TECHNICAL ARTICLE
Tips on Integrating Packaged Equipment into Plant SCADA Systems

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Integrating controls from an equipment supplier successfully within a Plant SCADA or DCS system requires communication on multiple levels. These levels include process of design, mechanical fit up and installation, as well as the coordination to get the equipment to work in concert with the plant's other control systems. Simply looking after mechanical/electrical details are not enough. To be successful, the plant's System Integrator and the equipment supplier's PLC programmer must work with each other throughout the entire project's development.

From the perspective of an equipment supplier, there are several things that can be done to help streamline the process integrating packaged equipment into a plant. The first and foremost is planning. Both parties – the plant designer and the equipment vendor - need to understand and appreciate what the equipment is supposed to be doing – and how it will do it – in the context of the entire plant. This includes both the process design and the controls design.

From an automation perspective, this means that the communications interfaces, and more importantly what functionality the communication interfaces are supposed to accomplish, need to be well defined and understood by both the system integrator and the equipment supplier. Putting down details on paper is highly recommended to ensure that everyone is on the same page. Also, any terminology which is used in the details should be clearly defined as words can often be interpreted differently by different people.

On a well-run project, integration issues will be sorted out well before equipment arrives on site for installation. Having to sort out integration issues after equipment has arrived on site is an expensive undertaking for everyone involved so it should be avoided whenever possible.

Figure 1 – Typical packaged system control panel

Here are some tips that should be kept in mind when working with an equipment supplier to provide packaged equipment for installation into a plant SCADA or DCS system:

- Make sure both parties understand how the particular type of equipment typically works, and specifically how this individual piece of equipment has been designed to work by the equipment supplier. It is this understanding that will provide a reasonable basis to work from for any project-specific customization.

- Confirm what type of PLC is going to be used on the equipment, and how that PLC is expected to communicate with the plant-wide SCADA system. This includes clearly specifying what type of communications protocol will be used, whether it will be Ethernet, an industrial network, hard-wired I/O points, or a combination thereof.

- Determine what general SCADA control requirements the Owner has. Is the SCADA system expected to only monitor the equipment? If so, what is it monitoring? Or, is there a need for the SCADA system to be able to send remote commands to the equipment? If the equipment is expected to receive commands from SCADA, does the equipment need a switch to select whether it is under local or remote control? What sort of equipment status information needs to be sent to SCADA?

- Determine what the alarm and fault display requirements from the Owner are, as well as any equipment and control instrument status requirements. Put careful thought into how this status information is to be displayed, whether it will be on the equipment, on the SCADA system, or on both. Thought should also be put into how alarms are acknowledged or reset, as this also can be done on the equipment, via the SCADA system and/or a combination of both – these need to be carefully planned so that operators will know what to expect.

- The Owner must obtain a written description of the equipment control philosophy from equipment supplier, and the equipment supplier needs to make sure they have a good understanding of how the Owner intends on using the equipment in the context of the entire plant. This will be beneficial when setting up SCADA parameters for active control of the equipment.

- The Owner's system integrator and the equipment supplier's PLC programmer need to develop and agree upon a list of data tags that are used for communications to/from the SCADA system. For Ethernet and/or industrial network connected equipment, tags are the only way the two systems can "talk" to each other so this needs to be carefully worked out beforehand, before either side spends time and effort of doing the programming on their end.

- Depending on the type of SCADA system used, the system integrator should work with the equipment supplier's programmer to group 'like' data tags into arrays to reduce network communication overhead if this is an issue. Any possible limitations or special considerations associated with the SCADA system and/or the PLC used on the vendor's equipment should be discussed beforehand by the programmers on the two sides.

- When working with equipment that will be connected to the plant network using Ethernet or an industrial network, identify the device IP or node addresses and provide to the programmer during the development phase. This will reduce the likelihood that an extra site visit by the vendor will be required update the equipment's control program locally.

- If the SCADA system uses watch-dog timers or "heart beat signals" to ensure that communications between vendor panels are working, the Owner's system integrator needs to notify the equipment supplier's programmer of the preferred 'heart beat' protocol. This will help ensure the process won't "run-away" and helps minimize the chance of nuisance alarms on the SCADA system.

Figure 2- A sewage grinder is example of packaged equipment

Figure 3 – Vendor provided HMIs and the Plant's SCADA HMI have to be developed to work together as part of the design and implementation process.

- For equipment that needs a "permissive" signal to be able to operate, clearly define how the permissive is being generated. Is the permissive being sent to the equipment by the SCADA system, does the equipment determine the permissive itself (e.g., checking a level using a level transmitter on the equipment), or are a combination of external SCADA signals and internal conditions needed for the equipment to start.

- Always arrange to have an "equipment online" signal sent from the equipment to the SCADA system. Then the SCADA system can trigger an alarm if the equipment has been turned off by mistake. The online signal also gives the SCADA system the ability to suppress nuisance alarms if the equipment has been taken out of service.

- Develop a mechanism to record and re-instate default setpoints on the equipment. This can be done for associated settings on the SCADA system, settings on the equipment itself, or both. Operators will likely see this as a "delighter," as it will allow them to get back to factory defaults if ad hoc changes to the operating parameters have caused the equipment to not work as well as when it was first installed.

- Clearly plan on how equipment should respond when different types of possible faults occur in the equipment or in associated parts of the SCADA system. For example, in the case of sewage grinders when a fault condition occurs, grinders should typically be left running, unless upstream gates can be closed automatically as this will prevent the grinder from starting in a blinded condition, which can do damage. Usually each different type of equipment will have a preferred, and a non-preferred, type of automated fault response operation.

To be successful in integrating equipment into a plant SCADA system, the secret is planning. Communications and coordination between the equipment supplier and the owner need to start early. As a rule, equipment suppliers want their product to work well, but to accomplish this they need to know as much as they can about the intended application of their equipment. This includes system integration and SCADA integration details.

In the system integration world time is of the essence – the earlier that instrumentation and controls related discussions can take place, the better. A bit of additional communication earlier in the process can pay off handsomely for any packaged equipment install. Remember, sorting out issues in the field is expensive – it's much better to sort things out in the meeting room and in the factory before the equipment arrives at the job site.

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