

From a DISTANCE

Some new ways to approach remote monitoring.

Remote monitoring of machine tools is helping to increase productivity and reduce costs. And as the technology improves, its application is certain to spread.

Software is available that can monitor an individual machine, a work cell, an entire facility or even a cluster of manufacturing facilities.

At the machine level, it's possible to monitor part parameters, tool wear, cutting forces, machine vibration, temperature drift and power consumption—even notify an operator of a breakdown.

These conditions can be tracked at the work cell level as well, along with information about part quality and how long it takes to process a part.

A facility might track all of these conditions for all of the equipment on the floor, in addition to shift-to-shift and operator-to-operator differences in efficiency. Large manufacturers, such as automakers, can monitor conditions for their facilities around the world.

Whether a manufacturer needs continuous evaluation of machine tools or as-needed responses, remote monitoring offers many benefits. Here are three new methods to consider, all of which are scheduled to be demonstrated at IMTS 2004 in September.

Cell Block

GE Fanuc Automation Americas Inc.'s *i*CELLOEE collects real-time availability, performance and quality

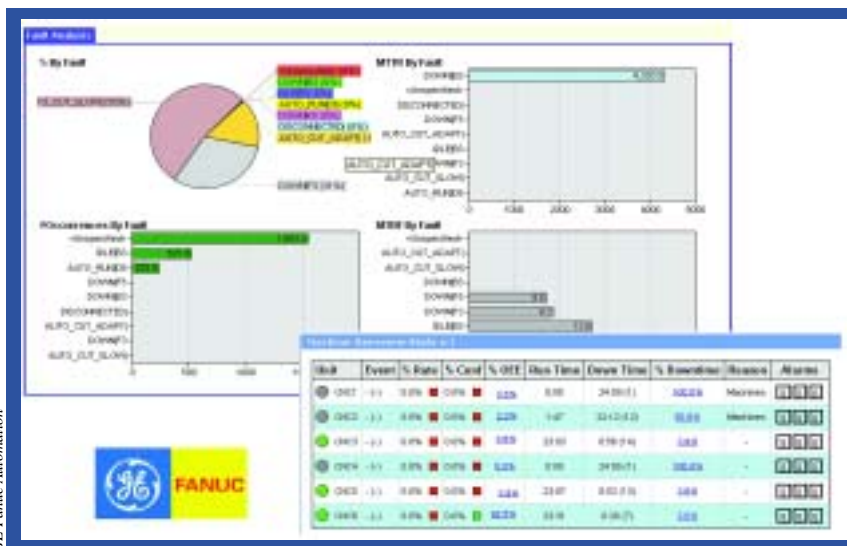
data from machine tools. The software records events as they occur on each machine in a plant. It then generates reports that can be used to focus in on variances in a plant to analyze the root causes of low productivity. The software helps identify downtime, inefficiencies and minor stoppages during production. It also has a drill-down capability that allows the performance of an individual machine to be assessed for any time period.

"It combines monitoring the efficiency of machine tools with providing some machine tool management functionality, either locally or remotely," said Wayne Kotania, product manager, machine tool solutions for GE Fanuc Automation, Charlottesville, Va.

The overall equipment effectiveness calculations identify the frequency and source of different types of downtime on a machine tool, such as whether it is a breakdown or lack of parts.

The software replaces "clipboard exercises" that operators routinely perform at the end of a shift. An operator typically reports what occurred on a machine tool during his shift, but this type of data collection doesn't provide any real-time information. Also, it is time-consuming and the accuracy can vary dramatically from operator to operator.

*i*CELLOEE plugs into a plant's network and allows Internet access, so data can be accessed from anywhere. Or, if the manufacturer wants an outside party to monitor just a single machine—and not have access to its plant



*i*CELLOEE offers local and remote reporting with screens related to production and efficiency, part program management and maintenance management.

network—a dial-up modem can be directly connected to the machine.

The software integrates closely with GE Fanuc's newer controls, from 1994 forward, which have high-level communication interfaces. These can be connected via a high-speed serial bus network or to an Ethernet. Other, older controls can be connected through an external programmable logic controller.

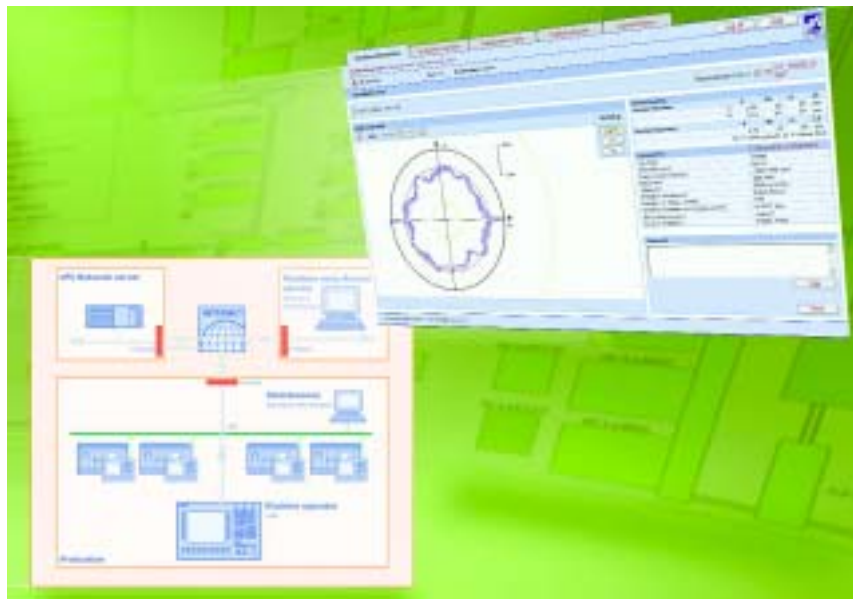
iCELLOEE can be configured to page service personnel if an alarm is triggered. Service and maintenance personnel can view alarm screens, alarm history screens and operation screens remotely.

Kotania thinks that remote monitoring is going to take off soon. "What has been holding it back a little are the issues people have with allowing outside parties to get onto their in-plant networks," he said. "As the security catches up and people feel more secure about Internet technology, they will feel better about allowing people into their systems."

Maintaining Service

Maintenance Service Corp. is a machine tool repair company based in Milwaukee. It retrofits and rebuilds machine tools, and offers to add remote monitoring capabilities to the machines it upgrades. The monitoring can be done by MSC or the end user.

MSC combines proprietary technology with GE Fanuc's iCELLOEE software to remotely monitor its customers' machine tools. "We are one of the first adopters of the iCELLOEE product, and



ePS & RTS

ePS Network Services allows service and maintenance personnel to continually evaluate machine tools.

we are working with GE on one of the first implementations," said Richard Marsek, president of MSC.

Performance data gathered from the machine control is transmitted via radio waves to the customer's network. Authorized personnel can use the Internet to look at various screens showing current conditions, alarms, error messages and so on.

MSC's monitoring service can predict ballscrew, bearing, hydraulic, lubrication and mechanical transmission failures. And machine tool crashes can be diagnosed using historical data.

The company can also recommend process improvements, including distributed-numerical-control part programming and optimization of part programs, feed rates and spindle power.

"Our main thrust is trying to achieve zero machine downtime by monitoring equipment so that you can prevent major repairs," said Marsek. "For example, one of our first test sites is going to be a customer that just incurred a \$25,000 repair. This was unscheduled downtime. If we had been able to observe the current load on the servomotor on the Y-axis, as well as the vibration from the deteriorating bearings, we could have alerted the customer that the machine was going to go down."

At IMTS, MSC will be demonstrating its real-time machine tool monitor-

ing capabilities on a PLC-based, re-manufactured Blanchard grinder and a GE Fanuc 16i-MB HBM control running GE's iCELLOEE software.

Service with a Smile

"The basic idea behind ePS Network Services is to establish a Web-based, cross-company network where experts from different companies can work together to solve machine tool problems, to monitor the conditions of machines without being at the machines themselves and to increase the productivity and availability of machines," said Jochen Heinz, part of business development and key account management for ePS & RTS Automation Software GmbH, Renningen, Germany.

ePS Network Services is a service from ePS & RTS, a subsidiary of Siemens AG, which monitors service and maintenance processes locally or remotely. ePS allows authorized users to view current and past conditions of connected machine tools over the Internet.

The company provides an Internet-based infrastructure with high-performance servers, storage media and software for the capture, preparation and archiving of machine-specific data.

"We are an application service provider, which means you can rent software from us. Therefore, you don't

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have to buy licenses in the conventional sense,” explained Heinz. “The software runs on servers located at our company. All information about connected machines, such as the service history, faults or current condition, is stored on these servers, so it is available to authorized users worldwide.”

The following services are available: eP-Access, eP-Dynamic and eP-Performance. Using eP-Access, service and maintenance personnel can access machine controls via the Internet, which means they have to make fewer trips to the plant. With the “remote control” function, they can perform all the operating functions, such as editing, parameterization, parts programming and program management of the control, just as if they were at the machine.

For safety reasons, however, they can’t execute machine movements or to start NC programs.

By using eP-Dynamic, end users can gain immediate access to all control data and diagnostic functions on the central ePS servers—without influencing their own production process.

Aside from archiving, eP-Dynamic also permits comparisons of current settings with the parameters stored on the ePS servers. That way, service and maintenance personnel can detect configuration errors or deviations.

If a fault occurs, service personnel can be notified by e-mail or text messaging. The ePS servers will already have detailed and updated information, enabling a quick response.

eP-Performance provides service

and maintenance personnel with standardized testing and measurement procedures, which enable continuous evaluation of the state of their machine tools. Furthermore, individual machine components, such as feed axes and spindles, can be monitored cyclically.

The test procedure and specific results of tests are sent to the ePS servers. The results can be evaluated for the entire life cycle of a machine tool using trend analysis. This enables advanced and targeted planning of servicing and the best use of inspection and maintenance time.

“Remote control of machines has been around for 10 or 12 years, but only a few cases have been real success stories,” said Heinz. “However, remote control use is growing fast.”