

Technology Fatigue

The SCADA (Supervisory Control And Data Acquisition) HMI (Human Machine Interface) provides Controllers with ears and eyes into the pipeline. A well-designed HMI provides Controllers with a consistent and accurate mental model, both in layout (geography) and in functionality (e.g., switching a valve to closed results in the stop of product flow and increases or decreases in pressure).

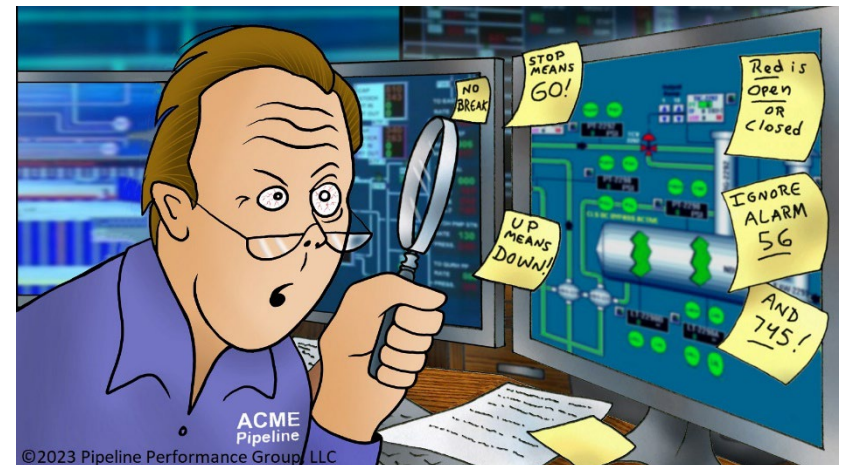
Most Controllers monitor their SCADA HMI across multiple screens throughout their twelve-hour shift. While fatigue of the body is a common issue resulting from 12-hour shift work, mental fatigue and visual fatigue from SCADA screens is also more common than you may realize. In our workload assessments, we find that the majority of Controllers report that the greatest workload demand they experience is from the mental demand of their job. A Controller's mental fatigue may accumulate over time.

A SCADA HMI that is intuitive and provides the right information, in the right format at the right time supports the Controller and is less likely to add to their mental fatigue. Alarms that require the Controller to dig through several screens to investigate the source of the issue can add to Controller mental fatigue. Also, information on SCADA screens that is too small, too cluttered, or too colorful can contribute to Controller mental and visual fatigue. Ensure Controllers have clean, clear screens with logical presentation of information. Viewing SCADA screens is less tiring if the display is designed in a way that is Controller-friendly. Dedicate pinned space to an alarm screen and provide easy navigation to alarm issues. It is key to include Controllers in the design of new systems or updates to existing systems. Design SCADA system with Controllers in mind!

In addition to mental fatigue, Controllers may also experience computer vision syndrome, or digital eye strain, or issues related to the complex work done by eyes during near vision computer use, over an extended period¹. The American Optometric Association reports that the most frequent health complaints among computer workers are vision related. Computer vision syndrome can become an issue when a task requires frequent, repetitive eye movements, when control room lighting is poor, when there is glare on the monitors, or when computer viewing angles or distances are not optimal. Current trends include more neutral tones and less use of harsh color. Whether screens have a grey background and neutral tones or have a black background and neon colors, the luminance ratio between the ambient control room lighting and the SCADA displays should be optimal.

There are practices that can help Controllers manage mental and visual fatigue. Circadian lighting, originally developed by NASA for use in space, helps to mimic the human circadian rhythm or 24-hour clock. In an effort to mitigate eye strain and fatigue, circadian lighting has been implemented in many control rooms.

Other practices that can be used by Controllers include the following:



¹ American Optometric Association

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- 20/20/20 Drill – For every 20 minutes of monitoring, pause for 20 seconds and focus on something approximately 20 feet away. Breathe deeply and exhale.
- Blink Breaks – Take regular breaks to intentionally blink. We tend to blink less when monitoring screens so making the decision to pause and blink at least 10 - 20 times to moisten the eyes can help prevent or relieve dry eyes.
- Eye Exercises – To strengthen and stretch the muscles surrounding the eyes, take a few seconds to exercise them. Sit up straight with face and eyes relaxed. Look up toward the ceiling without moving your head. Slowly circle your eyes in a clockwise motion. Close your eyes and exhale. Breathe deeply and look up again, this time rotating your eyes in a counterclockwise motion. Close your eyes and exhale.

Controller mental and visual fatigue related to SCADA systems is common. If you are a Controller, what are some steps you can take to help yourself? Provide your management with feedback on the usability of your HMI, maintain good lighting in the control room, take visual and mental breaks, be mindful of your eye health, and position your chair and your monitors for optimal viewing. If you are a supervisor, what can you do to help relieve the mental and visual stressors for your Controllers? Take time to do a thorough evaluation of your SCADA HMI and your control room environment, especially the lighting, monitors and chairs. Consider bringing in an outside third party to give objective feedback. Where there are issues, develop a corrective action plan. Most changes won't occur overnight, but one small step can make an impact!