MACHINE DESIGN

 Machine Design (ISSN 0024-9114) is published semimonthly by Penton Media, Inc., 1100 Superior Ave., Cleveland, OH 44114-2543. Copies not qualified for domestic requester circulation: one year, $105; two years, $165.

Penton

Penton Media, Inc.

The PUSH behind PC control

New management techniques and ease of use are keeping PCs the controller of choice in most motion control systems

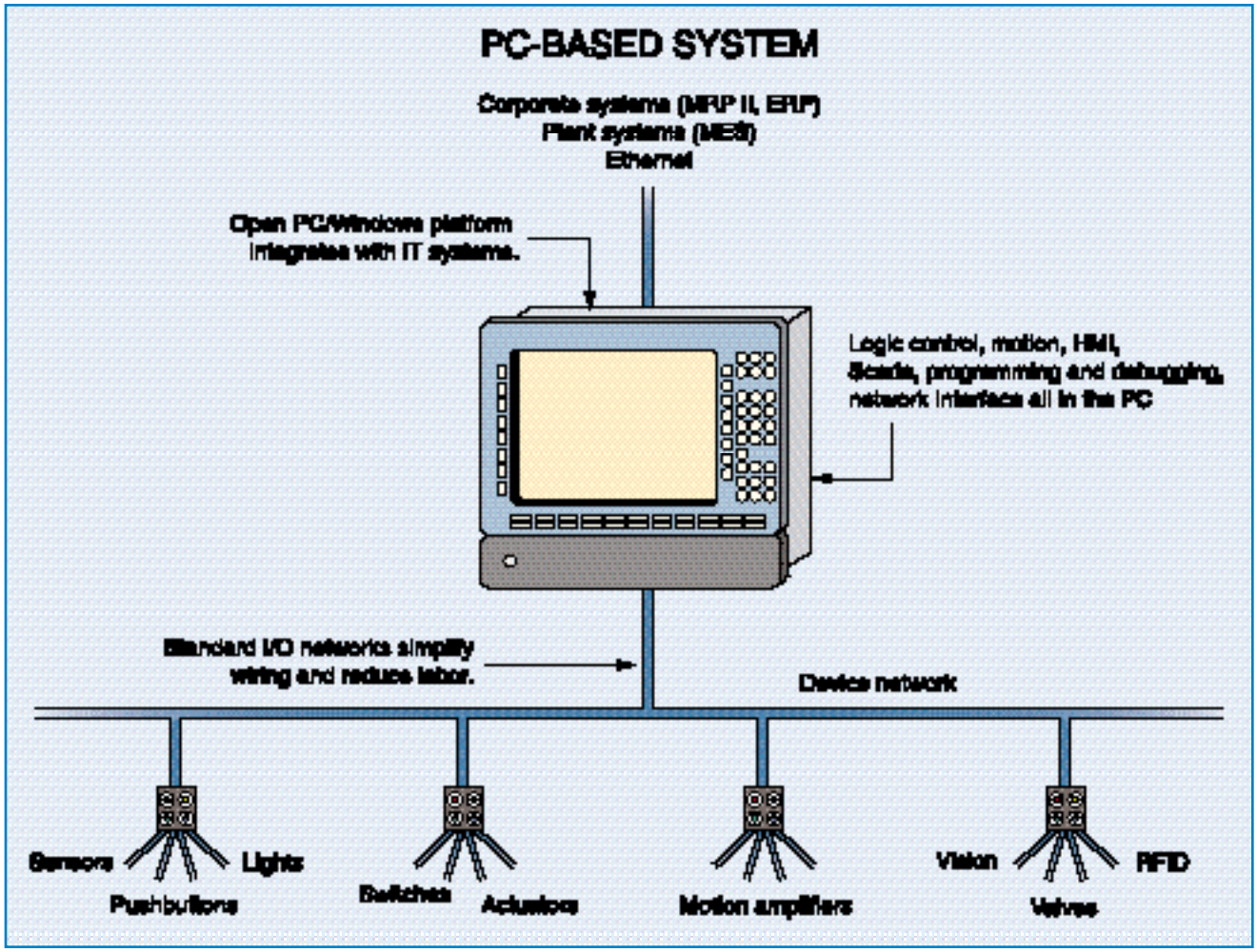
Andrei Moldoveanu
Nematron
Ann Arbor, Mich.

Supply Chain Management (SCM) is a hot topic today. It is a management technique designed to get the most out of manufacturing facilities. It mandates, however, the collection of real-time data on everything happening in the plant.

With PC controllers, the data is available and can be fed directly to the SCM system. The system can't wait for daily updates. This up-to-the-second information must be translated into useful metrics such as the availability of finished goods, subassemblies, parts, and raw materials. The metrics are then used to compute yields, evaluate quality, and schedule maintenance programs, all with an eye on productivity. The system must also track materials, assets, people, and tasks. All this information comes from the factory floor, in many cases directly from the machines.

Hardware edge

The adoption of personal computers as industrial controls has several parallels with program logic controllers. Those familiar with PLCs may recall that



PC-based control consolidates several components of PLC systems into an open-architecture platform. This platform exists in most HMI implementations and includes a microprocessor, power supply, and enclosure.

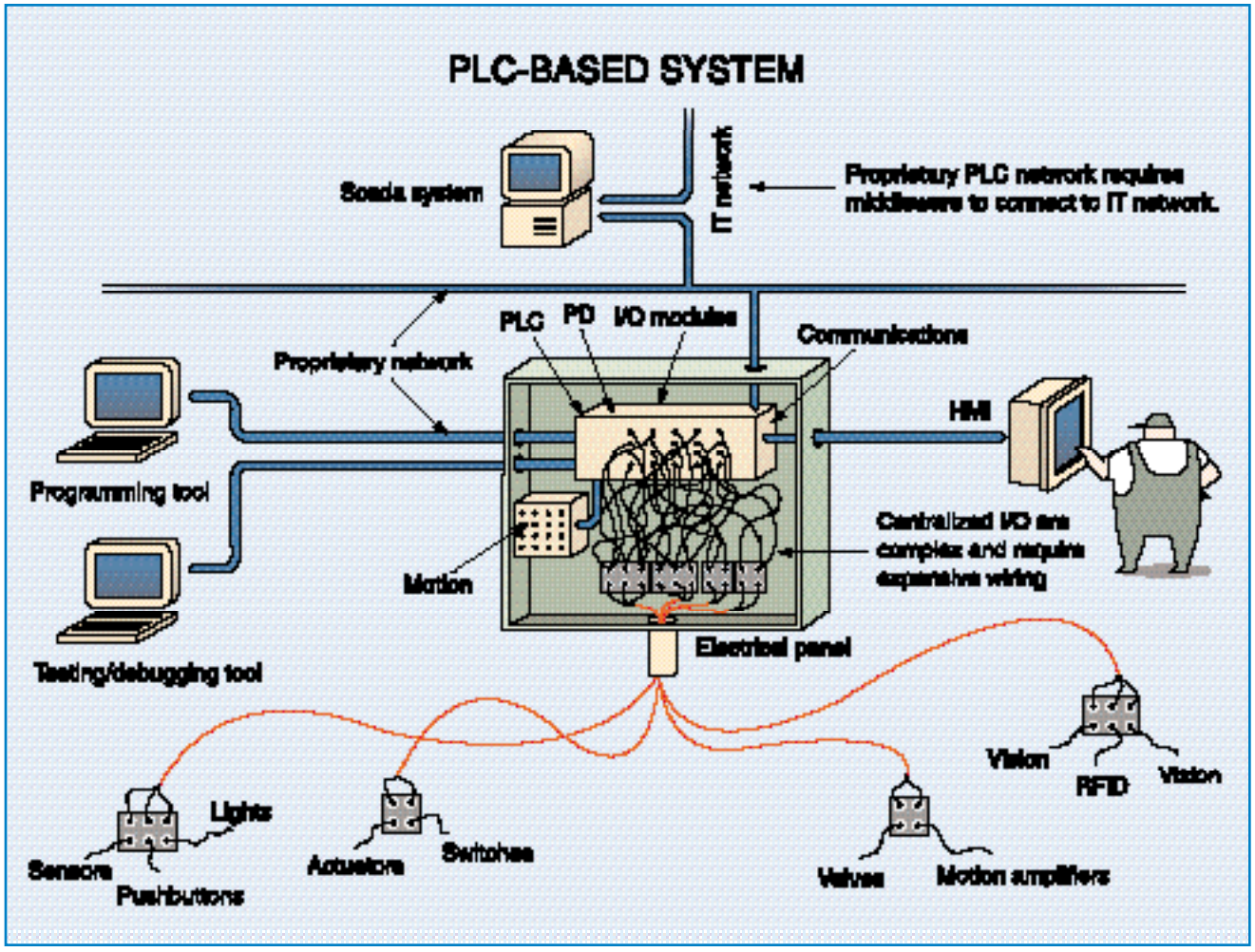
the technology didn't gain widespread acceptance until General Motors began using it. So, too, with PC controllers. The approach has gained momentum as some large and well-known manufacturers have begun using it.

Companies now report that PC controls can cut wiring requirements by as much as 50% while boosting productivity and reliability. One food-packaging OEM, for example, reports using PCs to reduce wiring costs by 60%.

It's interesting to review how these benefits came about. Traditional PLC-based systems have separate modules for logic control, motion, HMI, Scada, programming, and sometimes even debugging. PC-based systems often handle all those functions on the host CPU. Moreover, PC-based controls use open, nonproprietary hardware. The benefits of such open systems are widely known.

Nevertheless, a simple cost comparison between a PLC and a PC with logic-control software usually favors the PLC. But the picture changes if you take into account the consolidation of multiple components, added functionality, and savings over the entire life-cycle of a project.

The consolidation of components via the PC platform brings advantages that include running HMI, control, Scada, and other applications on a single device, which saves panel space and minimizes integration work. Today's PC processor speeds, plus the availability of real-time extensions for



Traditional PLC systems have separate modules for logic control, motion, HMI, Scada, programming, and debugging. This configuration, still in use today at many plants, uses centralized I/Os, resulting in complex and expensive wiring for all but the smallest system.

Windows, let PC controllers safely run MES applications such as maintenance dispatch, tool management, SPC, and material management. These added tasks do not affect the control functions. On the contrary, they are key elements of SCM and makes this new technology attractive to manufacturers.

Software advantages

On the software side, consolidating control, HMI, and Scada into the PC lets designers use a single database. This contrasts with typical PLC-based systems. Databases used in control tend to be separated from any others. There is often a significant programming effort associated with keeping the systems consistent.

PC-based control systems have also made use of fourth-generation programming languages that are intuitive and easy to learn. They also inherently support desktop simulation and debugging. For example, some developers credit flowchart-type programming languages with reductions of 50% and more in installation time. Meanwhile, ladder logic programming is still the most widely used approach on PLCs. Simulation and debugging in ladder logic can be laborious.

Recent advances have made it easier to apply PC hardware and software to motion control. One example is embedded OS for Windows NT. It eliminates the need for hard drives and other rotating media, thus making the system more robust. Moreover,

RULES OF THUMB FOR CHOOSING PC OR PLC-BASED CONTROL		
	PLC	PC
Under 100 I/Os, discrete	✔	
Under 100 I/Os, discrete, simple display	✔	
Under 100 I/Os, discrete and analog (few PID loops)	✔	
Under 100 I/Os, discrete, bar coding, RFID, Image, Motion		✔
Over 100 I/Os, discrete	✔	✔
Over 100 I/Os, discrete and HMI		✔
Over 100 I/Os, discrete and analog (multiple PID loops)		✔
Control, HMI, Scada		✔
Control and motion		✔
Control and advanced troubleshooting		✔

the embedded OS lets designers specify all program functions while severely restricting users from adding ones that haven't been validated. This practically eliminates the possibility of triggering the dreaded Blue Screen of Death and further contributes to system robustness.

PC-based control also has clear advantages over PLCs in terms of integration with IT systems and Internet technologies. Most business systems use some variation on the Windows/Intel system. Extending this architecture to the plant floor with PC-based control holds tremendous integration potential. For example, many companies have invested heavily in ERP, MRP, and MES systems and are just now realizing the benefits by using real-time production data made possible by PC-based control.

Another integration factor to consider when comparing PLC and PC systems is the support of open-network standards. PC-based systems generally come with drivers supporting multiple bus architectures. PLCs, in contrast, tend to support fewer network standards. Having several drivers tends to support legacy systems as well as more recent standards used on newer production lines. ■