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Scalability between hardware and a single engineering environment generates significant engineering efficiencies.

Good equipment with a great engineering software package can reduce engineering costs of a project up to 30%.

White Paper

Executive Summary

The key to creating a higher level of engineering efficiency for automation projects is to build an automated environment that helps make projects easier and faster. The more automation can automate itself, the less time and cost it adds to a project. Siemens and Rockwell have both developed engineering environments for their respective projects. Are they basically the same, or does one offer significant advantages?

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As industrial automation continues to become more sophisticated, users are happy to have new capabilities, but they often discover those capabilities come at the cost of complexity. Yes, today's controllers and field devices can do more, but they often take more time to configure and program. Siemens understands this problem and developed the TIA Portal to make automation engineering more efficient.

The objective is to create tools to make engineering more efficient by designing products and methods to reduce engineering costs during system design, commissioning and maintenance. Long-term Siemens customers that have adopted TIA Portal report reductions in engineering costs by 30% when they take advantage of its capabilities.

Siemens is not the only company that has recognized the value of helping users improve engineering efficiency. Rockwell Automation offers its Studio 5000, which encompasses Logix Designer and Logix Designer for Drives, along with a separate platform, Factory Talk View Studio for HMI design.

TIA Portal includes Step 7 V13 controller designer, StartDrive for drives and WinCC for HMIs, which are all included in one major software package that provides consistent look-and-feel and navigation when moving between functions. This software package's editors have a high level of uniformity allowing a programmer familiar with one to move easily to another.

1500, G120 & Comfort Panel

Dedicated to One Product Family

Both Siemens and Rockwell design high quality hardware. This paper will concentrate on the engineering environment and analyze the conceptual differences of each approach.

Building the automation systems for a manufacturing line, complex piece of machinery or chemical processing unit typically involves three phases:

- Design – Choosing hardware, designing networks and programming

- Commissioning – Making all the elements work together correctly after the equipment is built

- Maintenance – Once the system is in production, keeping it running and making improvements.

So how do these software platforms address all three phases?

Design

Designing an automation system involves programming controllers to work with field devices such as sensors, motors, valves and actuators. The user interfaces with the system using HMIs, and also needs safety systems. Engineering systems from Rockwell and Siemens offer a main project manager window that keeps track of all hardware items and allows for writing programming code. At first glance there are many similarities but differences quickly emerge.

Basic programming: The latest versions of Studio 5000 only programs the most recent versions of Compact and Control Logix controllers, so users are forced to maintain multiple versions of the software to also be compatible with the other Logix controllers. A given project is also limited to one CPU, so larger-scale machinery systems that require multiple controllers also need different tools.

TIA Portal offers a high degree of flexibility in that it can work with any of Siemens' controller platforms from the 300/400 to the newly released 1200/1500. Multiple PLCs, HMIs, drives and any other types of devices can be used within just one project. In addition, complex networks can be viewed easily using pictorial diagrams that show how all the devices are interconnected. These diagrams can even become active once the actual equipment is in operation, showing exactly what is happening on the networks. Any faults or connection problems appear on the diagram indicating where they are in the actual equipment.

HMI integration: Studio 5000 has this function in a different software package separate from basic program writing. Consequently much of the initial setup has to be done through manual code writing and there is no direct connection to support direct movement of PLC code to the HMI program.

TIA Portal puts all major automation components in the same windows, so adding an HMI is no different than adding any other component. Design wizards start the process by leading the programmer through the initial basic steps and then does most of the background programming automatically. TIA can also display PLC and HMI programming side-by-side, and simply dragging a tag to the HMI side will automatically create an I/O status field on the screen with all its properties assigned. Both program editors share a common database, so changes made in one side are automatically transferred to the other.

Code reuse: Since few automation projects begin with a totally blank slate, Studio 5000 allows for duplication of code from one project to another by use of copy-and-paste, or export-and-import. However, once code is copied, it loses any connection to the earlier application. If the earlier application is improved, any changes have to be moved to the new program manually.
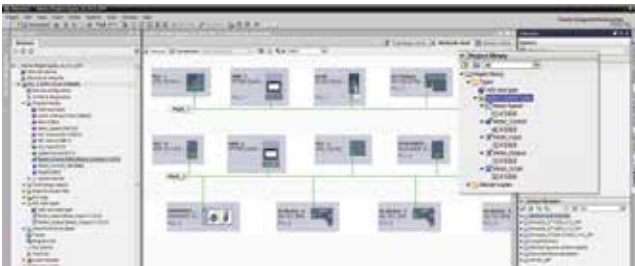
TIA Portal supports similar copy-and-paste functions, but it also allows users to create libraries of reusable code, everything from small function blocks to entire projects, keeping code writing from scratch to a minimum. Any code that is reused retains its links to the original so if there are improvements, it is possible to update the reused code if desired. This type of functionality makes it easy for companies to create and enforce standardized code for specific functions, posting it on corporate servers for easy access across multiple locations.

Drives: Most automation projects incorporate motors and drives in various parts of the process. Studio 5000 makes it simple to select a drive module and insert it into the system, but control functions have to be written into the code manually.

TIA Portal makes adding a drive the same as adding any other major component. When it is placed into the

network, an Intelligent Technology Object function will ask a series of questions about the drive to lead a programmer through parameters, connection sets and so on. When that object is created all the tags are ready to be assembled. Commands can be selected and drive tags are set up automatically providing simple control via open blocks. Tags are global and can be used anywhere.

Commissioning

Once a system is up and running, invariably there will be some bugs in the programming or some element needs to be changed. That's when troubleshooting and run-time editing becomes critical because production does not want to lose output due to programming problems.

Troubleshooting: When trying to find intermittent or sporadic problems, Studio 5000 provides a Trend function, which is a mechanism to plug a PC into the controller to monitor how it is working. Controllers have no internal monitoring capability, so the problem needs to pop up while the PC is recording for later analysis.

TIA Portal has an internal Trace Editor function to look for sporadic faults. Operators can program trigger points so that if a specific event happens, it will record all relevant data, including the time prior to the event, so pre-triggers can be identified. Since the Trace is a function of the Siemens Controllers, it only has to be activated and does not require attaching any external devices.

Run-time edits: Studio 5000 allows for program edits while in the running state, but the edits must be done rung by rung; and each modification needs to be checked, tested, and accepted. This will not work with certain code changes, like Add-on Instructions, as this requires moving the PLC from run to remote program mode which means the machinery stops. While the latest version has taken into account the need to expedite this acceptance process; there is now no mechanism for restoring the original code. Once a change is made, it cannot be undone without manually rewriting the code.

TIA Portal has a feature called Download in Run. A programmer can make a change, it gets compiled automatically, and the new logic downloads without stopping the process. Multiple changes can be made at the same time if necessary. Changes can also be undone, either one at a time or the entire session.

Some users find the ability to make program changes with TIA almost too easy. Technicians might change code to solve the symptoms of a problem rather than looking for a deeper cause. If such unwarranted changes are suspected, it's a simple matter to do a side-by-side comparison of the running code against the original with all changes highlighted, so the original can be restored if desired.

Maintenance

Sophisticated manufacturers have learned the value of proactive, condition-based maintenance programs that use diagnostic information from field devices to warn of problems while there is still time to make repairs before a failure triggers an unscheduled outage.

Device diagnostics: Studio 5000 supports diagnostic functions through polling. A line has to be written into the code to ask a device its condition using a GSV (get system value) function. With additional programming, that value can be sent to an HMI, but both require writing the functions into the code. If the controller stops running, all diagnostic functions also stop.

TIA Portal takes advantage of the fact that all of Siemens' devices are engineered at the firmware level to share information with each other. The controller knows the state of every device on the network automatically, without having to write any programming. Since this is independent of the program, these functions continue even when the system is in stop mode. Problems on the network show up in the pictorial diagram describing exactly what is wrong, such as a wire break on I/O card 6, channel 2.

If a technician has to go into the field, there are many options to gain vital diagnostics information about the running system. Since TIA portal gives consistent diagnostics on the controller, web server built into the controller, HMI devices, or through the programming software itself, troubleshooting is greatly reduced and accessible.

Total Integration, True Integration

TIA Portal represents the most comprehensive automation engineering support platform available from any source. With one package, it provides tools to simplify all engineering functions across the lifecycle of a machine, system or process. When combined with the versatility of Siemens' hardware and other software offerings, it can make engineering more efficient, reducing time to market and total cost of ownership.

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