



# 7 STEPS TO A SUCCESSFUL PLC MIGRATION

*Quality You Can Trust*

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# It's Time to Migrate

No matter how solid a piece of automation control equipment is, at some point, it reaches the end of its life cycle. PLCs and HMIs can last for decades without issue, but eventually it becomes time to upgrade to newer technology. Spare parts become scarce, DOS programming software no longer runs on your Windows-based laptop, and the burden on your team to maintain the old technology is too risky. Modernizing your PLC or HMI system becomes necessary for every organization at some point.

## Change Happens

As in every aspect of business, automation technology changes over time.

Every ten or twelve years, every major automation manufacturer releases a new product line that replaces one of their old lines. Each time these new 'faster, smarter, smaller' controllers are released, you must decide whether or not to migrate over from the old technology to the new technology. While it's not necessary to upgrade your system every time a manufacturer upgrades their product lines, over time the spare parts and support for the older platforms go away, and eventually, migration becomes necessary.

## Benefits of Migration

Regardless of what reason drives you to upgrade your control systems, there are a number of benefits to modernizing your PLCs, whether in part or in full, including:

- **Performance:** Today's PLCs are based on the latest processor chip-sets that are the fastest to hit the factory floor. Sophisticated redundancy algorithms, robust programming tools, and fast I/O buses provide huge performance upgrades in a much smaller footprint. And it's also a great time to make efficiency improvements in the performance of the machine.
- **Enhanced Communication and Information Sharing:** With built-in communication standards like Ethernet, Profi-Net and others, today's PLCs can easily connect to other plant systems and get easy access to information for optimized productivity. Network connection allows cross-communication between PLCs and can be connected to a data collection system for real-time machine information.

- **Spare Parts:** Of course spare parts will be readily available for years to come for the new system you select. But getting rid of the old system may allow you to get rid of (expensive) spares held just for that system. In addition, if you migrate to a controller family that you already have running elsewhere in your plant, you can leverage your existing spare parts inventory.
- **Avoiding Unscheduled Downtime:** The chances that a newly upgraded machine with the latest PLC and HMI technology will fail is much lower than that of a machine with legacy controls. And who can't use a little more sleep at night?
- **Support:** You will receive the best hardware and software support with newer PLCs. And if your maintenance team is already trained on the new platform you have chosen, you're that much further ahead of the game.

## Migration Challenges

Upgrading a machine to the latest technology provides a host of benefits, but getting from point A to point B (*or, from concept to completion*) can pose some challenges if not managed properly. It's important to have a solid plan of attack before you upgrade.

Ideas to consider include:

- When can I take the machine down and for how long?
- How will we operate our facility while that machine is down?
- Besides the cost of the replacement hardware, have we considered the total cost of programming, re-wiring, installation and training?
- Are there any changes to the performance of the machine that we should address?

Working with a knowledgeable partner with a proven process and an experienced team who knows all the ins and outs of migration mitigates many of the risks. Rely on a partner who can guide you through every step of the way.

# Qualitrol's Approach to Safe and Manageable Migration

Working with a knowledgeable migration partner with deep industry expertise and a proven track record of successful upgrades is critical. Here are the steps Qualitrol takes to ensure successful migrations for its clients.

## Step One: Define the Goals of Migration

The first step in a successful migration is discovery. This begins with a dialogue between you and your Qualitrol team to review and confirm upgrade objectives, timelines, and desired improvements. During this discussion, Qualitrol schedules a physical review of the PLC system that will be migrated.

Before migrating, Qualitrol will consider the following:

- **Platform.** In deciding what platform to migrate to, Qualitrol looks for possible efficiencies such as using the same platform that is already installed elsewhere in the facility. This provides economies of scale with spare parts, maintenance familiarity, and programming tools and documentation that may already be onsite. Beyond that, Qualitrol ensures that the chosen platform provides connectivity to other machines plant-wide as well as area-wide networks. Available space in existing cabinets can dictate controller size and guide you to a specific product family.
- **Connectivity to third party devices.** Qualitrol identifies any proprietary interfaces with HMIs, SCADA, DCS and other intelligent systems and devices that are desired. All special interconnections to third party devices must be considered and accounted for in the migration plan. In some cases, a reason for migration is to allow for interface to newer third party devices that have more sophisticated communication capabilities than the legacy PLC can handle. It's critical that these be taken into account in designing the new PLC system.

- **Operator interface.** If existing Human Machine Interfaces (HMI) will be used with the new system, the human factor must be taken into account. The operators are familiar with the old HMI and must learn a new one, which can be costly from a training and expertise development standpoint, as well as from an employee performance standpoint. Replicating the existing HMI operation and graphics can have its own challenges. Qualitrol takes these factors into account and provides multiple options to mitigate the risks and costs.
- **Operational goals.** A PLC upgrade is a significant investment, and it's critical that it serve the operational goals of the machine or process. Qualitrol helps you correlate your process goals with PLC capabilities such as improved speed and throughput. Qualitrol considers goals such as a simplified control scheme, reduction in the number of CPUs, and use of remote I/O, as well as incorporation of new third party devices that improve the quality of your product, and designs a PLC migration plan that serves them.
- **Time and scheduling.** Because downtime is potentially costly, Qualitrol works with you to identify the primary time constraints and scheduling issues. Migration can require temporary shutdowns of machines or even parts of the facility, and Qualitrol plans these ahead of time to minimize impact on operations. Based on the complexity of a migration, Qualitrol can institute a phased approach to a migration plan.
- **Installation accountabilities.** Some plants prefer that their own electricians handle the wiring of panels or field wiring in all panels, while some want the migration team to take total control of installation and commissioning. Qualitrol identifies who will be responsible for which parts of the migration, ensuring that there are no costly gaps or overlap

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## Step Two: Review the System

### Physical review

After initial discussions, Qualitrol engineers come onsite for a physical inspection of your PLC system. Qualitrol's engineers examine your system from a hardware standpoint and document your PLC system, as well as any associated HMI touchscreens, SCADA, or other communications requirements. When reviewing the system, Qualitrol's engineers answer questions such as:

- What kind of PLC is it?
- How extensive is it? One rack, multiple racks, or remote racks?
- What are the inputs and outputs? Are there remote I/O devices?
- Are there intelligent or specialty modules? Built-in redundancy?
- Are there any peripherals? Is there an HMI?
- Is there a SCADA (Supervisory Control and Data Acquisition) system collecting data?
- Any other external devices communicating with your PLC, such as a calibration tool?

Qualitrol's engineers seek to understand everything about your system as a whole, including any devices tied in or communicating to your system. They analyze the current I/O to determine if any special hardware is being used such as third party modules or breakout connectors, and take measurements and pictures of the panel, documenting equipment and the physical panel space available for needed equipment or wiring changes. If a new panel needs to be built, this is determined during this phase.



## Gather documentation

After reviewing the system, Qualitrol's team will ask you for copies of system electrical drawings and a copy of your PLC program. If Qualitrol is going to replace the operator interface device, Qualitrol will ask for the program for that too. All programs are then backed up.

The software for older controllers are often DOS programs. Qualitrol has the tools to program in DOS to interface the new system with these older controllers.

In some cases, all of this information can be gathered via phone conference, along with a package from you to Qualitrol that includes electrical drawings, your PLC program, and images of the existing system, plus the answers on Qualitrol's Pre-Migration Checklist. This step can sometimes eliminate the need for an onsite inspection.

## Step Three: Review Migration Options

After the onsite inspection, Qualitrol's engineers review the findings and make recommendations based on known end-of-life and legacy hardware issues. Qualitrol takes into consideration your time and money constraints, your preferred timeline, and what you want to accomplish from the migration.

Based on that, Qualitrol determines the best products to use and how to configure them to find the right solution for your needs. Qualitrol then provides a budgetary design and quote.

Qualitrol will suggest two or three different options for your migration, which may include a simple migration, a phased approach, or a full-bore migration. There may be a good, better, and best way to go, or divergent options to achieve the upgrades within your time and money constraints.

Qualitrol will also clearly lay out all of the assumptions and observations that went into making its recommendations. This is a great time to make sure that everyone clearly understands the scope and desired outcome of the project.



## Step Four: Choose the Plan

If the budgetary proposal meets your design and budget expectations and you decide to move forward, Qualitrol's engineering division prepares a detailed final proposal. They'll re-visit the project site to take a deeper dive into the existing system, collect data and complete initial tasks including the following

- Access the firmware revision levels for your current programming software.
- Review any other programming tools present in the plant, to maintain consistency.
- Record online the current firmware revision levels of the installed I/O modules, using GE Proficy Machine Edition, VersaPro, or LogicMaster programming software.
- Verify compatibility with the latest GE Proficy Machine Edition software.
- Identify location of all remote drops and remote racks.
- Determine if agreed-upon system design will work in the existing panels or if new panels should be constructed.
- Verify model numbers, communications protocols, and interface types for any third party devices to be interfaced to the final system.
- Inspect all infrastructure items needed for new system start-up such as power sources, network access, and final system location to ensure that all scenarios are accounted for and planned for.
- Meet with operators to understand any concerns or improvements that should be considered in the final design. This input is at your discretion.
- Determine if there are any restrictions to access to the machine such as only on weekends, only during a scheduled maintenance period, or only during second shift. This will factor into the overall onsite conversion timeline.
- Determine how much of the electrical installation you will complete yourself, and how much Qualitrol's team will provide. This includes who will connect the new panel to the power grid, and, if it is a total I/O upgrade, re-wire the entire I/O structure.

Following this visit, Qualitrol prepares a detailed final proposal for the total migration.

## Step Five: Project Kickoff

Once you accept the proposal, Qualitrol moves into action. During a kickoff meeting with all stakeholders, Qualitrol assigns a project manager to your migration project. This engineer's role will be to oversee the entire process on the Qualitrol side, as well as interface with you. Ideally, you designate one person as the main contact to answer technical questions and make key decisions on your behalf, helping ensure the project runs smoothly and meets all your expectations.

In the initial kick-off meeting, the following will be established:

- Master schedule for project – this includes the dates for hardware to arrive onsite, the time required to wire and install the system, and the dates for troubleshooting and debugging and final commissioning. Additionally, any acceptance tests or intermediate milestones you would like along the way are determined.
- Qualitrol collects any CAD-generated drawing files for the existing system. This will facilitate creation of new drawings and will help ensure that standard notation will be followed on the new drawings.
- Qualitrol will determine what data registers are being polled from any remote SCADA or HMI, so that these same data points can be placed in the right registers in the new system. This aids in the installation process and ensures the data is in the right place for the SCADA system to find it.

After the kickoff meeting, Qualitrol designs the final electrical layout, including new panels or sub-panels, and makes preliminary electrical drawings. All designs are provided in AutoCAD so they can be passed back to you in a useable format and changes can readily be made throughout the project.

Once the panel is laid out, the new PLC Bill of Material (BOM) is developed and procured. All the necessary hardware parts are purchased and ordered, and any physical assembly that can be done beforehand is completed in Qualitrol's in-house, UL-rated panel shop.

At the same time, Qualitrol begins to rewrite your PLC program, cleaning it up and making it more efficient. All software is tested in a control environment in Qualitrol's lab before Qualitrol takes it onsite.

Close contact between you and Qualitrol is maintained during this phase. Qualitrol continually updates you while the programs are written and panels built, ensuring that you are on board with the project as it unfolds. You also keep Qualitrol apprised of what is happening on your end, such as any events that could delay installation. Close and open communication is crucial during this time.

## Step Six: Install the New System

When the program is ready, the hardware has arrived, and the project is fully coordinated, Qualitrol arrives onsite for the scheduled installation. Because Qualitrol sets a target installation date at the inception of the project and continually communicates with you throughout the system production, Qualitrol can ensure that its engineers arrive onsite at the scheduled time to begin installation.

Most installations follow this process:

- If Qualitrol is to install a new panel, you remove the old panel and the site is prepped for the new panel. Otherwise, the panel should be already in place and ready to go.
- All of the I/O wiring is 'rung-out' to verify that the right field device is connected to the proper input and output circuits, per the system electrical drawings. Any inconsistencies are corrected and re-tested.
- Qualitrol's engineers test machine function with the new PLC in control. Depending on how the program is written, subsections of the machine's operations can be tested individually. Throughout this portion of the testing, your representative (an engineer or lead maintenance person) who intimately knows the correct operation of the machine is on-hand with Qualitrol's start-up team. This ensures that everything is tested and running as planned.
- Timer values and register values that control dwell times, speeds, or other critical machine functions are adjusted to optimize performance.
- If you require an official Factory Acceptance Test (FAT), Qualitrol's engineers work through the sequence of tests to your satisfaction.

- Qualitrol verifies that proper communication is occurring between the new system and any third party components. Qualitrol's engineers work closely with you and engineers from the third party to ensure all parameters are passing properly.
- Qualitrol verifies that all data is passing properly to any HMI or SCADA systems linked to the new system. Up-front planning of the data fields at the time that the program was converted minimizes the risk that data is missed or misplaced.
- Throughout this process, all changes to wiring, the program, and set points are documented by the Qualitrol team and incorporated in the final documentation, which is provided to you after commissioning.
- If your old system is being decommissioned, Qualitrol advises you on how to properly dispose of the old equipment.

## Step Seven: Commission and Train

Following a successful installation, it's critical to ensure that everything works correctly. Qualitrol engineers stay onsite while the new system is commissioned and operated real-time in full production mode. Qualitrol understands that there are ways the machine is supposed to work, and that only when the real product is made with the real operators working the machine can a true test of the final operation be confirmed. Qualitrol's team is prepared to work around the clock if necessary to ensure successful operation. Qualitrol is not satisfied until you verify complete satisfaction with operations and enhancements.

During this process, there's often a program or wiring change. Any changes are performed quickly and added to documentation. After a successful start-up and commissioning, Qualitrol creates a final set of drawings and software revisions, gives a copy to you, and saves a copy on its servers.

Finally, you check that everything is working properly, and the migration process is complete.

# About Qualitrol

Qualitrol International is the repair and remanufacturer division of Cimtec Automation. We have installed, serviced or repaired hundreds of thousands of PLC systems over the past 20 years and hire the most knowledgeable automation engineers in the world.

Qualitrol is the only factory-authorized GE 90-70 Repair Center in the world and is also the only place you can still get new GE 90-70 PLC parts.

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