

When to Consider a DCS vs a PLC

In many cases a small system design immediately conjures a PLC approach. But why is this? The reasons are usually the same:

1. *Low Cost.* Most people have bought DCS solutions before and know the price point of a DCS from a world-class vendor like Foxboro, Honeywell, ABB or Emerson. PLCs are typically perceived as lower in price than DCS solutions.
2. *Easy decision.* Management has approved PLCs in the past and will probably approve that approach again.
3. *We know them, we have them.* There are already PLCs in the plant and they are working ok.
4. *We can support them.* Our maintenance department has PLCs and they know how to fix them.
5. *Fast Project implementation.* Ladder logic, although it may not be the most efficient method of building all control strategies, it has worked in the past and it is a known entity.

The above points are well taken, but there are many underlying points that should be considered. Each may have more or less applicability to any given project but when making a decision about a control strategy that will last for years, the below items should certainly be on your radar.

The big issues surrounding the use of a PLC over a Low Cost DCS like the Foxboro A² automation system fall into 2 major categories:

Integration/Long Term Support

1. System upgrades: Will all the elements of a piece-parts solution be available in the future?
2. Factory Support: Multiple products from multiple vendors can cause fingerpointing when it comes to service and warranty issues.
3. Long Term Installation: Will the SI be around 3 years from now when a next phase of the project is needed?
4. Lifecycle costs: A disparate set of products from multiple vendors will increase long term costs as far as, training, product upgrades, service contracts, warranty, etc.
5. Enterprise integration: Future expansions and the ability to make all parts talk to information gathering packages will be easier with an integrated solution. ArchestrA delivers on this promise.

Technical Issues (all can be traced to time to engineer and accuracy of the solution)

1. Peer to Peer: This benefit is seen by reduced wiring costs between controllers and with a reduction in engineering time based on simplified mapping.

2. **Single Database:** The accuracy of the initial build and the maintenance of the system are made far easier with the single database. Transcription errors are minimized and changing tags in control schemes is much simpler.
3. **Security:** Most PLC packages do not include Security Management in the package. It must be purchased and configured separately.
4. **Alarms:** Most PLC packages do not include Alarm Management as part of the database, which will add extra time and complexity to the project.
5. **Advanced Math Functions:** PID calculations are done in the CPU of the PLC so multiple and complex calculations will slow down the process time. Additional costs may be required to do advanced math with add on cards.
6. **Proprietary HMIs:** Many PLC vendors use their own HMI which makes interface to other devices difficult and training more expensive.
7. **Open Protocols:** Some PLC vendors use proprietary protocols at the control level which makes communication difficult.

For a more detailed discussion see below on the issues not considered when buying a PLC to do control:

What issues are not considered?

1. ***Enterprise integration (open connectivity).*** Choose the control system that will provide you with capability to seamlessly add enterprise solutions onto your control layer. Right now you may not be thinking of things like, Manufacturing Execution Systems (MES), Asset Management, reporting packages, statistical process control (SPC) downtime tracking, or a variety of other enterprise layer solutions, but information rich applications will most likely be expected right around the corner. Your vendor should be able to provide a seamless flow of process information from the control layer to information layer. Today's information hungry corporations need to squeeze every bit of production capacity out of their assets and Invensys ArchestrA enabled solutions and Wonderware packages provide the consistent flow and a lifecycle that ensures tomorrow's applications will work with today's control system.
2. ***System upgrades and expansions.*** A PLC, which is a disparate set of parts from multiple vendors, will make it difficult for your facility to expand. The local SI may be around for years but will the hardware that they supplied today be usable in the future or will it even talk to the system components that are supplied during your next expansion. A single company providing all the parts from one factory with one set of quality guidelines and with one software infrastructure will guarantee that your assets are protected. Nothing will meet this challenge better than Foxboro's control platform and Wonderware top end software.
3. ***Factory support.*** Inevitably problems arise during the startup and lifecycle of the project. Consider a PLC approach with disparate parts - I/O, controllers, HMI, Historians, web viewers, and others. As good as your SI might be, they can only control the system that they receive. Imagine the problems when the parts don't talk as well as they should. You must consider where you will get your support. It will always be a better, cleaner situation when you have one company standing behind all

the components with a standard warranty and repair contract. Also consider factory support and service agreements. A major organization like Foxboro will always stand behind the equipment and will work to make sure that your system is up and running as quickly as possible. Your SI can also do this, but many times their hands will be tied by the vendors that they use.

4. **Life-cycle cost.** Life cycle cost takes into consideration many things such as, ease of engineering system changes, hardware and software upgradability, interface to 3rd party devices and applications, warranty and service support, training and more. A product line that is managed and owned completely by one company will provide significant advantages in each of these areas. The ArchestrA infrastructure of a system will also ensure the ability to easily integrate future ArchestrA enabled applications into the system. An organization with a migration track record like Foxboro, who still allows customers to build off their original I/A Series system from 17 years ago, will ensure the same migration and low life cycle costs remain.
5. **Long-term installation.** This point should be considered when examining the SI you will be dealing with. Strong SI's will be able to provide a steady stream of support over the years, however, for the best long term strategy a well known, world class organization with a good track record of project management, installation and local field service support will always be a more solid solution. Secondly, working with one organization from the first phase of the project and through expansions will ensure a good level of continuity that will ultimately reduce life cycle costs.
6. **High Speed Peer to peer enabling multi master capabilities.** PLCs are not peer-to-peer instruments. What does this mean? The impact is felt with engineering time and wiring costs. Take for example a Gas header to three furnaces. Without peer-to-peer capabilities input/output signals from Gas Flow, Air, Blowers and valves will have to be replicated and mapped into each of 3 PLC slots controlling each furnace. Furthermore, the wiring from each transmitter on the header will need to be passed directly to each PLC. With a DCS solution, the signals from each transmitter can be mapped directly to the first Controller then copied into the second and third controller without the need to rebuild the strategy three times. Additionally, since the DCS controllers are peer to peer the wiring will be daisy chained from Controller 1 to Controller 2 to Controller 3. The overall impact of peer-to-peer control is significant reduction in wiring and significant reduction in engineering time.
7. **Single database** A Single Tag database with definitions will make it easier to manage the plant and process control models. This point must be taken into consideration in terms of life cycle costs and system maintenance. With a PLC a change of controller or node number will be more difficult if the address is based on the physical location of the tag in the system. With the Foxboro A² automation system the central database means that to reassign a tag you simply relabel the tag definition in the database and paste it into the new control scheme.
8. **Security** - With a PLC the security strategy is not provided within a security manager package. With typical HMIs there is no tag based alarm definition provided and therefore every signal must be handled separately. Ultimately this will cause problems with security levels and administration of the security system.
9. **Alarms** - With a PLC there is no alarm strategy out of the box. Alarm programming will add engineering time and complexity to the system. Maintenance of the alarm

strategy will be much more complicated for plant personnel who were not involved in the original implementation. With the Foxboro A² automation system, alarms are embedded by the function blocks within the control strategy which has a default alarming strategy that works out of the box. Alarms are organized in up to 255 area's and priorities range from 0 to 15. Also included are acknowledgement routines and alarm handling strategies. The alarms are created at the controller level and not the HMI level and stored into a SQL database for archiving and troubleshooting. A 21 CFR part 11 compliant version is available.

10. *Advanced math functions (PID control)* - PLCs were not designed to do advanced math functions or accurate analog control. If future applications require PID functionality, expensive add-on cards that require programming in different language and different environments using floating point math may be needed. Structured text used in Foxboro A² automation system provides an easy language to do these calculations. Secondly, since PID functions are typically calculated in the CPU of the PLC, calculations needed for multiple PID loops can quickly bog down the CPU.
11. *Domain Expertise.* Typically, working with a large DCS manufacturer ensures that there is a significant amount of domain expertise available within the engineering environment. Although SI's do work in certain areas it is generally understood that the DCS vendor has expertise in specific markets because they are working on these projects all over the world and have centralized areas of expertise.
12. *Open communication protocols at control level as standard.* Proprietary protocols used by many PLC vendors at the control level will make it difficult for units to communicate with 3rd party instruments. The T940 and T800 have modbus RTU and Profibus as standard communication.
13. *Proprietary HMI packages* A proprietary HMI will make it difficult to continue to maintain the system. Many PLC manufacturers use their own HMI. Whereas, a globally recognized HMI like Wonderware takes advantage of over 800 Wonderware drivers and add-on software packages sold by Wonderware and third parties. Foxboro A² automation system is highly integrated with InTouch so you can save significant amounts on engineering and development of the GUI since it is off-the-shelf InTouch.