Adaptive operator workspaces improve the mobility of control room operators

Operators occasionally have to leave their workplace temporarily. ABB has created a prototype workspace that aims to improve operator mobility by removing the necessity for them to be near their workstation while still enabling them to perform their work effectively.

Today’s control room operators are often faced with workstations of a much greater complexity than those of even just a decade ago. Even though automatic process control solutions can handle many process events, the constant presence of a human operator at a workstation is, in many cases, imperative. However, the operator may have to leave his station at various times during his shift. What can be done to maintain his vigilance over the processes for which he is responsible during such absences?

The main goal of the prototype was to increase operator flexibility regarding how and where they interacted with the control system.

• Operators interact with several complex graphical user interfaces (GUIs) on several different monitors and navigate between many different views of the control process.
• It was a challenge for operators to find the correct mouse for the correct screen and to navigate to a particular view or object. Navigation is usually implemented through complex multilevel drop-down menus and sometimes navigation menus span the entire screen.
• When operators need to leave their workstation and, for instance, go to a colleague’s workstation, it is difficult for them to stay informed about what is happening on their workstation (e.g., what alarms are being triggered).
• Operators sometimes need to engage in work outside the control room, e.g., on the factory floor. When returning to the control room, they may need additional time to remove safety equipment or clothing or wash their hands before once again interacting with the control process.

The information gathered provided key design considerations for the new solution.
Design concepts
Based on the needs identified during interviews and observation sessions, a prototype was built. The main goal of the prototype was to increase operator flexibility regarding how and where they interacted with the control system by providing:

- the ability for the operator to work even when not in front of the displays
- flexibility in the way the operator works
- fast navigation between different views in the system
- fast navigation to a specific process object in a view
- better situational awareness for quickly detecting alarms, types of alarms and state of the current process view.

When there is at least one urgent alarm, the lamp switches to bright red. When there are only warnings, the color switches to orange.

Features of the prototype included:

- an adaptable GUI that adjusted the size of text and graphics on the screen based on the operator’s location within or outside the control room
- an interactive light that projects white ambient light when no alarms are present. When there is at least one urgent alarm, the lamp switches to bright red. When there are only warnings, the color switches to orange
In addition to colors, the intensity of the light may also be altered to indicate the alarm priority.
— 01 A smaller GUI used for the prototype, shown when the operator is close to the screens.
— 02 Larger prototype GUI, shown when the operator moves away from the screens.
— 03 Light display connected to alarms triggered in control room.
— 04 Speech and gaze can trigger the display of information relating to a specific process graphic.
— 05 Using Leap Motion to point and select a graphic in the control process.

The first step to be taken in designing a solution that allows more operator mobility is to gain an in-depth understanding of how control room operators perform their work.

Furthermore, the operator can use their index finger as a mouse pointer to select objects and to perform click operations.

These modes of interaction free the operator from mouse- and keyboard-only interaction with the process and enable them to work in a more mobile, flexible and unrestricted way. They also eliminate the difficulty of finding the correct mouse on a desk containing several mice, allowing operators to focus fully on their tasks. Providing operators with the ability to access the information they need while being able to move freely in and out of the control room ensures situation awareness is continuously maintained.

This type of solution can be used in a wide range of industrial processes, giving operators more flexibility of movement while maintaining operational standards.