WW HMI SCADA-04 Discover the new Situational Awareness Library in InTouch 2014

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New Release!

InTouch 2014

Situational Awareness
Situational Awareness

The perception of environmental elements with respect to time and/or space, the comprehension of their meaning, and the projection of their status.

WW HMI SCADA-01 Increased Operational Effectiveness with Situational Awareness
Aspects of Good HMI Design Philosophy

- Goal Oriented Design
- Hierarchical Information Organization
- Proper Color Usage
- Actionable Alarm Awareness
- Effective Design Elements

Situational Awareness Library Brings together:
- Elements Styles
- Symbol Wizards
- Alarm Borders/Aggregation
Situational Awareness Symbol Library

Equipment

- Agitator/Settler
- Equipment Status
- Feeder
- Hand Switch Selector
- Heat Exchanger/Fan
- Loop Block
- Miscellaneous Equipment
- Multi-stage Pump
- Numeric Data Block
- Output Bar
- Parallel Control Valve
- Pump/Blower/Rotary Valve
- Rotating Equipment
- Sequence Button
- Tank/Vessel
- Thickener
- Valve/Damper
Situational Awareness Symbol Library

Meters/Polar Stars

- Invisible Profile Meter
- KPI Bar
- Meters
- Multi-Level Meter
- Rake Height Meter
- RPM Meter
- Small Flow Tracker

- Polar Star 3 Spoke
- Polar Start 4 Spoke Diamond
- Polar Start 4 Spoke Square
- Polar Star 6 Spoke
- Polar Star 8 Spoke
Meters
Polar Stars
Situational Awareness Symbol Library

Dashboard Tools

- Bar Chart
- Box Chart
- Bullet Graph
- Column Chart
- Column Chart Pairs
- Column Chart Trips
- Deviation Chart
- Parallel Coordinates Chart
- Pie Chart
- Stacked Column Chart
- Stacked Column Chart Alarms
- Target Graph
- Value Comparison Chart
- Variable Monitoring Bars
- Win Loss Chart
Dashboard Tools
Data vs. Information

Information comes from putting data in context

- When data is presented without context it forces operators to remember or search for the related values

Data without context

How far is it from setpoint?
Is it getting close to alarming?
Is it inside the normal operating range?

At best, this is inconvenient – but during an upset it can lead to slower response times and cause costly errors
Meter

This is an example of a meter used to represent transmitters and controllers on the graphics:

In this Section, we will be learning about the different components that make up all such meters.
Meter – Orientation

Most meters can be displayed either vertically or horizontally.
Meter Components

Let’s look at all of the components that make up the meter...

FIC 123

123.4 m³/h

C
Meter Components

Either the tagname or the more common name (short name) for the meter is shown here. This can be toggled on and off by the operator on Level 2 displays.
Meter Components

**Graphical PV**
The PV is also represented graphically.

**Numeric PV**
The numeric PV can be toggled on and off by the operator on Level 2 meters *(coming soon)*.

**Engineering Units**
The units can be toggled on and off by the operator on Level 2 displays *(coming soon)*.

The PV is also represented graphically.

123.4 m³/h

C

FIC 123
Meter Components

**Controller Output**
This bar shows the output of the associated controller. When the controller output is zero, the bar fills WHITE. When the output is maxed out, the bar fills BLACK. In between zero and max, the bar fills GREY. (examples are shown at the right)
Meter Components

Controller Mode

Shows the current mode of the controller

C = Cascade
A = Auto
M = Manual
Meter Components

**Optimal Range Box**

This is a “target” range that you define for the PV. It is only shown if set by the operator. It can be used to show the optimal or ideal range that you would like a PV to be in. It is independent of the alarm limits.

How does it help?

The optimal range box allows you to very quickly glance at a meter and check if the value is OK.

For ex.:

Temporary conditions – Upstream operator wants you to limit flows temporarily.

Ongoing conditions - prefer a flow in a certain range to optimize pump performance.

A way to see a critical indicator drifting before alarms get tripped.
Meter Components

Glance Test

When you click, an example will appear briefly at the far right of the screen – see if you can tell whether the PV is inside the optimal range or not.

*Click again…*

*And again…*

Each example was only shown for \( \frac{1}{2} \) of a second.
Meter Components

All meters are able to show certain reference values that can help you to interpret the PV:

- High High Alarm Limit
- High Alarm Limit
- Tracker
- Setpoint
- Low Alarm Limit
- Low Low Alarm Limit

![Diagram showing FIC 123 meter with values 123.4 kg/h and C]
Hi Hi Alarm Limit

This alarm limit is always displayed using a “flag” shape, consisting of a line with a triangle attached to it facing upwards. The flag is always at the LEFT (for vertical meters) or at the TOP (for horizontal meters).
Hi Alarm Limit

This alarm limit is always displayed using an “L” shape, with the tip pointing up. The high alarm is always at the LEFT (for vertical meters) or at the TOP (for horizontal meters).
Meter Components

Lo Alarm Limit

The low alarm limit looks like this. The low alarm is always at the RIGHT (for vertical meters) or at the BOTTOM (for horizontal meters).
Meter Components

Lo Lo Alarm Limit

This alarm limit is always displayed using a “flag” shape, consisting of a line with a triangle attached to it facing downward. The flag is always at the RIGHT (for vertical meters) or at the BOTTOM (for horizontal meters).
Meter Components

**Tracker**

The tracker is a memory aid that can be enabled and set by the operator.

*Tracker is set in the faceplate*

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**What can I use the tracker for?**

If maintenance is going to be working on a meter you can set the tracker to help you remember what the value was.

A field operator is testing a pump and wants to know when the line pressure is 85 PSIG, before it hits the trip limit at 95 PSIG, so set the tracker at 85 as a reminder to call the field operator.

During startup – the tech requests level of 63% in the crude tank, so set the tracker to 63% as a reminder to call the tech.

Any time you want to mark the current PV in order to come back later and see if it has changed (e.g., after you make some process changes).
Meter Components

Setpoint

The setpoint is a simple, black line on the meter. As you would expect, the setpoint is only available on controllers.
Reference Values - Review

Here again are each of the lines commonly found on the meters...

Hi Hi Alarm Limit
Hi Alarm Limit
Tracker
Setpoint
Lo Alarm Limit
Lo Lo Alarm Limit

FIC 123

123.4 kg/h
Full Scale vs. Practical Range

**Full Scale Flags**

These flags tell you that the meter is displaying the full range of the instrument.
The Practical Range (Operating Range) is the range of values that you are **normally** interested in for a given PV.

Let’s say the instrument is capable of reading values from 0-1000.

When the Practical Range is set, the meter is “zoomed in” on a specific part of the scale.

This range is set **by operators** from the faceplate.

For example, if the Practical Range is set at 100 to 150, the scale endpoints will correspond to these values.

*Note that the full scale flags are gone.*
Practical Range

If a PV drifts outside the Practical Range, the meter will automatically revert to Full Scale.

The intended purpose of the Full Scale flags is to alert you when this has happened.
Practical Range

Why is it a good idea to set the Practical Range?

Let’s say that a swing of 75 units in the value of a PV is significant – something you would normally want to know about.

On a meter showing the practical range of 100-300, the PV symbol will move this much.

On a meter showing the full range of 0-1000, the PV symbol will move this much, which is much harder to detect visually.

This can be a particular problem for temperature meters – one plant had them ranged from -200 to 850ºC which was much wider than the required range.
Meter Types

Thus far we have used a Flow Meter in our examples

However there are different types of meters used to show other kinds of process values
Meter Types - Review

Flow Meter
“Floating Ball”

Temperature Meter
- “Thermometer”
- Can show Deviation

Pressure Meter
- “Expanding balloon”
- Can show Deviation
Meter Types - Review

Level Meter
“Filling Bar”

Analyzer
- “Rounded Rectangle”
- Clock shown if sample not continuous

Miscellaneous Meter
- “Thin Filling Bar”
- Has Description

[Diagrams of meter types with labels and values]
Meter Types - Review

Target Meter
- "bulls eye"

Deviation Meter
- "Bar fills from middle"
- Has Description

![Target Meter Diagram](image1)
![Deviation Meter Diagram](image2)
Trends

Trends are effective for attaining Level 3 SA – Projection.
Level 3 Display

Boiler Feed Water

Drum Level Control

Boiler Drum

Inputs for Simulation Purpose

<table>
<thead>
<tr>
<th>Set Points</th>
<th>Process Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z2B1-P666</td>
<td>139.00 Kg/cm²</td>
</tr>
<tr>
<td>Z2B1-I664</td>
<td>38.00 °C</td>
</tr>
<tr>
<td>Z2B1-H664</td>
<td>216.00 1/hr</td>
</tr>
</tbody>
</table>

Sw Paths

<table>
<thead>
<tr>
<th>Valve CuPot</th>
<th>Process Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV500</td>
<td>16.67 %</td>
</tr>
<tr>
<td>LV501</td>
<td>8.33 %</td>
</tr>
<tr>
<td>LV500A</td>
<td>50.00 %</td>
</tr>
<tr>
<td>LV500B</td>
<td>0.00 %</td>
</tr>
</tbody>
</table>

Actual Alarm 0.00
Benefits – Scenario Study Results

**Less Time to Orient to Problems**

The operators using ASM displays:

- Were *more* proactive
- Oriented to the problem an average of 4 minutes faster
- Detected an event *before* the alarm 48% of the time,
  - 38% improvement

**Faster Total Completion Time**

The operators using ASM displays:

- Took *less time* to deal with the event
- Were *more consistent*
- Took 10.6 min vs. 18.1 min avg. to complete task (41% improvement)
- Successful 96% of the time
More Benefits…

<table>
<thead>
<tr>
<th>Task</th>
<th>With Traditional HMI</th>
<th>With High Performance HMI</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detecting Abnormal Situations before alarms occur</td>
<td>10% of the time</td>
<td>48% of the time</td>
<td>A 5X increase</td>
</tr>
<tr>
<td>Success rate in handling abnormal Situation</td>
<td>70%</td>
<td>96%</td>
<td>37% over base case</td>
</tr>
<tr>
<td>Time to complete abnormal situation tasks</td>
<td>18.1 min</td>
<td>10.6 min</td>
<td>41% reduction</td>
</tr>
</tbody>
</table>
Reference Material

High Performance HMI Handbook
ASM Consortium Guidelines to Effective Operator Display Design
Designing for Situational Awareness
Information Dashboard Design
Show Me the Numbers