

Although data acquisition has been around for decades, traditional stand-alone hardware has been expensive, inflexible, and not very user-friendly. Over the past several years, however, use of the PC has significantly transformed the data acquisition industry and facilitated the jobs of many data acquisition users.

Data Acquisition Rides the PC Bandwagon

BY MARTY WEIL

What is the most compelling trend in the data acquisition industry today? According to a recent study by Venture Development Corp. (Natick, MA), it's the application of the personal computer. Exploiting the flexibility and cost-effectiveness of the desktop PC has become the prevailing choice of many users of data acquisition technology. Access to PCs has been provided through the development of two classes of hardware (analog I/O boards and front-end devices) that convert and condition analog measurement signals, allowing them to be understood by PCs.

According to the VDC report, shipment of personal computer-based data acquisition hardware is expected to approach \$370 million by 1997. "The trend toward faster growth in the analog I/O board sector will continue over the next several years," says Maurice Klaphish, vice president of VDC. "By 1997, analog I/O boards will have grown to comprise more than 56% of these shipments. They have done well, primarily because they are easy to install and are much less expensive than front-end boxes. These boards offer the capabilities needed by most PC data acquisition users."

Although the VDC report mentions low cost as one of the driving forces behind the boom in PC-based data acquisition, this doesn't mean that PC-based data acquisition is a "down and dirty" solution used in lieu of stand-alone hardware. "PCs are not 'the poor man's' data acquisition solution," Klaphish stresses. "PC-based data acquisition is a very effective solution for both large and small companies. It's no secret that the personal computer is an enormous value, and manufacturers, regardless of size, realize that they can get a lot of computation capability for very little money. However, low cost is not solely responsible for this trend; that is a misnomer."

So, what is responsible for the PC's emergence in

the data acquisition industry? According to many of the companies that manufacture and sell PC-based data acquisition solutions, the trend is being driven by several factors beyond the obvious ease-of-use and low-cost aspects. "After more than a decade on the factory floor, the PC is a proven commodity," says Ron Walk, strategic marketing manager for Intelligent Instrumentation Inc. (Tucson, AZ). "The fact that people on the plant floor no longer have to worry about the PC's reliability is a very important factor. Manufacturers are now more comfortable with having personal computers involved in mission-critical roles."

For instance, a pair of South African companies, First National Battery and Advanced Semiconductor Devices, have developed a PC-based system for monitoring the spot-welding process during the manufacture of lead-acid batteries. The system monitors the subsequent filling of the batteries with electrolytes and controls the initial charge rate and the resulting temperatures. The 486-based PC system incorporates data acquisition boards, signal conditioning hardware, and high-level application software from Intelligent Instrumentation.

Total Worldwide Shipments of PC-Based Data Acquisition Products by Product Category (Millions of Dollars)

Millions of Dollars

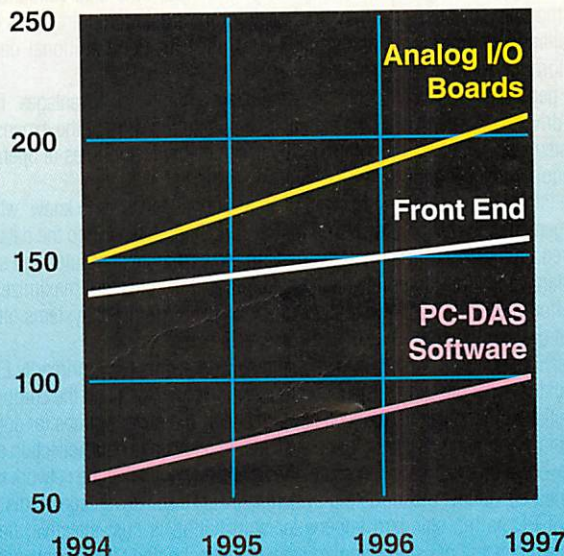


Chart illustrates total worldwide shipments of PC-based data acquisition products by product category.

Another Intelligent Instrumentation customer, SKC Ltd., a Korean-based manufacturer of video tapes and laser discs, is using a PC-based system to control the mixing of materials during the manufacture of audio/video tape and disk media. The personal computer-based system measures the flow of materials into the mixer through a flow meter and controls the speed and duration of the flow via analog control of pumps and digital control of valves. The PC system provides clear displays of the

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SECTION

AUTO

Source: Venture Development Corp.

Chart: PK-Eltion/Fran Hoy Associates, NYC

status of the system at all times. The data acquisition hardware consists of a 486-based PC equipped with data acquisition boards and modules.

THE OPEN ADVANTAGE. According to Walk, the growth of PC-based data acquisition worldwide is fueled by the almost universal acceptance of Microsoft Windows and its GUI front end.

"We see manufacturers moving to PC-based data acquisition because of the open-systems aspect," says Walk. "The workforce is now familiar with the PC—gone are the days when a new commercial software package demands an entirely fresh learning curve."

Rich Mullen, marketing manager for Keithley MetraByte, a division of Keithley Instruments (Taunton, MA), agrees. "The PC is a known commodity, and it runs the known standard software, Microsoft Windows. The open-systems nature of the PC provides the user with a lot of flexibility and the knowledge that this application can expand in the future. The long-term viability of the PC in the factory environment, and in other environments, is a critical factor in the success of PC-based data acquisition."

For its part, Keithley offers a high-performance data-acquisition PC plug-in board. The company's board, for example, is used in automotive shock-performance

testing. The board collects data through accelerometers connected to a car's shocks as it is driven down a bumpy road. Back in the lab, the two analog outputs are hooked up to hydraulic actuators. The two outputs then send the collected data to the actuators in waveform output for users to experiment and evaluate.

Another PC data acquisition vendor, OPTO 22 (Temecula, CA), a maker of a PC-based remote telemetry unit, also sees the open-systems aspect as crucial to the success of its product offering. "The PC is a completely open system, and it allows the user to take dissimilar devices, or multiple protocols, and get them working together," explains Gary George, vice president of marketing at OPTO 22. "This is a big reason why our product line has taken off."

According to OPTO 22, its Mystic RTU is the first to combine multitasking, flow-chart control, and logic software with a seamlessly integrated Windows-based operator interface.

THE LINE BLURS. The combination of price, performance, and open systems is making the personal computer an attractive alternative to stand-alone data acquisition, and there are signs that the PC is beginning to encroach upon the territory of the venerable programmable logic controller (PLC). "The PC is gnawing away at the traditional domain of the PLC," says George. "Some control applications that a few years ago were the sole domain of traditional programmable logic controllers are now PC-based. Today, a PLC and PC are very much alike—they are both computers and they both have similar architectures—but they are just packaged differently. If a box looks like a PLC and uses a 486 chip and runs DOS, is it a PC or is it a PLC? The line blurs."

"The price/performance criteria is definitely driving people to the PC-based data acquisition market," adds Walk of Intelligent Instrumentation. "The PC has become more powerful and the price has fallen, so that now more computing power is available for less money with a PC-based solution than with a PLC."

It seems like momentum is definitely on the side of the PC.

"Data acquisition and control are coming together and, in a few years, it might not be the case of debating the benefits of one over the other," predicts Mullen of Keithley MetraByte. "In other words, we will not have a PLC doing the control and a PC doing the data acquisition—the PC will do both." MA

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INDUSTRY VIEW

New Generation of DC Takes Advantage of PCs

Until recently, most data collection systems that have been installed for the purpose of collecting manufacturing data on the shop floor have been custom systems. The hardware vendor provides the terminals, the printers, and the equipment installation instructions. Someone—maybe the hardware vendor or perhaps a systems house or integrator—provides a set of tools to aid in the development of software to control the data collection hardware and utilize the collected data. Then the systems house/integrator (or perhaps the in-house data processing department) slowly and carefully proceeds through the steps of defining, designing, coding, debugging, and implementing the software, which allows the collected data to be used.

Today, a new generation of data collection systems, designed to address many of these issues, is coming to market. These new systems focus on providing management information targeted directly at shop-floor supervisors. They provide information in real-time to the shop floor, and take advantage of current technology in networks, PCs, and PC-compatible data collection hardware. The best systems are parameter-driven for ease of installation and maintenance, provide real-time data validation, and consist of a set of integrated modules to satisfy a variety of shop-floor information requirements (such as work-in-process, time and attendance, labor, materials, etc.). And, they include traditional data collection functionality with pass-through to corporate systems.

This new generation of data collection systems offers a number of advantages. They include well-designed, parameter-driven software that allows a great deal of tailoring without the expense and risk of custom software. A system can be set up to conform to the user's methods and rules of operation, then can be adjusted as these requirements change.

Real-time information addresses the need of shop-floor supervisors to know "what's happening right now." If the management information processing for the shop floor is built in to the data collection system, it eliminates the requirement to wait for data uploads to the corporate computer and subsequent batch updates. Real-time data validation (complete data validation as it is collected) maximizes data accuracy and minimizes the effort required to achieve that accuracy. Many customized systems offer a limited degree of this capability at greater expense.

Data collection hardware, which uses standard network technology (primarily Ethernet), permits complete integration of the data collection system communications functions into the corporate network. This provides for easier initial implementation, reduced support costs, and better options for communications between the data collection system and other corporate systems. In addition, a data collection system that resides directly on a PC network allows for shared access to the data at any point that the network is accessible. While the latter is not a new capability, most existing systems haven't taken advantage of this technology.

The use of PC as the standard supervisor workstation is cost-effective, flexible, and reinforces the aforementioned concept of using standard networking technology for the data collection hardware. The use of the new generation of DOS-based, PC-compatible data collection hardware reinforces and supports the benefits of real-time data validation, use of standard network technology, and integrated use of PCs in the data collection system. DOS-based, PC-compatible data collection terminals also allow data collection software developers to use high-level programming languages and software development tools. This, in turn, permits the resulting software to provide an expanded set of features and higher reliability more cost effectively than can be done using wholly proprietary terminal hardware.

In summary, a new generation of flexible, network-based, PC-compatible, data collection systems is becoming available. This will help users meet the increased manufacturing management demands which intensify the need for fast, accurate, shop-floor management information. These new systems can be implemented and upgraded on a modular basis, tailored without programming to fit the operation, and integrated into a standard networking environment. The net result for shop-floor supervision will be a much-needed set of powerful, flexible, effective tools—the tools not only for survival, but the tools for success. *By David Studebaker, president of Studebaker Technology Inc. (Glen Ellyn, IL), a developer of manufacturing management software.*