

DESIGNING YOUR HMI WITH I.S. IN MIND

End to End SCADA Design - Electrical to Business Intelligence

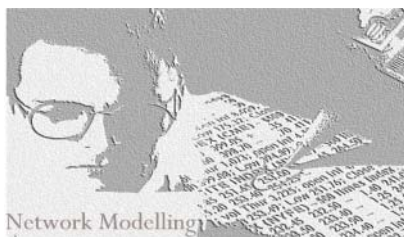
Operational or Data Analysis. Which will it be?

Traditionally, process plants have been funded and managed by engineering groups. Increasingly planners, modellers and management groups are seeking to measure and manage the enterprises entire asset investment. Many process plants were originally developed for operational management only. For example, the time to annunciate an alarm condition on the factory floor workstation might be 2 seconds, and sampling rates for process variables important as they are, would be second in importance to alarm annunciation. The control system communications system would normally be designed for very small access times so that as alarms and control actions would occur instantaneously, and operators would see the actions in real time, virtually instantaneously.

Secondary to this requirement would be the transferring of volumes of data. This is particularly true for batch type data. Historically, logging analogue information in the HMI has been supported by the relative small access times. A drawback with this scenario is in increasing the number of analogues (process variables) and how they are processed by control and monitoring equipment. This has a large direct impact on how the HMI system performs.

Modelling data accuracy and resolution

In any process control system it is imperative that data resolution be determined early in the design. Resolution inevitably determines the volume of sampled data to be reported. This impacts on both the communications media requirements (bandwidth) and ultimately the database size. Over sampling although safe in the minds of those planning a system without an intimate knowledge of the process to be managed, can virtually make a system unusable at various points. These potential stop points are usually referred too as bottlenecks. Field instrumentation accuracy and stability should be matched by the control and monitoring equipment. How often the analogues are sampled and the time resolution are critical decisions for many processes. The monitoring equipment communication protocol should support the time base resolution requirement of both the sample equipment and the data repository. This is perhaps more apparent on time series historical data that arrives in the repository some time after the events have occurred.



Capturing the minimum reporting element

The minimum reporting element is the smallest pre-processed measure of quantity the data modellers wish to see or archive. For example, instantaneous flow may be nice to have, but even high speed data acquisition loggers are limited in memory capacity to support this dream. Depending on the objective and the process, it may be a reasonable request to pre-process the flow by sampling every second and averaging every 5 samples. The resolution on such a process might still be 12 bit data with an accuracy of 0.5% and is clearly understood by the data owners. Armed with a summary of all the analogues and their minimum reporting definitions, the HMI designer can embark balancing the operational performance specifications with the data modelling requirements

Managing this balance requires attention to detail especially on low bandwidth communications media.

Why not have it all?

Having it all comes at a price, particularly for distributed control systems. The main engineering discipline for a balanced design approach is communications bandwidth planning based on an intimate understanding of the protocols, electrical interfacing standards and of course the data volumes and access requirements as discussed above. The approach must begin with the end in mind. The data outputs (back-end system) must be defined before the front end (data gathering engines and devices) are designed or even chosen.

What about legacy systems?

You may ask what about my system? No one thought too much about Information Systems or reports when our system was designed. Yes it is true that perhaps the system may not have been designed with reports or back end database connections in mind. If good engineering practice was applied it is likely that at least the point (or tag as it is often called) naming convention is such that relational database techniques can be utilised to maximise benefits. The "only" rework involved is perhaps to capture the minimum-reporting element in the control devices. For real time only based systems with high performance communications media coupled with good engineering design in the tag databases, it is likely that as long as the HMI application system can provide adequate database connectivity and performance, the system is primed for information mining. Perhaps this hope of combination is more optimistic because this is rarely the case.

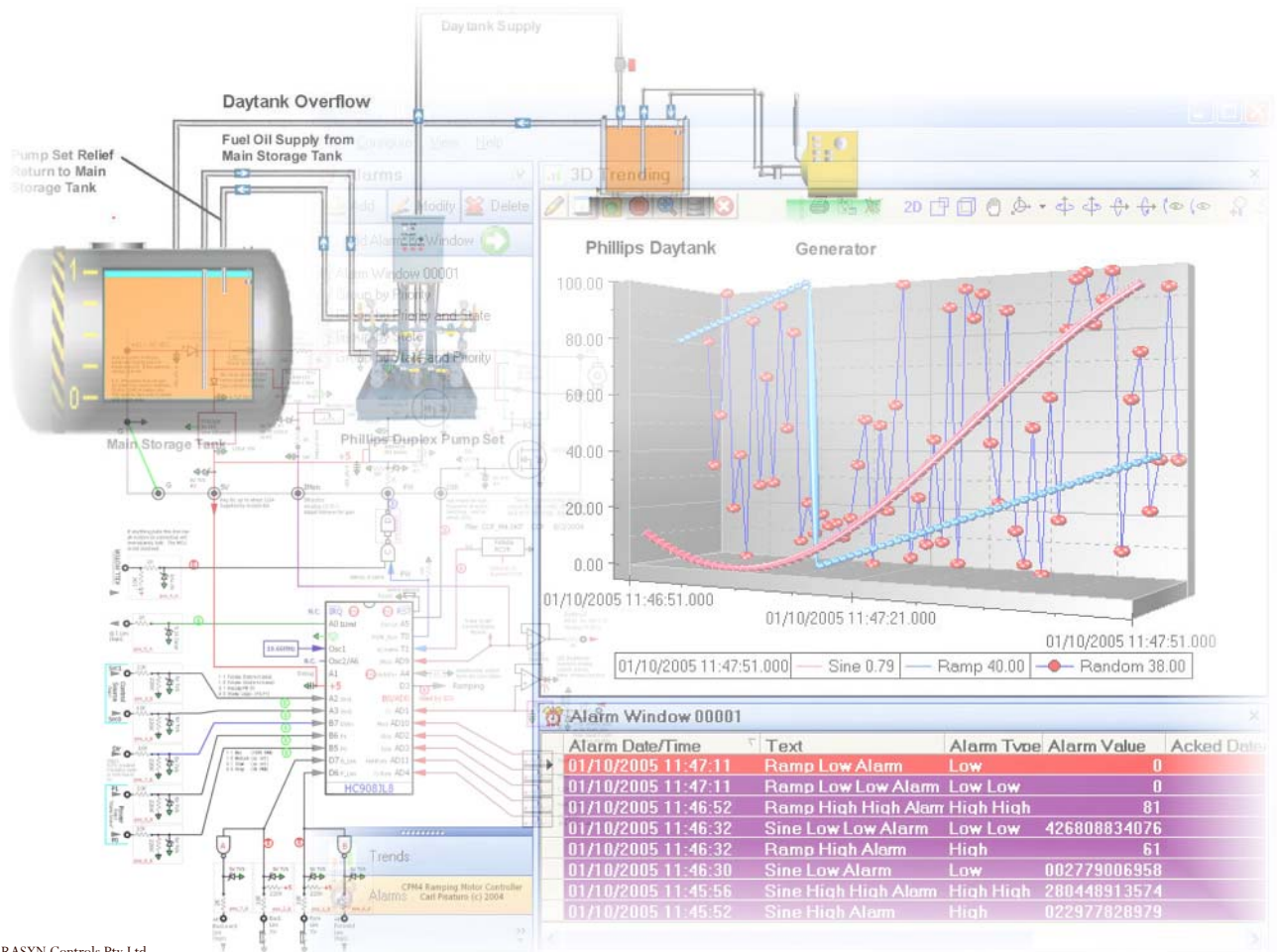
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The most important mindset.

Even today HMI software applications generally have some type of reporting system inbuilt but the functionality and openness is usually focused on raw data. The product developers are not able to guess how the end users plant is defined and therefore tools are provided to the market place to facilitate reporting.

- Usually external information systems are required to provide generic tools for accessing and manipulating the data appropriately. For process control engineers reporting is usually what is left for last. "Lets see what comes out first and then we can customise your reports to match your particular requirements" might add comfort to a client wanting to hear that they are a part of the design process, but it overlooks the significant demand that back end systems have on front end real time applications.
- HMI real time systems should be developed with Information System's specifications completed first. Design the inputs and associated controls according to the overall objectives, or simply put, define all the outputs first!



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