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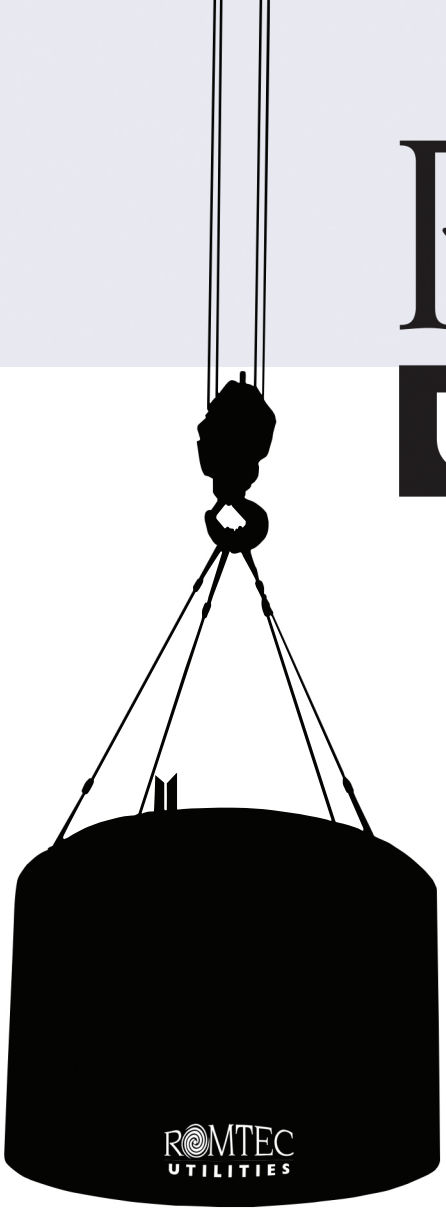



# Avoiding "*Proprietary Restraint*" in Pump and Lift Station Controls

Romtec Utilities
Technical White Paper

www.RomtecUtilities.com

## Avoiding “Proprietary Restraint” in Pump and Lift Station Controls

Figure 1: A Control Panel’s Enclosure, Dead Front, and Hardware

### Introduction:

Electrical controls are one of the most important systems in a packaged pump station. In today’s industry, Romtec Utilities participates daily in a growing trend that places increasing emphasis on sophisticated electrical controls. High-quality electrical controls need to be configured by an industry expert with substantial experience in the design and engineering of flexible control panels.

This trend represents a shift away from the old process of purchasing pre-engineered controllers “off the shelf” from a preferred company. This process was suitable for decades because most pump and lift station owners did not have access to professional electrical engineers, and the pre-engineered controllers were effectively marketed as technologically superior. It was also a major advantage that a control manufacturer could provide support to maintain the equipment for the pump station operators. This approach is much different today.

In industries like the automation industry, programmable logic controllers (PLCs) have long been the standard. PLCs utilize flexible platforms and established hardware to provide sophisticated controls. These capabilities are well-suited to modern pump stations that often experience higher technical demands. As these devices gain popularity for pump station controls, municipal agencies are beginning

to reject proprietary devices in favor of open PLCs because of their reliability, capability, and serviceability.

Not only does this trend benefit the technical demands of a modern pump station, but it also typically costs less over the life-cycle of the control panel. Almost every community across the country now has access to local professionals in electrical systems. These service providers can repair or modify an open PLC panel from a reliable manufacturer with fully-tested hardware and existing published literature. This costs less than maintaining an “off the shelf” pre-engineered control panel because there is no proprietary restraint on the device.

Proprietary restraint can be gauged by the degree to which agencies apart from the original manufacturer can maintain and support the device. Devices with high degrees of proprietary restraint will experience inflated costs for resolving operation issues, installing compatible upgrades, and integrating with additional devices or systems. These devices also risk becoming unsupported and obsolete. Avoiding proprietary restraint can benefit a modern lift station by providing truly site-specific controls and creating an open system that can be easily maintained and supported. Romtec Utilities recommends using an open PLC platform to provide long-term, cost-effective pump station controls while avoiding problematic degrees of proprietary restraint.

### Site-Specific Controls

**Figure 2: Operation, Maintenance, and Repair are Easier with Site-Specific Control Panels**

There are two ways to think about site-specific controls. The first way is to consider how accurately the electrical controls meet the pump station requirements. The second way is to consider how accurately the electrical controls match all the applicable codes and design standards. In order to successfully produce a site-specific control panel, both of these design criteria need to be met.

Modern pump and lift stations are becoming increasingly advanced. They utilize redundant systems, electronic metering devices, sophisticated valve assemblies, variable frequency drives, sensitive alarm sensors, and more. Using a different manufacturer for each component is common to meet the requirements and goals for a site-specific pump station. It is important that the controller is flexible enough to integrate all of the components into a functional system.

Another aspect of site-specific compatibility is developing a controller suitable for the capabilities of the operating and maintenance staff. In one location, it might be preferable for a lift station owner to specify simple controls with a simple push-button interface and local alarms. In another location, it might appropriate to specify advanced controls with a touchscreen interface and a SCADA (supervisory control and data acquisition) system. Each municipal or private customer should gauge the knowledge of its staff so that the appropriate HMIs (human machine interface), communication devices, and accessibility credentials can be engineered into the control panel.

Pre-engineered control panels with a high-degree of proprietary constraint can limit the compatible components that can be used in the construction of the controller and in the lift station. An open platform, like a PLC, can be programmed to communicate with virtually any electrical device. This allows the lift station owner to specify features such as the type of buttons on the interface, the type of alarm, or the type of I/O (input/output) modules. These can be valuable considerations for a lift station owner, and with a proprietary controller, the owner will not be able to get site-specific components.

Proprietary controls typically only offer a single HMI to execute the lift station controls. They do not offer credentials for accessing the programming of the device. The code is owned by the controller manufacturer for its duration and cannot be changed or modified except by a certified technician. These devices cannot claim to be site specific with regards to meeting unique requirements.

The second major aspect for controllers to be considered site-specific is meeting all applicable codes and design standards. States, counties, industries, and other

classifications all carry different applicable codes for lift station engineering. Although a pre-engineered control panel may meet standard codes at the time it was manufactured, these devices cannot be independently modified if codes or requirements change. The lift station owner will be subject to the availability and cost of the manufacturer to update a proprietary controller, if an update is even possible.

In some cases, design standards are determined based on the preferences and experiences of a municipal district or private firm, but at times, electrical codes will help determine design standards as well. Proprietary controllers are not typically designed to function in custom layouts. These devices are designed one time for a specific range of conditions that can satisfy an assumed percentage of customers. These devices can hamper design standards from being truly site-specific because of the limitations associated with high degrees of proprietary restraint.

## Open and Flexible Platforms and Hardware

Pump and lift station controls are built off of platforms through programming code, but not all platforms are created equal. Platforms can vary dramatically in a number of crucial areas, such as scale, programming languages, programming interface, and compatible hardware. Different platforms also provide architectural advantages and disadvantages for developing a control system. Platforms are better suited to meeting goals when they are open and flexible.

### Scalability

Control systems can be quite varied and consist of memory, software, terminals, external devices, conduit, networks, and more. A control system must tie together all of these distinct elements to function correctly. The scale of the platform can either restrict or expand the total capabilities of the control system. There are two ways to measure the scalability of a platform.

First, scalability can be measured in terms of the ability to physically add components to a control program. Controllers rely on physical components like Input/Output (I/O) modules –or relays– to detect and distribute electrical signals. When a new lift station component is added, like a pump, a new I/O module is needed to relay electrical communications between the control program and the physical device. This first measure of scalability determines the maximum capacity for adding physical components to a control program on a platform.

Second, scalability can be measured by the ability to join control programs to the same platform. For pump and lift stations, this type of scalability is best exemplified by a SCADA system. A city or utility district might own several lift stations where each station has a controller with a separate control program. The scalability of the city or utility district's platform would determine how many of the lift stations could be added to the SCADA system.

Pre-engineered controllers with a high degree of proprietary restraint will be extremely limited with the scale of their platform. These can be thought of as closed platforms. These devices will have a set number of I/O points and may not be able to interact with other control programs. In regard to scale, controllers with high degrees of proprietary restraint are neither open nor flexible.

## Programming

As mentioned in the previous section, the code for proprietary controllers is owned by the manufacturer. This means that programming on these devices is not open or flexible respective to service and maintenance. There is also no standard programming language for devices with a high degree proprietary restraint. This quality has several implications.

First, there is no widespread knowledge about the capabilities of the programming because access to the code is controlled by the device manufacturer. This means that any information about the capabilities of the platform and its programming can only be acquired through the manufacturer. The only work-around is finding a peer who owns the same device to gauge his or her experience, but this type of fact-finding should not be considered site-specific in nature.

Second, there is no community to provide support for privately owned code. Any problem experienced by the control program must be resolved by a certified representative of the manufacturer. The problem could be minor or catastrophic in nature, but the only means to find out is to contract a certified agency. Closed platforms and code that are not open incur higher maintenance costs because there is no community or competition.

Last, manufactures can choose to stop supporting their code whenever they want. This can be a big problem for a lift station owner. If a proprietary controller becomes unsupported, the good news is that the code is now open; the bad news is that there is no one with the knowledge to work on it, and the manufacturers will not provide assistance to avoid liability issues. Many times, a lift station owner will need to buy a completely new controller if an unsupported device fails.

## Hardware Compatibility

There are many available manufacturers for electrical components, but the full breadth of products and brands cannot be used on devices that have a high degree of proprietary restraint. This can include hardware options such as the HMI, the enclosure, or any of the associated relay modules. As with any hardware, there is a wide range in terms of price and quality for these products. Service and maintenance is much easier when there are more products available.

In computers, hardware is judged by an old IBM term called “RAS” –reliability, availability, serviceability– to judge the quality of hardware. This term can be applied to controllers in the same way as computers. Reliability means that the hardware produces the desired results continuously. Availability means that the hardware can be used often without experiencing downtime. Serviceability means that malfunctioning hardware can be repaired or replaced quickly and without any issues.

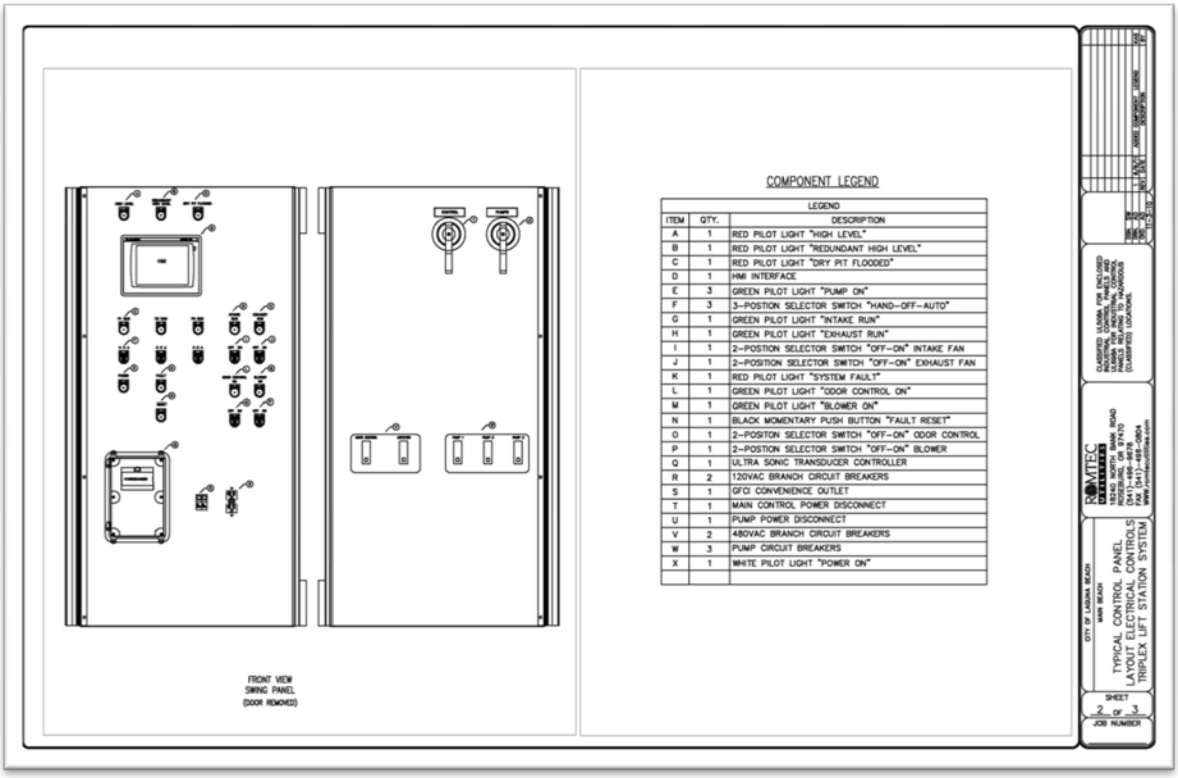
Open platforms have a much broader scope of products and manufacturers that can be used. Using fully-tested hardware with existing documentation will better meet the requirements outlined with the term RAS. Proprietary controls use hardware that is pre-engineered into the device and typically only available through the control manufacturer for replacement or inventory. Even with modular controls designs, the platform may or may not be open to a wide range of hardware.

Architectural Disadvantages

Proprietary controls with closed platforms are pre-engineered with specific architecture. The architecture of the panel might be completely unable to be changed either through the hardware or through the legal terms of purchasing the device. This prohibits the control panel from ever being expanded or manipulated from an architectural standpoint.

Lift station owners may wish to switch certain components in their system, or they could even choose to add new devices to improve the function of the system. Proprietary control panels might not be able to accommodate new components because of restraint to the architecture. For example, a new analog I/O module would be required if a lift station owner wanted to add a thermocouple to his or her system. A proprietary device may not accommodate adding a new device if there is no free analog I/O points. Changes to the architecture of a proprietary device can be difficult and expensive, if not impossible, which can really limit a lift station owner's ability to control his or her system.

**The Advantages of PLCs**



Owners and operators of pump and lift station systems are increasingly looking for better control options. Programmable Logic Controllers are becoming a popular alternative in the pump station industry for avoiding the pitfalls of proprietary restraint. PLCs provide a number of far-reaching benefits that are not currently available with pre-engineered devices. These benefits include the toughness of the device, the open platform, the standardized programming languages, and the availability of qualified service people and support communities.

## Robust

The history of the PLC platform began in the automotive industry over 40 years ago. In the decades since, PLCs have been adapted for the controls of countless forms of automated manufacturing. Operating in a various manufacturing conditions has led to PLCs becoming more and more robust to survive these work environments. Most lift stations can benefit from the level of robustness available with a PLC device.

PLCs have been field tested to endure severe conditions like dust, moisture, vibration, and extreme temperature. Overheating can be a particularly significant concern for lift station owners because many control panels are located outdoors in direct sunlight. PLCs are capable of operating without issue in all but the most extreme of these situations.

Proprietary control panels are not nearly as robust. These devices are pre-engineered with a specific tolerance for hazardous conditions. They cannot typically be specified to operate beyond their predefined ranges. In regions with heavy sun, rain, snow, or dust, PLCs will provide much better long-term control solutions than proprietary devices.

## Open Platform

The developmental history of the PLC platform has also led to it being very open. For the first decade of operation, these devices commonly used proprietary programming and terminal hardware, but the rapid development of computer technology in the 1980s quickly led to these devices becoming more open to be programmed through personal computers.

The PC opened up the API (application programming interface) capabilities to program for the PLC platform. This includes the development of graphical user interfaces designed to simplify programming in languages accepted by the PLC platform. The increased simplicity of the API has broadened the capabilities of the

PLC platform and the capabilities of qualified service personnel. PLCs can easily accept new control functions and integrate with hardware or systems because of the openness of the platform.

## Standardized Programming Languages

Many programming languages have been developed over time, but the strength of a language is derived from the number of people who understand it. Proprietary code, for example, is only truly understood by the manufacturer who owns the code and the service personnel who are trained to use it. This type of programming language is not strong because if the manufacturer ceases operations the code becomes essentially unusable. Programming languages that are widely known are much stronger because there are many people capable of working with that code.

PLCs can accept any programming language in theory, but in order to preserve the strength and reliability of the PLC platform, standard programming languages have been designated. These languages are Sequential Function Chart (SFC), Instruction List (IL), Ladder Diagram (LD), Function Block Diagram (FBD), and Structured Text (ST). By using these common languages, the PLC platform is accessible to a large community of programmers, developers, and electrical engineers.

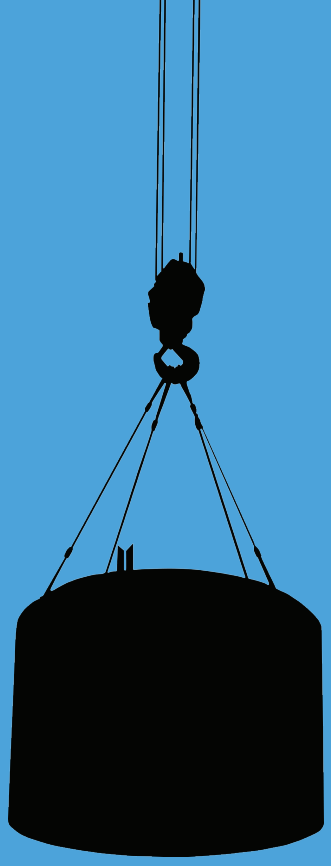
## Support Community

PLC design standards are constantly being developed based on technological progress and industry demands. A fewgroups have emerged as authorities on PLC standards with frequent publications about research, developments, and field practices. The biggest and most influential group is the International Electrotechnical Commission (IEC).

The IEC frequently works with other U.S. groups to develop its standards such as the American National Standards Institute (ANSI) and the National Electrical Manufacturers Association (NEMA). These groups work together to identify best practices and disseminate the information to the broader community of industry experts. This type of support opens up the availability of service providers for things like maintenance, hardware, programming, specification writing, and any field service. The community support for PLCs is unrivaled in the control industry.

## Conclusion

The fundamental issue surrounding proprietary restraint is the concept of “vendor lock-in.” Once a customer has purchased a proprietary control panel, they are dependent on the manufacturer for all future support and services. This is profitable for the manufacturer but does not serve the best interest of a lift station owner or operator. Pump station and lift station controls are best developed by being site-specific and on an open and flexible platform. Romtec Utilities believes that PLCs are the best available technology for developing lift station controls. These devices are getting used more and more in the pump station industry because of their widespread advantages. Electrical controls are an important system and should not be hampered by proprietary restraint.



# About Romtec Utilities

Romtec Utilities, Inc. designs, manufactures, supplies, and installs site specific packaged pump stations. Our pump stations include detailed drawings and specifications in the CSI format with all structural, mechanical, communication, and electrical plans. Our documentation also includes a complete bill of materials, a well-defined scope of work and services, and a complete system warranty. Our complete packaged systems serve commercial, municipal, state, federal, agricultural, and industrial applications for virtually any type of water-pumping system.

Romtec Utilities, Inc. began operation in 2000 in Roseburg, Oregon. The US economic conditions at that time fostered the growth of a booming housing market, and Romtec Utilities did a lot of business working with developers and public agencies who needed packaged lift stations. Romtec Utilities distinguished itself by offering quality designs, fast lead times, and an ability to get projects approved and installed quickly.

In the wake of the 2008 Financial Crisis, the market changed and so did Romtec Utilities. Romtec Utilities made a rigorous evaluation of its product offering to become more cost competitive. We also placed more emphasis on working with industrial clients with a broad range of applications.

In the following years, Romtec Utilities underwent dramatic changes that have ultimately made us a better company. We expanded our interests to include more stormwater, more wastewater, and more industrial water applications. We improved our vendor relationships to provide our customers with more products and capabilities at lower prices. We developed an efficient and precise documentation process to foster fast and clear communications, and we strengthened our field services and repair capabilities.

We have completed hundreds of projects across the United States and have supplied packages for international installations. Contact us for assistance. We love to talk about pumping systems of every type, shape, and size!

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