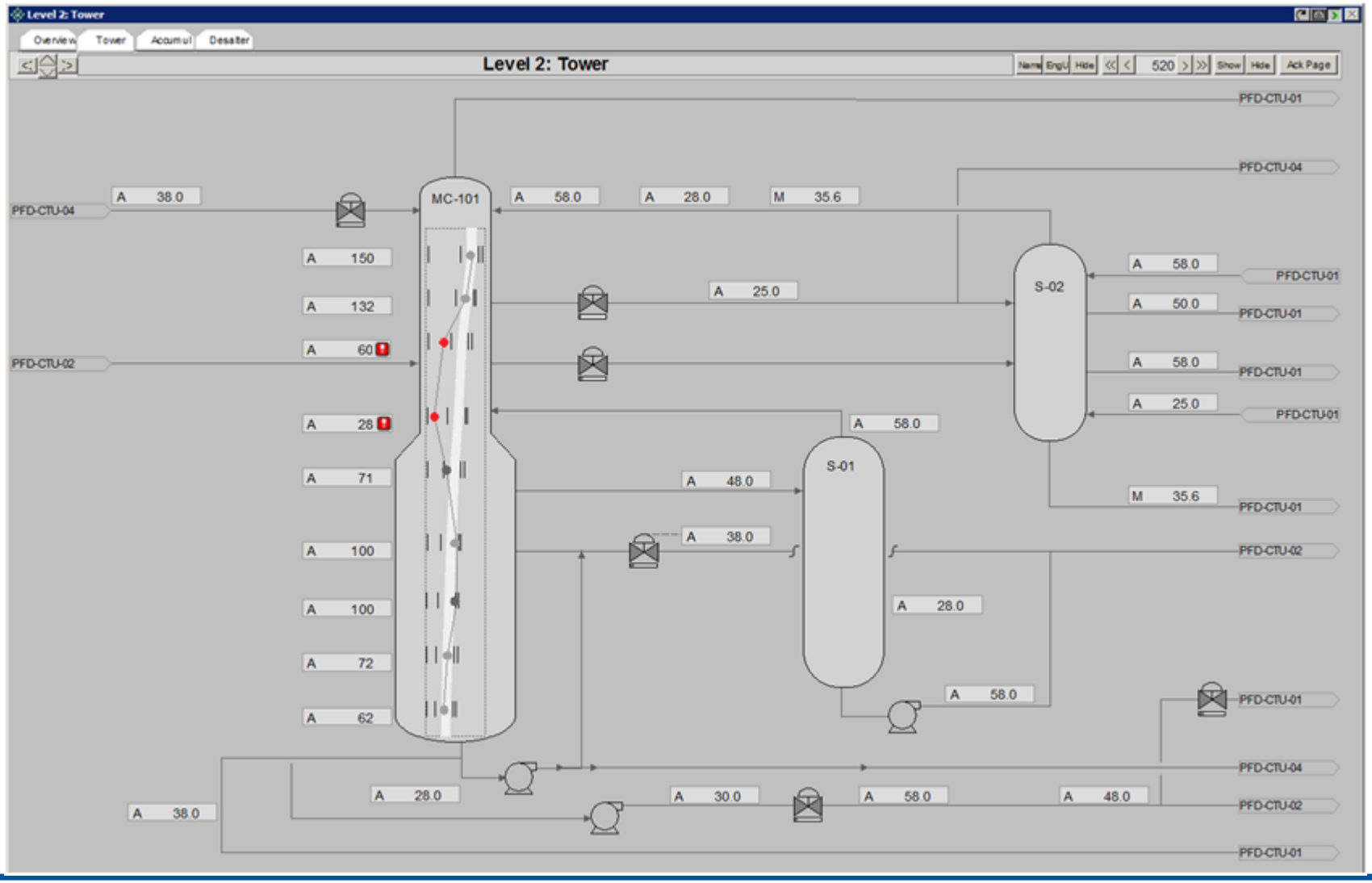
Level 2 example



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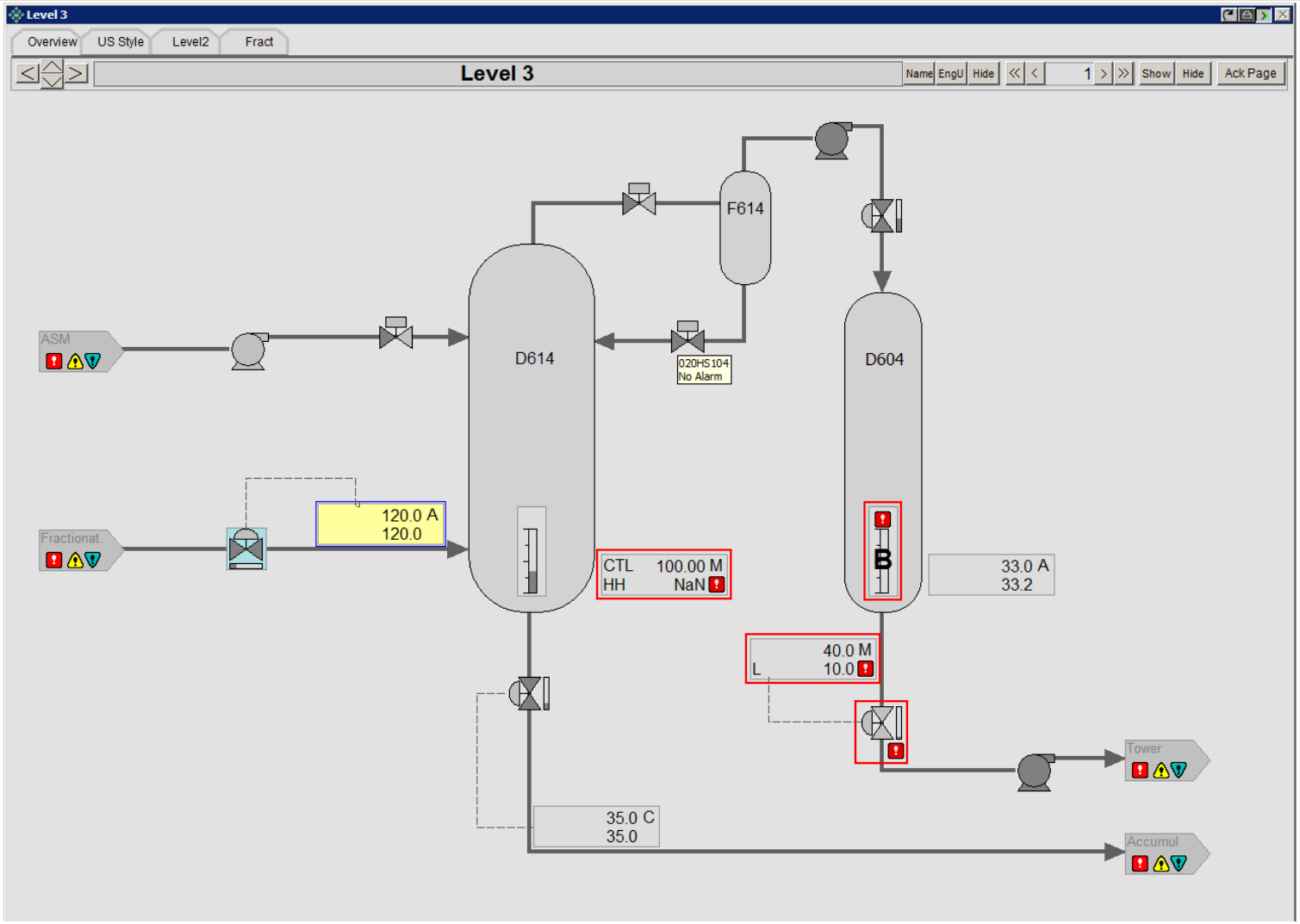
Level 3 example



Qualitative Display Shapes and the impact on SA

Is there a Problem?

	10:00	10:30	11:00	11:30	12:00
Tray 58	130.2	129.7	129.8	130.2	129.7
Tray 49	139.4	139.2	140.2	140.2	139.6
Tray 40	149.9	148.8	150.4	150.7	150.1
Tray 31	159.4	162.2	164.9	170.4	175.5
Tray 22	169.9	170.5	171.0	171.9	171.0
Tray 13	180.3	182.7	181.2	182.6	181.7
Tray 4	190.2	192.2	191.1	192.4	190.0

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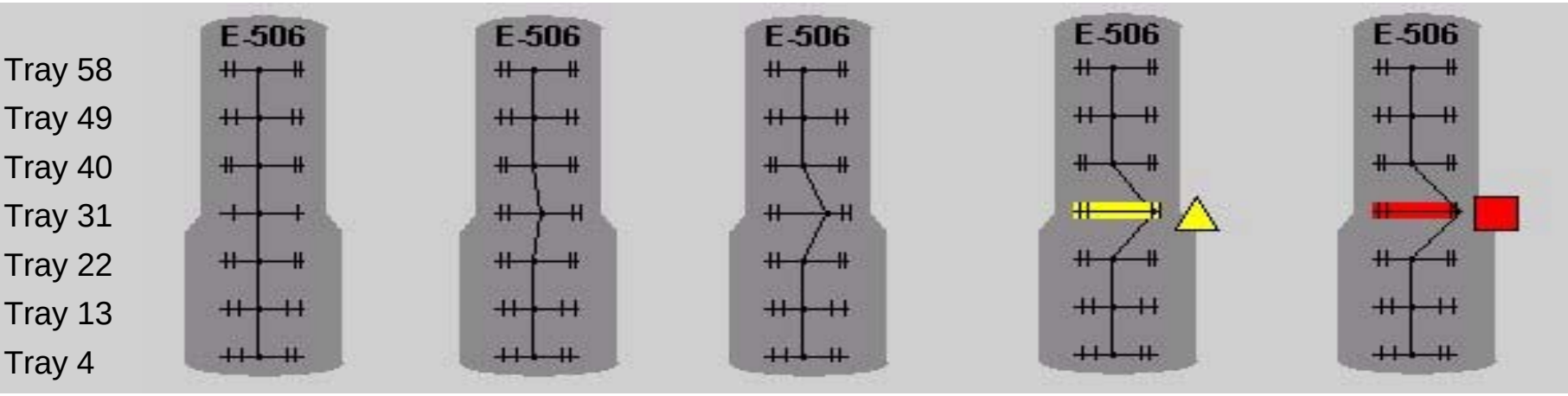
Qualitative Display Shapes and the impact on SA

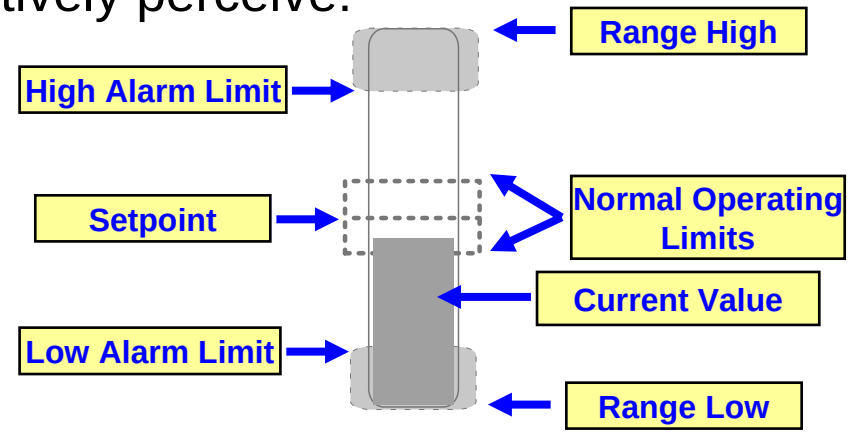
Watching a Fault Propagate for an individual Graphic

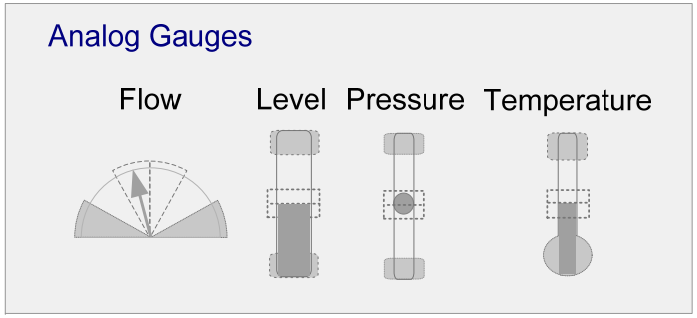
	10:00	10:30	11:00	11:30	12:00
Tray 58	130.2	129.7	129.8	130.2	129.7
Tray 49	139.4	139.2	140.2	140.2	139.6
Tray 40	149.9	148.8	150.4	150.7	150.1
Tray 31	159.4	162.2	164.9	170.4	175.5
Tray 22	169.9	170.5	171.0	171.9	171.0
Tray 13	180.3	182.7	181.2	182.6	181.7
Tray 4	190.2	192.2	191.1	192.4	190.0

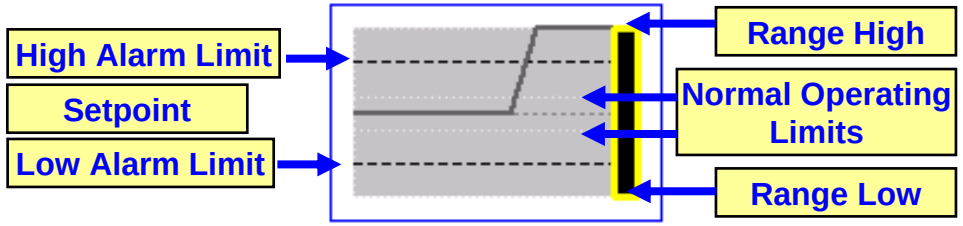


Qualitative Display Shapes and the impact on SA

- Information in the new display shapes is presented in such a way that operators can qualitatively perceive:
  - **normal operating limits**
  - **alarm limits**
  - **how close the process is relative to the limits**
  - **how quickly the process is moving towards / away from the limits**

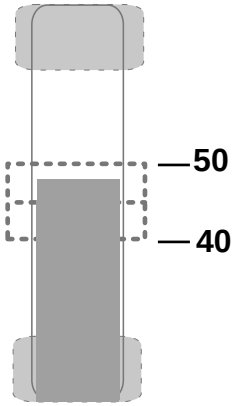
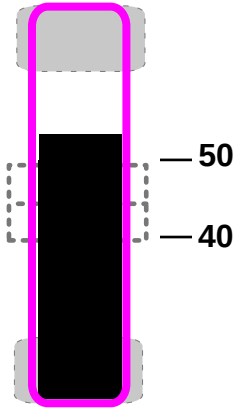






Qualitative Display Shapes and the impact on SA

- Detecting deviations to variables can be supported in different ways in the Level 1 overview displays:

Schematic Overview Display			Functional Overview Display	
Operators must assess process variation relative to their memory of operating ranges and alarm limits	**45.01**	**Normal variation**		Operators can perceive normal and abnormal variation relative to visual elements (operating range and/or alarm limits) in the shape
Operators must judge whether an abnormal condition is occurring (cognitively demanding)	**55.05**	**Abnormal Process deviation**		Operator attention is drawn to abnormal process deviations and alarms using visual cues

HMIWeb Solution Packs

HMIWeb Solution Pack Goals:

- Consistent HMI concept
- Integrated solution offering
- Effective plant operations
- Flexibility in use
- Low price for project implementation
- Low maintenance costs
- Effective support (TAC)
- Standardization
- Professional documentation
- High quality solutions

- Performant HMI Solution
- Library compatibility (easy to share)
- Roll-out of ASM (Abnormal Situation Management)
- Common look and feel for all shapes
- Quick project start
- Minimized project risk
- Clear sales, quotation, project baseline

Our thoughts what HMIWeb SP should be

Thoughts behind the HMIWeb SP

- Not just a library of objects
- Complete set of tools to develop your displays
- Consists of:
  - Operating Philosophy
  - Object Functional Design Specification (covering common object behaviour)
  - Library with over 2000 objects including professional documentation
  - Training material
- Continuous development:
  - Expanding functionality
  - Improving usability and performance
- Life cycle approach:
  - Project execution
  - Operator effectiveness
  - Site maintenance

HMIWeb Solution Pack Deployment Model

- There will be two HMIWeb Solution pack libraries
  - Experion Standard HMIWeb SP (EP-HMISPSTD)
  - Experion Advanced HMIWeb SP (EP-HMISPADV)
- Existing solution pack will be referred to as the Standard Solution Pack.
- New advanced objects (radar plots, objects from the ASM Visual Thesaurus project) will be added to a separate Advanced Solution Pack.
- Advanced HMIWeb SP will be a licensed option
- Advanced and new Standard HMI Web Solution pack will be available for R310.3 R311.2 and R400

Standard HMIWeb SP Features

- Delivers maximum functionality with high performance
- Consistent operation philosophy throughout the plant
- Easy display implementation
- Support of multi level display concept
- Easy cloning and adaptation of objects
- Pop-Up and faceplate support
- Shortcut menu support
- Flexible colour and text configuration (using CSS)
- Build to meet ASM guidelines

Standard HMIWeb SP Features

Main library features (cont'd)

Over 2000 objects for both C200/ C300, Scada, TPS HPM, TPS HG and Foundation Fieldbus (with control on the wire) with the following functionality:

- Alarm indications & navigation
- Analogue indicators (with & without SP)
- Counters & totalizers (with & without SP)
- Digital state symbols
- Switches
- Motors
- Pumps
- Valves (2-way & 3-way)
- Numerics & Flags
- Regulatory control indicator (PV, SP & OP)
- Regulatory control valves (with bar & value)
- Buttons
- Bars
- Fans
- Fire & Gas symbols
- ESD Symbols
- Motor Operated Valves
- Static symbols
- And much more

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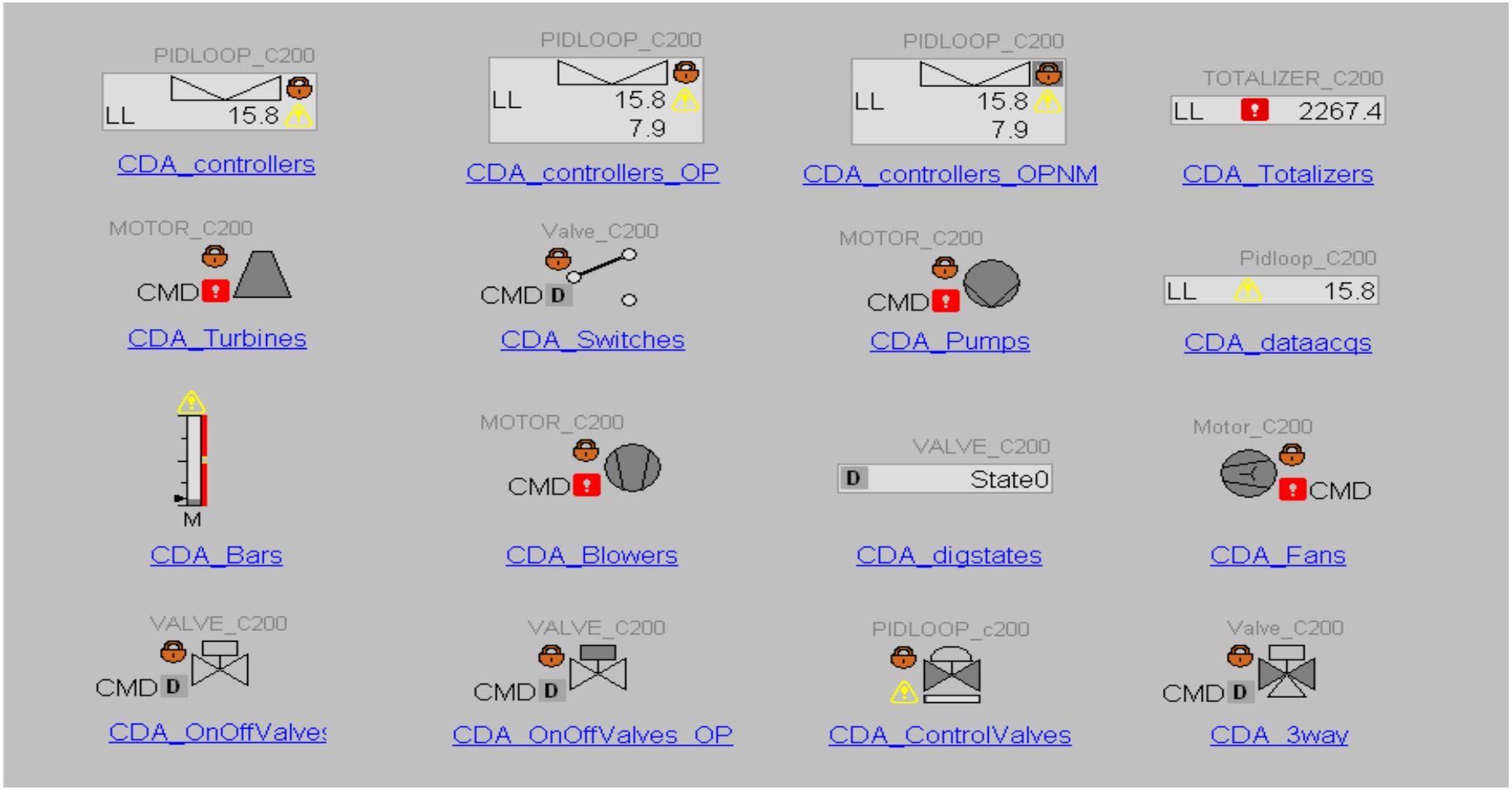
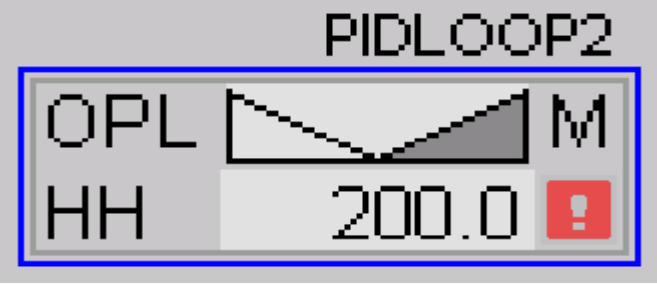
Standard HMIWeb SP Features

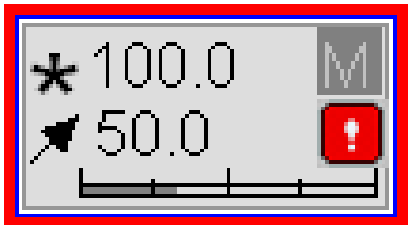


Common behaviour for all objects

- Mouse behaviour
- Color usage
- Mode indication
- Nmode indication
- Normal Mode Attribute
- Alarm type indication
- Alarm priority indication
- Inactive indication
- Error indication

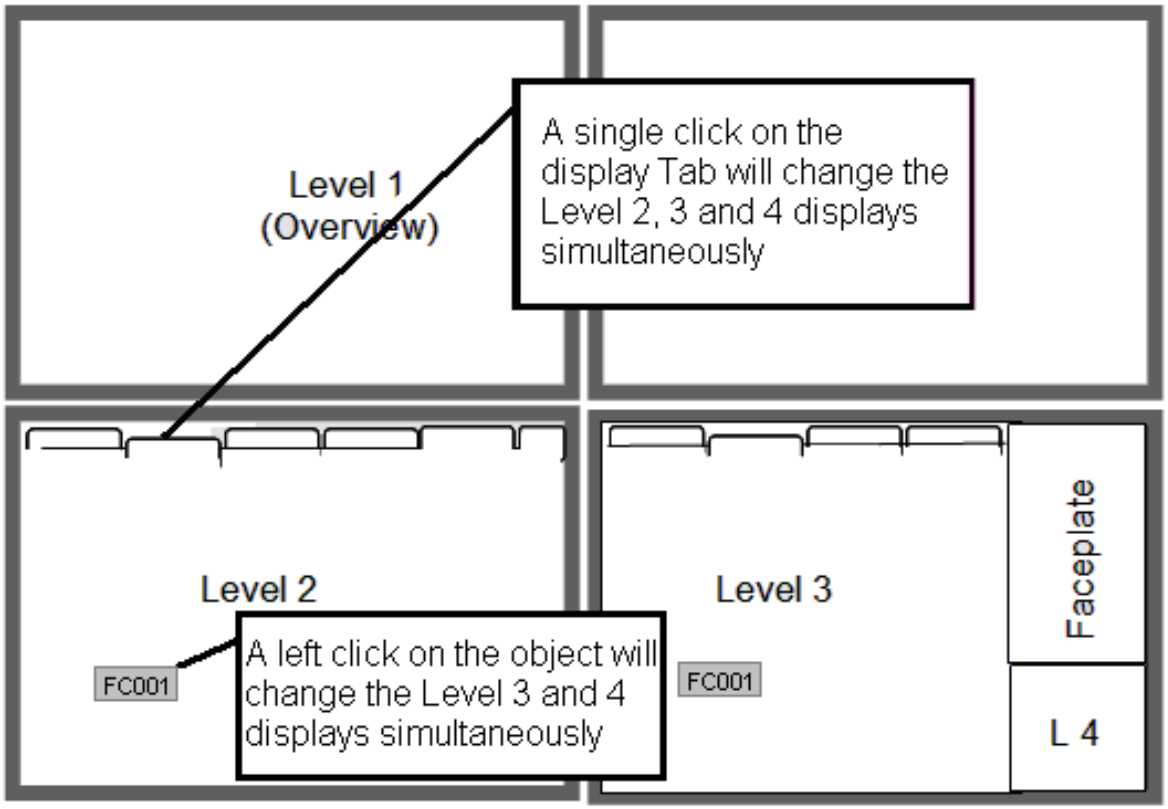


- Redtag
- Winding
- Ramping
- Initialization
- Bad PV indication
- Alarm disable indication
- Tagname indication
- Engineering Unit Descriptor
- Selection box
- Shortcut menu functionality



Advanced HMIWeb SP Functionality

- Display yoking



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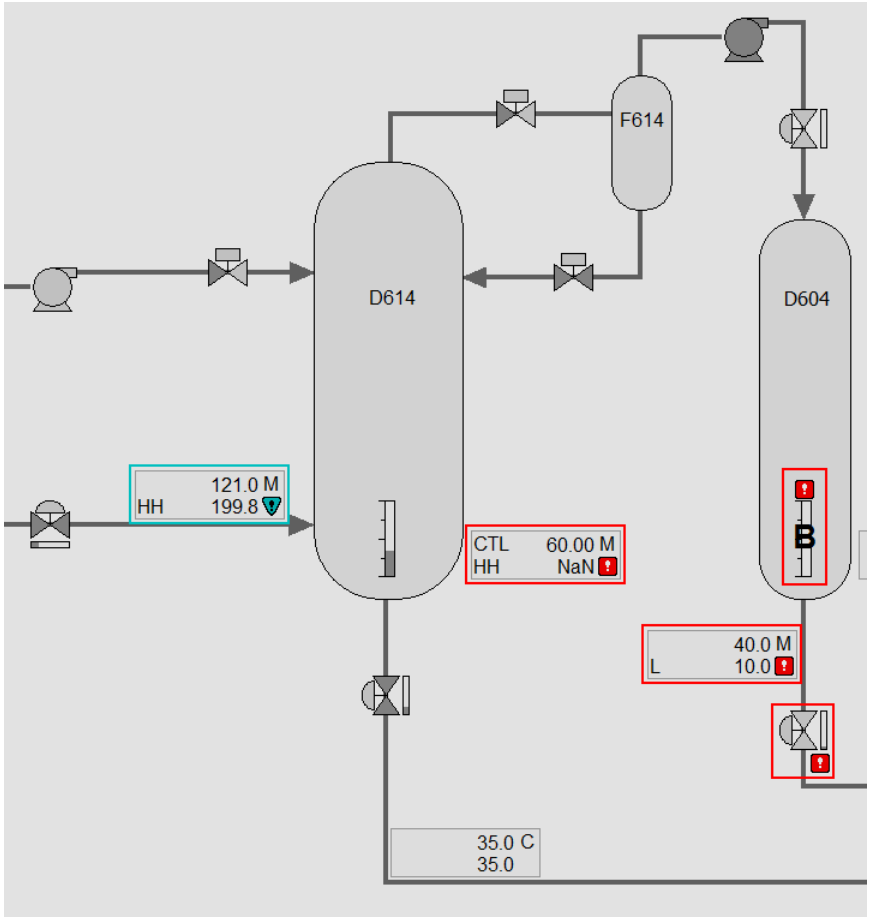
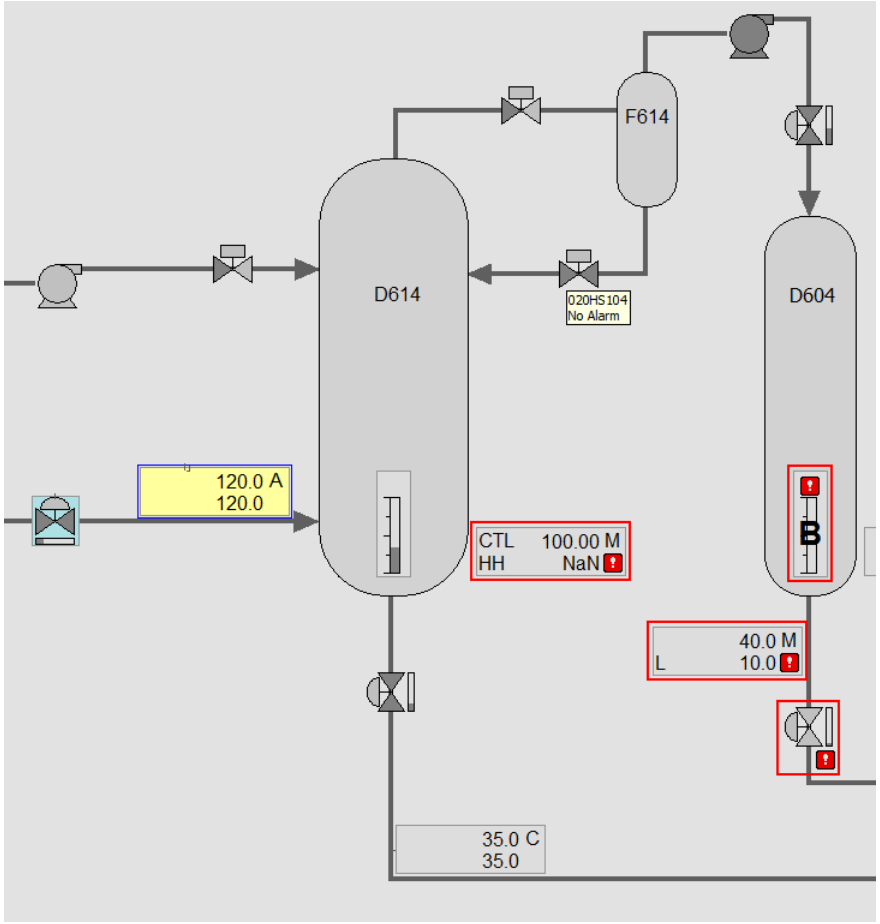
Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus



Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus



Advanced HMIWeb SP Functionality

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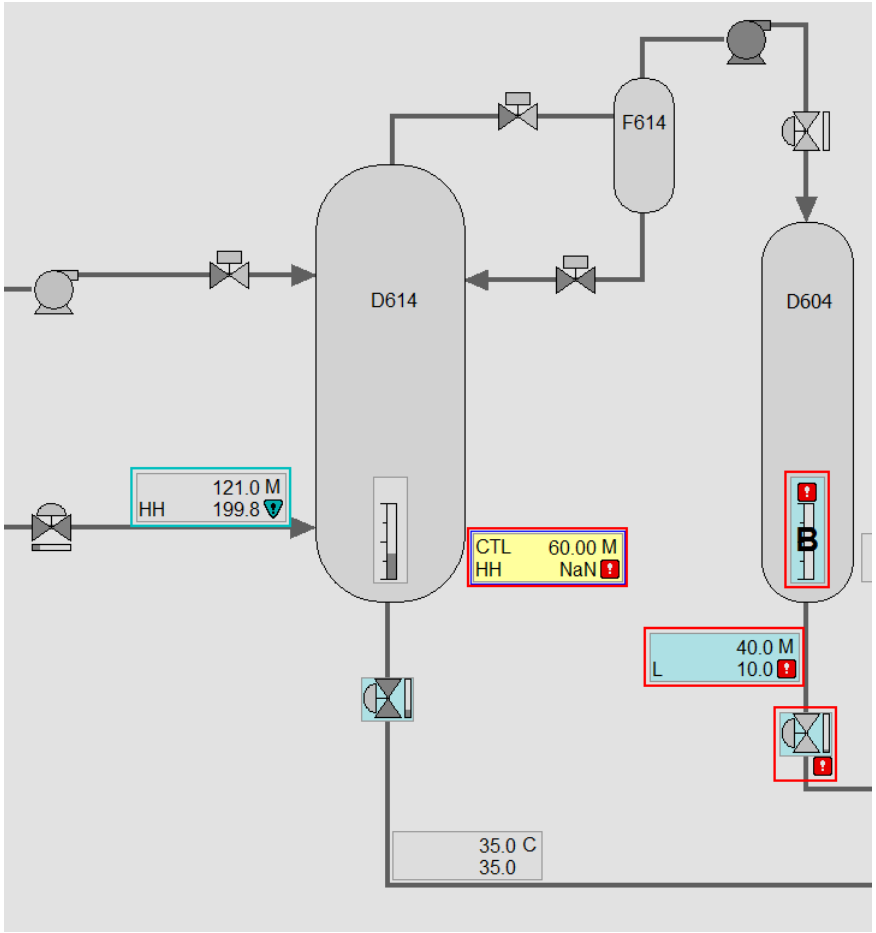
- Principal and Associated Focus



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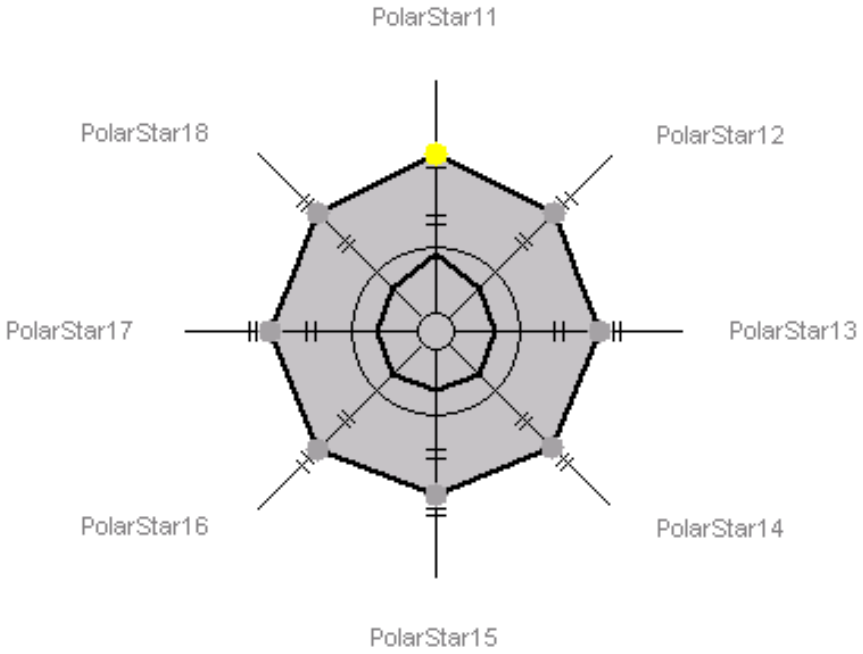
Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus
- Tabbed Display

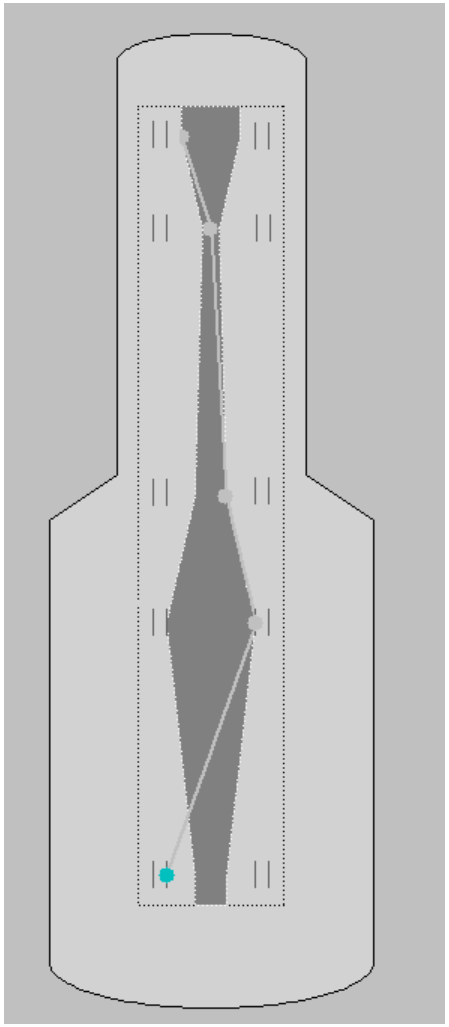
Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus
- Tabbed Display
- Level1 shapes
  - Polar Star



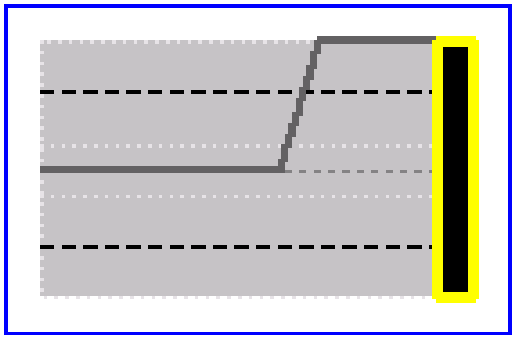
Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus
- Tabbed Display
- Level1 shapes
  - Polar Star
  - Temperature Profile



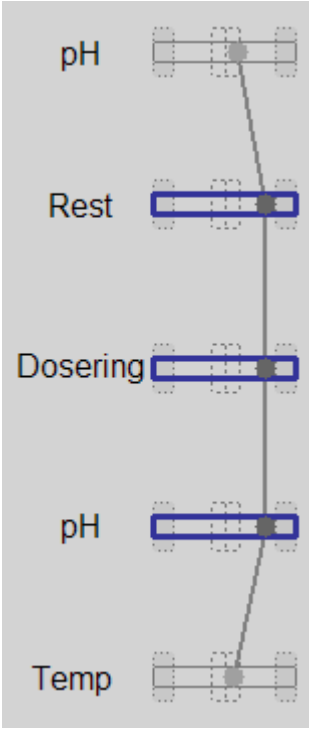
Advanced HMIWeb SP Functionality

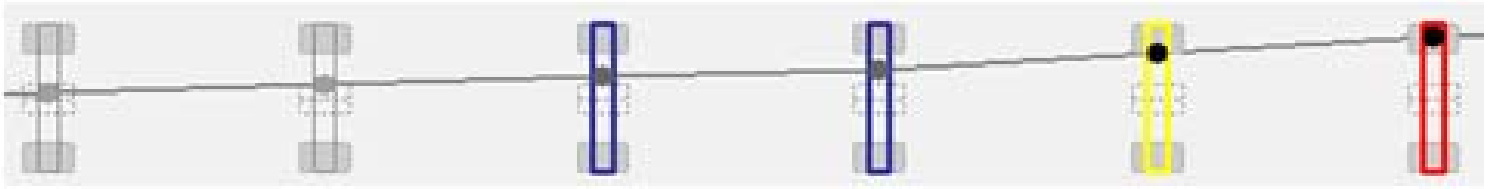
- Display yoking
- Principal and Associated Focus
- Tabbed Display
- Level1 shapes
  - Polar Star
  - Temperature Profile
  - Historical Data Object



Advanced HMIWeb SP Functionality

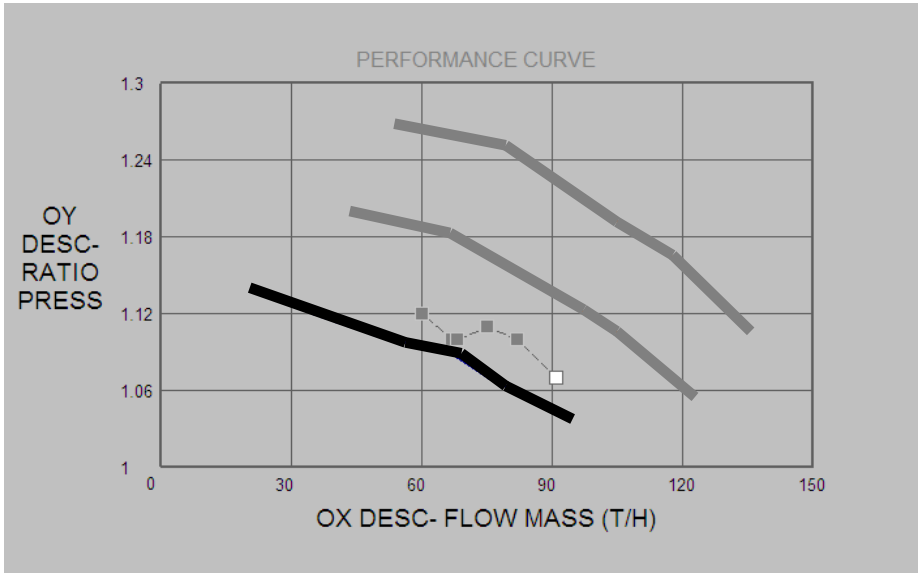
- Display yoking
- Principal and Associated Focus
- Tabbed Display
- Level1 shapes
  - Polar Star
  - Temperature Profile
  - Historical Data Object
  - Horizontal & Vertical Profile Object





Advanced HMIWeb SP Functionality

- Display yoking
- Principal and Associated Focus
- Tabbed Display
- Level1 shapes
  - Polar Star
  - Temperature Profile
  - Historical Data Object
  - Horizontal & Vertical Profile Object
  - Performance Curve Monitoring



Advanced HMIWeb SP Functionality

- Display yoking
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  - Polar Star
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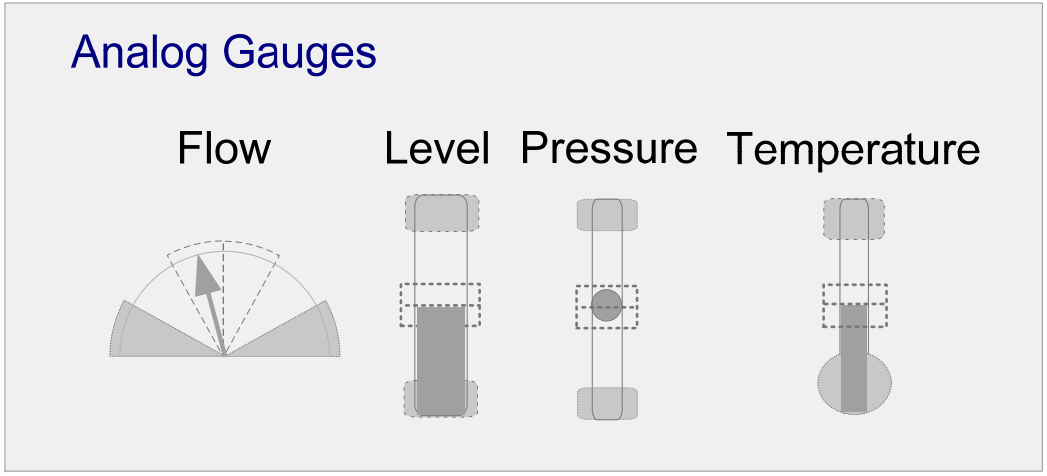
  - Performance Curve Monitoring
  - Gauges
    - Flow
    - Pressure Gauges
    - Temperature Gauges
    - Level Gauges



Advanced HMIWeb SP Functionality

- Display yoking
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  - Polar Star
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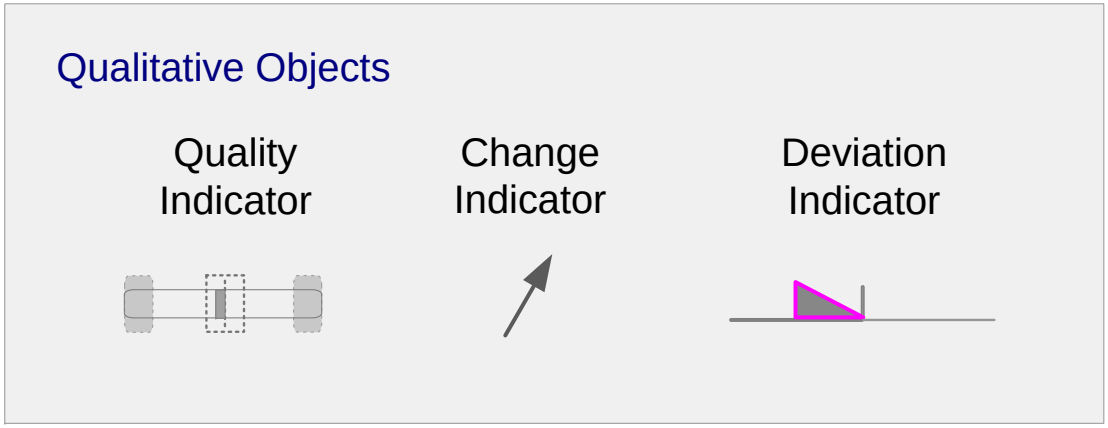
  - Gauges
    - Flow
    - Pressure Gauges
    - Temperature Gauges
    - Level Gauges
    - Valve Outputs
    - Change indicator
    - Deviation Indicator



HMIWeb SP - why use?

- It’s a worldwide supported library
- Consistent HMI concept
- Rich functionality
- Designed to meet ASM guidelines
- Flexibility in use
- Optimized for performance
- Low price for project implementation
- Low maintenance costs
- Effective support
- Standardization
- It offers effective plant operations
- Professional documentation
- Common look and feel for all shapes
- Quick project start
- Minimized project risk
- For sales persons it offers a clear sales, quotation & project baseline

HMIWeb SP - when to use?

- For all Experion HMI projects
- - CDA, Scada, FF, HPM, HG

- It's more than just a bunch of objects
- It's a methodology of how to do your job
- It provides a default Operating Philosophy, which can be extended to meet customer specific needs
- It provides an FDS and DDS, which can also be used as a basis to specify your customer specific needs
- It provides good engineering guidelines
- Rich functionality, of which a lot may be re-usable for your project (e.g. the context menu)
- It contains a display editing tool named "HMIWeb PowerTool" which should be used for more effective display engineering (this tool is only meant for internal use and can not be sold to customers or other third parties)

HMIWeb SP .V. HMI SP Advanced - what's so Different?

- Existing solution pack will be referred to as the Standard Solution Pack.
- New advanced objects will be added to a separate Advanced Solution Pack.
  - Principal and Associated Focus
  - Display yoking
  - Tabbed Display objects
  - Polar Star (Radar plots)
  - Temperature / deviation Profile
  - Horizontal Profile Objects
  - Historical Data Objects
  - Performance Curve Monitoring
  - Shapes for Level 1 displays based on the ASM Visual Thesaurus study

HMIWeb SP or HMI SP Advanced for use with ASM - or both?

- Both,
  - Standard SP for ASM compliant “Normal” process, ESD, F&G, permissive, displays.
  - Advanced for the advanced ASM best practices,

- HMIWeb SP helps you to create a **PROACTIVE** rather than **REACTIVE** environment

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