PLCs become small, fast, smart

Programmable logic controllers (PLCs) are the logical choice for many control applications and, like many technologies in automation, continue to shrink in size, increase in function, communicate more, and integrate well with other forms of industrial computers.

For these and other reasons, Control Engineering subscribers plan on buying more PLCs in the coming year, according to those responding to a recent Reed Research Group survey. Among the 202 respondents who specify, recommend, or buy PLCs, 59% do so for in-plant requirements, 19% for OEM needs, and 22% for both.

Forty-five percent of respondents said they will increase PLC spending, 49% remain the same, and 6% expect a decrease; in 2002, just 29% expected to buy more, 64% remain the same; and 7% decrease.

The survey also showed that wireless connections to PLCs are expected to increase drastically in the coming year; Ethernet use also will increase.

Popularity of PLCs sizes (by number of I/O) stayed about the same in 2004 and 2002; but use of PC-based control and soft-logic controls increased a bit. Micro PLCs (16 to 128 I/O) accounted for 27%, medium-sized PLCs (129 to 512 I/O) 27%, large PLCs (>512 I/O) 18%, PC-based controllers 10%, nano PLCs (under 15 I/O) 7%, soft logic 7%, and embedded 4%.

Mike Miclot, Logix marketing manager for Rockwell Automation, says some increase from PC-based control and soft logic is “not surprising, and can most likely be accounted for by organizations moving from traditional ‘home-grown’ control systems, to implementing and adopting off-the-shelf solutions.”

More PLCs are being used in process and batch applications, a trend Miclot also doesn’t find surprising, “as customers begin to realize that a DCS is overkill for batch operations.”

Respondents in 2004 are using PLCs for process control and machine control equally at 72%, motion control 45%, batch control 36%, diagnostics 19%, and other uses 6%. These figures are virtually the same as in 2002 except for machine control, which then accounted for 79% and batch control at 31%.

More PLCs are being connected to PCs and fewer are used in strictly stand-alone applications, perhaps two sides of the same trend of increased information sharing. Answering the question: “How do most PLCs interface with other systems?” respondents said—network with personal computers 30%, stand alone 29%, network with other PLCs 24%, networked with distributed control system 18%.

In 2002, it was stand alone 34%, networked with PCs 26%, networked with other PLCs 24%, networked with distributed control system 16%.

Nick Infelise, PLC product marketing manager, Omron Electronics, says advanced communications makes “it is easier for manufacturers to share data and have single point of access to plant floor. Looking at present and future use of communications protocols used with PLCs, users anticipate less serial, more Ethernet, and a lot more wireless. Leading ways of communicating with PLCs are: serial RS-232/RS-485 89%, Ethernet 86%, and 4-20 mA/0-10 V dc 81%.

PLC communications are also improving predictive maintenance, with “status and diagnostic capability built-in to remote devices on I/O networks, safety networks, and direct access to remote networks from a single point to speed debug,” Infelise adds.

In 2004, among those saying they use Ethernet, 79% use it as a supervisory network. Nearly two-thirds (65%) use it to network PLCs; 44% use it for controlling I/O devices 44%. Among those who use Ethernet, 83% use TCP/IP; EtherNet/IP stands at 54% and Profinet at 7%.
Among favored programming languages, ladder diagram remains dominant. Even so, Connie Chick, business manager for controllers, GE Fanuc Automation, notes that "expansion of programming tools, including function block diagram and sequential function chart, increase control engineers’ options of the application functionality, all while minimizing the project timing impact."

In 2004, ladder logic accounts for 94%, function block 44%, SFC 22%, structured text 21%, C programming 18%, flow chart 14%, instruction list 11%, and other 1%.

In 2002, ladder logic was 96%, function block 38%, SFC 17%, flow chart 14%, C programming 18%, instruction list 12%, structured text 15%, and other 2%.

Built-in communication support is far and away the most important factor to survey participants in 2004 when buying a programmable logic controller CPU at 78%; total memory 53%, scan time 52%, PID 49%, motion support 24%, removable memory cartridge 16%, and wireless capability 6%.

Built-in communications and motion support each were six percentage points higher than result of the 2002 poll. Most important features for future PLC purchases among 2004 respondents are more remote I/O subsystems; universal programming software for multiple hardware targets/platforms; integrated I/O modules; I/O networked to PCs; and Web-enabled PLCs.

Feature sets such as expanded controller memory, built-in communications support, PC-like application mobility and motion support all aid control engineers’ options for applications, as well as increasing project return on investment, Chick explains. “The controller now has built-in functionality;” additional equipment, such as second CPUs, communications cards, and conversion programs now are unnecessary, she adds.

On features, Miclot says he sees increased “use of removable memory cartridges, for example, Compact Flash cards in Logix controllers from Rockwell Automation. Removable memory cartridges expand functionality and provide flexibility in applications. This enables OEMs to create entire projects, burn them onto the compact flash card, and mail it to the installation. For end users, it means lowering mean time to replacement, because during a hardware failure, the maintenance engineer simply takes out the old compact flash card and inserts a new one.”

Infelise, says users can expect more advanced motion control and process control from PLCs “without burdening the CPU scan.” In addition, the PLC experience continues to get easier with function block and structured text programming capability, built-in libraries, and more flexible and intuitive software for PLCs and SCADA, he says.

**PAC: PC w/PLC ruggedness**

Programmable automation controllers (PACs) are said to combine the packaging and ruggedness of a PLC with software flexibility and functionality of a PC.

“Applications for industrial controllers vary greatly in their requirements for domain functionality, communication protocols, interface needs, programming language and feature sets within a plant or OEM machines,” says GE Fanuc’s Chick. “That is why control engineers are looking for multi-domain functionality in automation controllers with universal programming, increasing functionality while minimizing project-timing impact. A multi-domain controller with a common development platform can reduce overall training requirements and time to deployment for all applications in a facility.”

To gauge survey respondent’s PAC understanding, the Control Engineering survey asked, “What do you consider a programmable automation controller to be?”

Exactly 30% chose “Like a PLC but more ‘open’”; 29% said a “PC-based processor in a rugged PLC-like package”; 18%, “A superset of PLCs”; 17%, “A subset of PLCs”; and 33%, “Not sure.” Addition shows that more than one answer was allowed; “correct answers” were the first two choices, or the last one.

Programmable automation controllers—if they hope to tout PAC advantages to those who purchase PLCs—need to better differentiate PAC features and functions from traditional PLCs. But most traditional PLCs now part with tradition. Perhaps function now trumps form, and there’s less need to use names for logic devices: PLC, PC-based controller, PAC, DCS, embedded controller, and loop controller. “Just give me a dozen of those, please.”