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Eight Ideas for Successful DCS Implementation

Implementing a new distributed control system is one of the biggest and most complicated projects in a process control engineer's career. Doing one successfully requires everything from a well-defined project document to good grounding practices. Here are recommendations for best practices and some pitfalls to avoid.

1. **Standardize.** Use of standard wiring throughout the system will make it for easier for others to understand and troubleshoot. Use standard, off-the-shelf components for ease of stocking and reordering. If possible, have two sources for the products being used or purchase interchangeable brands.

2. **Remember the basics.** It's the little things that can trip you up. Make sure you use proper grounding, proper grouping of signals and proper termination of electrical signals. Make sure you understand the supplier's grounding requirements for your DCS system. Grounding principles need to be clearly understood by all automation engineers, not just the electrical staff. International standards can be misinterpreted. Instruments and the control system need to be grounded separately. Double check the grounding before powering up any DCS system to avoid any short circuits, particularly during factory acceptance or site acceptance testing (FAT/SAT).

3. **Is communication complete?** While most automation suppliers have different software versions for communicating with the system, make sure they will transmit all the required information. Many systems only transmit the basic parameters, which means all diagnostic features will not be available. The introduction of the "Control in Field" concept, although not often used, has added some complications and needs to be thoroughly examined when implementing a DCS.

Know Your Process

When using a DCS, you need to understand the process clearly. Many times the programmability of the DCS renders a "take it easy" attitude in the engineers, leading to costly downtime in commissioning the plants. Be sure you know the implications of controlling one way or another. Try to understand the interrelations among the variables and the best way to control these.

4. **Structuring I/O.** Since today's electronics are available with high-temperature specs and may be G3 compliant (conforming coating), the I/O structures should be moved to the field, reducing the rack room footprint and cabling cost. Communication links should be used over fiber optic, in a ring configuration to provide some level of redundancy, to interconnect the field I/O structures. Extended I/O terminal blocks (three to four terminals per channel) should also be used to allow field wiring to be connected directly, avoiding marshaling terminal strips with the related space, additional cost, installation cost and the possibility of poor connections.

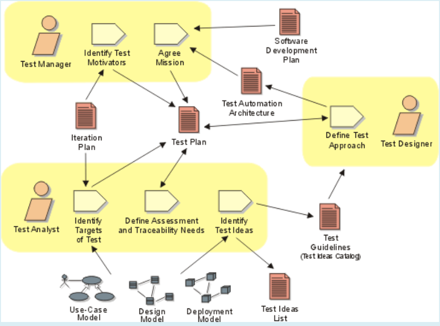
5. **Dual purpose.** The purpose of DCS is twofold. Centralized human control and interface to the plant as well as a centralized location for MIS info to the management network. DCS control should not include auto tuning of control loops other than simple on/off or start/stop functions. These should be the function of a local dedicated controller. Use the DCS to update the tuning parameters.

6. **Good links.** Distributed control systems are only as good as their communications links. Choose a very solid and reliable link between processing units.

7. **FAT is where it's at.** Make sure you do a comprehensive and detailed factory acceptance test (FAT) before cutover. FAT involves experienced operations people interacting with engineering to validate graphics and verify that instruments in the configuration exist and will remain in service.

8. **Use single server.** Base the selection of a DCS system on its redundant capability. A single server system is preferred. Pay attention to the hardware license for client and server to avoid delays during a system or hard-disk crash. Care must also be taken in selecting appropriate layered switches for communication. Make sure you properly configure trends and history data for future analysis.

Define in Detail



Successfully implementing a DCS project requires that all stakeholders (operations, maintenance, project team, vendor, management, etc.) have a clear definition of what they want from the system. In both upgrading and installing new DCS systems, the best tip is to keep the end in mind. Good up-front engineering pays dividends. Automation technology can only assist us if we know what the needs are.

Maintenance must know what reports and information they really require to do their work. Operations must be completely sure how they operate and what is the best way to do it. Don't assume anything. Write everything down that's actually required and all the things the technology can do. Be very specific. In the end, the best DCS is the one that best satisfies all the important requirements in the plant. Writing and signing this definition document should be the first step in any project.

Teamwork Is Critical in DCS Projects

No matter how well you have planned, always leave some slack in your schedule. You may get off to a great start, but problems invariably surface. The fastest way to confuse a project is to have too many disjointed teams. DCS projects are extremely complicated and all the groups have to interact. Even if you don't have anything new to share, schedule a weekly call so everyone knows what everyone else is doing.

If you've found a solution to a problem, one of your other team members may run into the
same issue. Instead of wasting precious time, they'll know to call you. Keep the calls short and sweet, but make sure everyone provides a good synopsis.

If you are not a people person, make sure you get someone on your team who can talk to people. Otherwise, people will hide their issues. Most importantly, do not shoot the messenger. If someone comes to you with an issue, handle it, but do so in a way that they will bring you other issues. If everything is a disaster, no one is going to tell you anything until it is too late to handle calmly (and cheaply).

As long as you have a competent team and are using a good product, you have the basis for
a successful project. A successful, on-time and on-budget installation depends on whether or not the team works well together.

Best Practices for DCS Infrastructure

- Using separate DCS marshaling, server and operator rooms, but keeping the server and operator rooms close together, are some of best practices and human factors experience to keep in mind when implementing a DCS. Other recommendations:

- Separate grounding for each room, instrument and signal and frame of the DCS.
- Need a good air filtering system for each room, depending on the plant or process hazards, to protect electronics.
- Make sure proper air conditioning is available all the time.

- Don't mix MCC and DCS marshaling panels. These panels or rooms need to be kept separate.
- Have a dedicated UPS with the minimum required battery backup provided separately for marshaling, server and instruments.
- Use one communication protocol standard for electrical equipment and instruments.
- Choose a reliable communication protocol for critical loops, such as conventional hardware instead of an OPC server or system. If the OPC server hangs or stops, it makes a mess for controls.
- Educate everyone on the operational differences between a DCS and PLCs and where each should be used. Most people don't understand why you need a warm start option for controllers with a DCS, for example.
- Use one programming approach for the entire system.