

feature

# OEE and beyond:

## using data to your advantage

By Thomas R. Cutler

Many machine tools in use today are poorly set up for the data collection and communications needed to measure the Overall Equipment Effectiveness (OEE) information needed for profitable company decision-making. There are historical reasons for these shortcomings, along with industry and research solutions emerging to address them.

In the 1980s, CNC machines with RS232 serial ports for communications with computers emerged. Programs were stored on a PC, backed up or called up remotely. The approach was so successful that some of these controls and machines remain in use today.

The main weakness of RS232 serial port technology is the length of the cables required on a shop floor. Longer cables mean slower data transfer rates, and increase the risk of data transmission errors. The harsh conditions of some shops can cause PC failures that interrupt day-to-day operations.

Today, these failures are not acceptable. Migrating to the Ethernet for networking connectivity is the solution.

Conversion to a company-wide Ethernet-based machine tool communication network, (while still loading and accessing a machine through a local, legacy serial port is cost-effective) has a short return-on-investment (ROI) period; it also provides the easiest migration path to reliable shop floor information and increased operational efficiency.

According to John Rattray, a senior executive with Memex Automation, "Manufacturers with an eye on the bottom-line should look at this technological leap to maximize the utility of their most valuable assets, their shop floor machines. The added-value provided by Ethernet technology ensures a competitive edge and a successful business in today's global environment."

Graham Young, technical sales manager at Memex, recently discussed the advantages of migrating from serial to Ethernet communications on the shop floor, noting, "There is a technological shift on the shop floor that is allowing machines to communicate directly

with corporate information systems, generating big benefits for companies by increasing their operational efficiency. Applications are available that provide real-time machine

monitoring, acquisition of OEE metrics, dynamic computer-aided machining, automatic synchronization of part programs, work order scheduling, and central control

of machine operations."

On the research front last year, during a keynote address at the Canadian Manufacturers & Exporters conference  
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## feature

## Mazak demos MTConnect Energy Dashboard value

by Rob Colman



At IMTS 2010, Mazak demonstrated its Energy Dashboard, a tool that exemplifies how the MTConnect communications protocol can provide manufacturers with cost savings and a boost to productivity and efficiency.

Asked to define MTConnect, Mazak software developer Neil Desrosiers compares it to a USB key. "USB doesn't tell you what you can put on those devices, USB is strictly an enabler. That is what MTConnect is for the metal cutting industry. There are other standards out there now. The big difference between MTConnect and those standards is that it is royalty free. And because of this, we have brought together

a large assembly of OEMs to take part in its development."

The energy dashboard is not currently a product available off the shelf. It was chosen as a proof of concept because adopting it in machine tool operations offers the biggest bang for a company's buck. Desrosiers believes that with the standard in place, software companies will fight to best serve companies using the open protocol.

"Who is going to create the best software that is going to give you the dashboard, the data, and analyze the data to give you the best return on your investment? There may

ence held in Ottawa, Federal Industry Minister Tony Clement announced funding for several large-scale research projects, including the NSERC Canadian Network for Research and Innovation in Machining Technology (CANRIMT) study, led by Dr. Yusuf Altintas of the University of British Columbia. The five-year, \$5 million project involves university researchers from across Canada working in modeling, analysis, monitoring and control of machining processes and manufacturing automation.

Ratray's firm is also participating through collaboration with Dr. Allan Spence at McMaster University, who noted "This is a special opportunity to advance virtual machining technology through integration of laser scanning and Computer Aided Design (CAD) algorithms with online monitoring, measurement, and control. This funding will allow us to more precisely predict and control mold machining operations — even for cases where actual geometry departs from CAD actuals."

### Take up the tech advantage

New machine interface hardware has reduced the expense of data collection, making OEE metric collection affordable. The ROI is very rapid, with reports of 20 percent or greater productivity improvements.

Because OEE systems can automatically accept signals directly from the machine tool control, unless there is a fault or other downtime event, there is no longer a need for the operator to provide input for each cycle. This direct and real-time capability avoids ERP data entry issues with operator errors, failure to record, and lost hand written reports. The OEE system is a labour saver, often justifying the investment even before the benefits of increased efficiency, lower costs, and competitive advantages are factored into a cost benefit analysis. Ratray insists this factor is most critical to metalworking enterprises because "it removes the human element and there is accurate data with built-in monitoring tools and alerts. If you can measure it, then you can manage it."

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be three software products out there that do the same thing and one will probably stand out in time," he says.

Currently, Desrosiers notes that there are many companies out there figuring out how to use MTConnect to their best advantage. "Half of these companies are having a third party software company develop what they want to integrate into their current ERP system. The other half is buying off-the-shelf products to do machine monitoring and use calculations. This is an enabler for you to collect data. And with today's technology, once you get the data into one of these systems you can do whatever you want. There are a lot of companies implementing right now. I know of a few companies

that have done a lot of the work themselves and already have BlackBerry and iPhone apps running internally for device monitoring."

Desrosiers is working on about 10 MTConnect pilot projects right now, and planning the set-up of about 10 more. To make a system MTConnect compliant is relatively easy, he notes. "It is all software, so basically we update the main software so that we can install an MTConnect adapter, which extracts the information from the CNC. It might take an hour and a half to completely install the MTConnect adapter."

Machine tools aren't the only thing that can be monitored using the system, however. It could be a valve, a pressure sensor, temperatures, flow level, fluid levels. Machine tools are just a starting point.

Desrosiers notes a number of items monitored with MTConnect. For instance: Is the device powered on? Is the machine in operation mode or set-up mode? If it is in automatic operation mode, is it in cycle? What cutting program are you running? You can deduce what projects are running, where in the machining process they currently stand, how your coolant levels are holding up, the axes positions, tool life management, load factors, rpm.

"All of this can help you make intelligent decisions about schedule management, reduce production losses, improve productivity and create energy savings," says Desrosiers. "The possibilities are endless once you have the tools in place."

For more, visit [www.MTConnect.org](http://www.MTConnect.org).

From a metalworking perspective, OEE provides valuable new benefits. Here are some recent comments received from both management and shop floor users:

"We believe we can use data to motivate employees with a shared understanding of how we can be more productive, and that's what it's all about."

"Machine connectivity unites the islands of machine automation, establishing a fully-connected, enterprise-wide manufacturing nervous system that gives real-time visibility of production and the ability to adapt and control each machine."

"Customers can see and believe in what we're doing to improve on time delivery because we have traceability of machine operations through OEE."

Global technology initiatives from technology suppliers, coupled with university research, recognize that machine tools are uniquely poised to adopt new capabilities. At the International Manufacturing Technology Show (IMTS) last September, the MTConnect Institute proposed the establishment of the Legacy Machine Tool Connectivity Working Group (WG). This group will be essential in addressing the very important issue of providing best practices and overall guidance for the physical connectivity of the thousands of legacy machine tools in manufacturing shops around the globe.

Meantime, MTConnect Institute has developed open standards intended to foster greater interoperability between manufacturing controls, devices and software applications by publishing data over networks using the Internet Protocol (IP). The standards offer a solution to the exchange of data from shop floor devices to higher-level systems. The future looks bright for those adopting these tools.

*Thomas R. Cutler is the President & CEO of Fort Lauderdale, Florida-based, TR Cutler, Inc. ([www.trcutlerinc.com](http://www.trcutlerinc.com)).*

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