

## **e-MANUFACTURING AND THE INTERNET** (Making Machines into Smart Partners)

Steve Krar

In today's extremely competitive world, manufacturers that use machines need to improve their productivity by taking advantage of any new automation technology available. Every manufacturer must look for ways to reduce manufacturing time, use labour efficiently, and reach higher levels of quality. Until now, automation technologies have been the key to minimizing costs and maintaining consistent quality. Now the question is, can the advances of the process control world and the networked office be applied to the shop floor? The goal is to create an inter-networking standard that makes every machine a partner on the corporate network

### **InterNetworking Standard**

Even today, modern machines remain largely closed **islands of automation**. Plant machinery needs to be networked into the enterprise-wide information system. Presently, this lack of connectivity represents a huge constraint as far as productivity is concerned. The goal is to create an InterNetworking standard that makes every machine tool a partner on the corporate network in order to identify, monitor and optimize production on the factory floor. Then, every machine becomes an important part of management's information system and the enterprise-wide profit process. The point of production is then linked directly to the supply chain on the one hand and the demand chain of fulfillment on the other. This combination between management planning, purchasing, production, operations, sales and service is currently missing the direct link to the machine tool.

### **Connecting Machine Tools**

Connecting machine tools on the shop floor into an overall **plant system** will release the information from each machine and allow management to increase profitability. This dynamic communication extends information related to production beyond the factory floor. Then, machine tools become servers of information in real time, feeding their information to other functions within the corporation anywhere in the world.

### **The Missing Element**

Until now, the missing element has been the universal bridge between Industrial Automation and the Information Technology sector. Manufacturers need a network that joins together all points of production into a secure, browser-based information system. Better information such as event monitoring, tool diagnostics, and productivity information from the

bottom up, is now possible by a nearby open architecture. Unfortunately, largely because of proprietary applications, Computerized Numerical Controls (CNCs) do not communicate with each other, or with management adequately. Rather, they are primarily receivers of part program data. An open architecture platform will address this general problem. Different machine tool systems can then be arranged into a close enterprise-wide management information system.

### **Machines as Web-Enabled Appliances**

Very few manufacturers have ever considered the result of machine tools as web-enabled appliances on their factory floor. In many cases CNC machine tools are not used to their fullest potential and they act as stand-alone islands of technology. They are:

- Dumb islands of technology – not networked.
- Made to run only part programs well.
- Are cut off from the management information system.
- Are mostly closed fixed systems.

Giving every machine tool a hardware and software upgrade to permit it to host Internet Protocol (IP) addresses shatters the glass wall between the factory floor and the world that depends upon it. The technology of networking machine tools over the Internet has been around since the mid 1990s). And many applications that control and monitor equipment remotely by this method have inspired us since.

### **InterNetworking**

Through what is called **InterNetworking** the hardware and software technology turns machine tool controls into Web servers, each with its own unique Web address and complete communicative functionality. Once so equipped, machine tools are integrated into the supply chain in ways limited only by the manufacturing imagination. Any process that contributes to a machine tool's effectiveness and productivity - monitoring, diagnostics, repair, planned maintenance, training, customer service, inventory control, warranty issues - can see dramatic efficiency improvements within the **InterNetwork**.

**InterNetworking** creates a secure, open architecture platform that turns every machine tool into a partner on the corporate network. A machine tool as a partner becomes a **Web appliance** that connects the point of production to management's information system - the supply and demand chains - in real time. Just as **e-mail** has dramatically changed the way we communicate, and **e-commerce** has fundamentally changed the way we do business, **e-manufacturing** will prove to

maintain the rapid rate of change while leveraging the investment industry has made in automation and people.

To quote from an ARC Survey Report: “The largest reservoir of untapped operational information is locked in the machine tools on the manufacturing floor.” Using open architecture CNCs in a plant is fundamental in gaining a competitive advantage. Open architecture CNCs tied into the information technology mix is equally critical in optimizing production in both job shops and high production lines.

### **Manufacturing Costs**

Every company must constantly work to improve product quality, increase productivity, and reduce manufacturing costs. This is a never-ending process and the manufacturing professional must apply the lessons learned through experience to develop practical solutions to keep ahead of the competition. To compete successfully, it is important to look at all phases of a manufacturing operation in order to reduce waste and lower costs. This involves departments such as product design and development, engineering, accounting, purchasing, manufacturing, and marketing.