

### Effective Operator Interface Design Solution:

- Key features of the advanced design approach include:
  - Multi-level, simultaneous views of increasing plant detail
  - Linked navigation
  - Controlled window management
  - Integrated trending
  - Integrated alarm information into graphics and navigation
  - Context sensitive access to additional information
- Case study results showed that professional console operators could respond and solve abnormal plant situations faster when they used the advanced operator interface.

### HCS Advanced Operator Interface™

The HCS Advanced Operator Interface™ design features a suite of user interface elements and techniques that embody effective human factors principles that have been demonstrated to improve console operator performance. The HCS Advanced Operator Interface™ design includes:

- Tiled multi-window architecture with linked navigation between associated objects across display hierarchy
- Principled, coordinated visual coding scheme to draw operator attention to most important information
- Pre-defined, scripted shape library for dynamic display objects with inherited properties supporting visual coding scheme.
- Library of over 200 shapes and faceplates for Honeywell PKS and GUS GPB.
- Common trend object integrated at multiple levels of the display hierarchy to support multiple uses.
- Context-sensitive menu on right mouse click to support access to specific information or actions associated with a display object.
- Distinctive, multi-tone alarm sounds for multiple console control room environments

HCS partners have been key contributors in research studies conducted within the ASM® Consortium to understand challenges associated with current industry practices and to develop new concepts to improve operators' ability to prevent and respond to abnormal situations.

HCS is performing research into enhanced visualization techniques in alarm summary designs and overview displays to increase operator's situational awareness and responsiveness to process upsets.

HCS works collaboratively with clients to define an Operator Interface Philosophy and Style Guide that best meets the strategic business and performance objectives of their organization. The HCS Advanced Operator Interface™ solution is customized to comply with each site philosophy and style guide.

### Bottom Line

Advanced Operator Interface™ features support Proactive Monitoring behavior in operators.

Improved response will reduce the frequency and impact of abnormal situations.

### Can an Operator Interface Make a Difference?

Professional operators' performances with either a traditional or an Advanced Operator Interface were compared during a series of simulated plant upsets. The two groups of operators were selected to be well matched in experience and knowledge of their plants and their operator interfaces.

In the traditional plant, the operator interface was a well-designed "single" window system. It is a "single" window system where the windows have very limited interaction with the other windows on the console. The control console was made up of eight principle workstation screens plus dedicated alarm screens and an equipment panel.

The second group of operators used a multi-window interface to their control system that had been implemented by NOVA Chemicals based on early research work of the ASM® Consortium. This interface was comprised of eight main screens – working as two sets of four along with the alarm and equipment panels.

The operators were from two world-scale ethylene plants that both used high-fidelity dynamic simulators to train the operators in planned and unplanned activities.

The two groups of operators were pre-tested to assure that there were no demographic differences between the two groups. The pre-test examined qualities such as years of experience as an operator and years of experience as a console operator.

Examples of two screens from the Traditional Interface and the lower two screens from the advanced operator interface are shown in the adjacent diagrams.

### Simulation Scenario Findings

Using four matching scenarios from the plants' incident databases the participants' responses were assessed for their time to orient to the problem and for their time to solve the situation.

Overall, the operators using the advanced operator interface were *more* proactive and oriented to the problem an average of 4 minutes faster.

The operators using the advanced operator interface also took significantly *less time* to deal with the event and as a group, were *more* consistent in doing so!

- An average completion time of 10.6 minutes vs. 18.1 minutes for those using the traditional console
- A 41% improvement in completion time compared to the Traditional interface

This case study was sponsored by NOVA Chemicals and the ASM® Consortium.

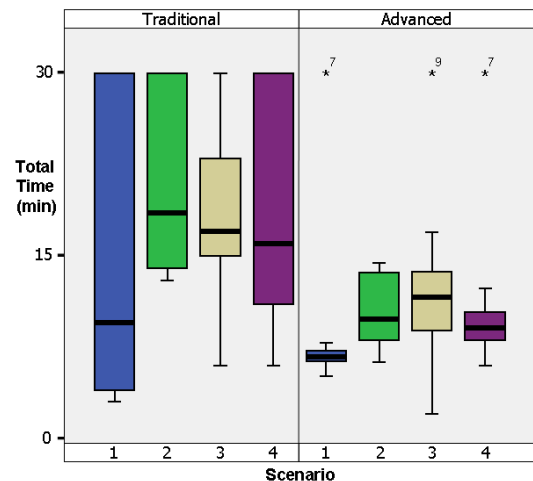
Traditional Interface



Advanced Operator Interface



Completion Time Results



### About HCS

Human Centered Solutions (HCS) is a multi-disciplinary group of psychologists and engineers who apply human-centered design to enhance the performance of people in and around the control rooms. In addition to operator interface design, HCS provides expertise in operator staffing, alarm management, console workstation design, control room and building design, procedure system design, training system design, and work process design. HCS is an active member of the ASM® Consortium and is currently a key participant in the Consortium's research program.