While our whole visual field is about 180 degrees, the sensitive area of our retina is about 2 degrees. The functional range for utilizing visual information typically varies from 4 to 30 degrees. With stress, the visual field narrows. Recent research by Atuso Murata showed the funneling effect, in which increased foveal task complexity narrowed the functional visual field (Foveal Task Complexity and Visual Funneling, Human Factors, Vol. 46, No. 1, 2004, p135-141). The funneling effect results in longer response times to stimuli in the peripheral visual field. So the argument that more CRTs are needed in an upset, when the task complexity in the primary visual field will likely be its highest, runs counter to data on how people process information.

Do You Know How Tired You Are?

Fatigue is a key issue with safety-critical jobs that must be performed 24-hours a day. Recent research on fatigue in over-the-road truck drivers has disturbing implications for the process control industries. A field measurement of driver alertness hypothesized that self-assessment of fatigue by the drivers and time to collision (separation from vehicles in front of them) would be valid sensitive measures of fatigue, but the data showed otherwise (Belz, S.M., Robinson, G.S., & Casali, J.G. “Temporal Separation and Self-Rating of Alertness as Indicators of Driver Fatigue in Commercial Motor Vehicle Operators, Human Factors, Vol. 46, No. 1, 2004, p154-169). The authors found that the drivers exhibited driving without awareness (DWA) followed by a sudden onset of fatigue-related symptoms. Contrary to simulator studies, fatigue was not preceded by a multitude of symptoms/indicators, but came on rapidly. The implication for any safety sensitive position is that, by the time the individual feels fatigued, their performance may already be severely compromised.
The level of automation in process plants is rapidly increasing. In some cases, the automation is in place to improve profitability during steady state operation (e.g., multivariable controllers); in others, to improve response to plant upsets (e.g., safety shutdown systems, batch programs to park the unit). Due to relatively new use, process plants are only beginning to see the problems that other industries have encountered with automation; namely, that it is often misused (relied on when inappropriate) or disused (not relied upon when appropriate).

John Lee and Katrina See investigated some of the causal factors in the failure to appropriately use automation (Trust in Automation: Designing for Appropriate Reliance, Human Factors, Vol. 46, No. 1, 2004, p50-80). The effort to use the automation, such as how long it takes to implement it when under a severe time crunch (e.g., a compressor trip), will reduce automation use, even if the operator intended to use it. High workload situations can result in over-reliance on automation in an effort to prevent increase workload. However, our ability to trust the automation is one of the primary factors in our willingness to rely on automation, and trust has both general characteristics and those associated with the automation itself.

Trust research runs the gamut from organizational and interpersonal to internet and automation. However, some general findings are worth noting. First, people vary as to their levels of trust. Individuals who are viewed as “trustworthy” tend to have more trust in others and are more willing to delegate tasks to automated systems. Those individuals with a high level of self confidence will utilize automation less (trust themselves more), with the opposite being true (low self-confidence=high automation use). Second, trust has inertia, with initial impressions counting more than later impressions. Also, negative impressions weigh more heavily than positive impressions (“fool me once”). Third and finally, the organization impacts trust. Reputation, roles, and gossip will all affect the individual’s willingness to trust.

The users of automation will develop trust based upon three factors:

1. Performance - current and historical operation of the automation,
2. Process - degree to which algorithms are appropriate for the situation, and
3. Purpose - degree to which automation is being used within the realm of designer’s intent.

It can be quickly seen that the automation needs to be used if its performance is to be assessed. In addition, the current situation must be understood (situational awareness) in order to determine if the algorithm is appropriate. Finally, the training and interface needs to be designed to convey the intended use of the automation. The authors summarized the issue of trust with automation as follows –

“The operators will tend to trust automation if its algorithms can be understood and seem capable of achieving the operator’s goals in the current situation.”

Ask yourself then, do our operators understand the algorithms of their advanced control? Can our operators maintain awareness of changes in plant situations to determine if the automation is appropriate? Do our operators have feedback on automation performance, such as upset programs, to develop trust? While not the only factor in an operator’s decision to rely on automation, trust is crucial.

Did you know --

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