

CRM and Philosophy: October 2021

A Well Designed SCADA HMI is a True Work of Beauty

In 1840 Henry David Thoreau observed that “*Beauty is where it is perceived.*” That quote rings true even today, and I believe it can be applied to SCADA Human Machine Interface (HMI).

There is no denying, that the SCADA HMI is an essential, if not the most essential, tool in the control room. An HMI that provides its Controllers with the right information, at the right time and in the right format is truly a thing of beauty. However, it is sometimes tough for us, as Human Factors professionals, to find beauty in some of the HMIs that we have seen in the many control rooms we have visited. In fact, on many occasions we have had to delicately tell a control room manager that their HMI was truly “an ugly baby” which only its mother could love. But somehow the Controllers always manage to perceive beauty in their HMIs; after all, it is their window into the pipeline. It provides them with the essential information they need to monitor and control. How are we missing the beauty in these HMIs?

Henry David Thoreau also said, “*the question is not what you look at, but what you see.*” We have seen experienced and skillful Controllers that are able to use all kinds of HMIs to get the information they need. However, we have also seen Controllers sorting and navigating through multiple sources of data to integrate the information they need to troubleshoot or monitor system state. Where is the beauty in that? And what happens when a Controller is in a stressful and time-pressured decision-making state, when cognitive functions may be affected? How can a well-designed and organized HMI support Controllers in all of their roles and responsibilities during normal, abnormal and emergency situations?

The PHMSA regulatory requirement for SCADA (§ 192.631 (c) Gas, § 195.446 (c) Hazardous Liquids) states the company needs to:

(c) Provide adequate information. Each operator must provide its controllers with the information, tools, processes and procedures necessary for the controllers to carry out the roles and responsibilities the operator has defined by performing each of the following:

- (1) Implement sections 1, 4, 8, 9, 11.1, and 11.3 of API RP 1165¹ (incorporated by reference, see §192.7) whenever a SCADA system is added, expanded or replaced, unless the operator demonstrates that certain provisions of sections 1, 4, 8, 9, 11.1, and 11.3 of API RP 1165 are not practical for the SCADA system used;*
- (2) Conduct a point-to-point verification between SCADA displays and related field equipment when field equipment is added or moved and when other changes that affect pipeline safety are made to field equipment or SCADA displays;*
- (3) Test and verify an internal communication plan to provide adequate means for manual operation of the pipeline safely, at least once each calendar year, but at intervals not to exceed 15 months;*
- (4) Test any backup SCADA systems at least once each calendar year, but at intervals not to exceed 15 months; and*
- (5) Establish and implement procedures for when a different controller assumes responsibility, including the content of information to be exchanged.*

But how does your company define “adequate information”? And is “adequate” the same for the company as it is for the Controllers? We have asked over 1300 Controllers if their SCADA HMI provides them with the necessary information to do their job. The majority of them, 4 out of 5 Controllers, agree that their SCADA HMI

¹ API Recommended Practice 1165, “Recommended Practice for Pipeline SCADA Displays,” First edition, January 2007, (API RP 1165)

provides them with adequate information. However, substantially fewer agree that their HMI displays are well-designed and logically organized.

So, what can you do to support Controllers in their need for adequate information? Conduct a gap analysis with API RP 1165. Do a usability assessment of the HMI. Talk to your Controllers to find out how displays can be designed with them in mind. Obtain feedback from Controllers before making system upgrades. Provide training before SCADA system changes are implemented. Make sure you have a formal process for Controllers to submit requests for changes to displays, and make sure those requests are tracked and resolved. Provide your Controllers with the best support you can.