Newer controls feature much improved touch-screen interfaces, better software functionality and connectivity choices

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CNC control systems continue to move toward touch-screen human-machine interfaces (HMI) that appear more like a smartphone, with leading control developers like FANUC joining other independent and proprietary control providers who are moving in this direction.

While these new interfaces are considered more user friendly, especially to the younger generation, the shift isn’t all about window dressing. The systems come with substantial improvements that are said to speed programming. New interface or not, many of today’s control systems also offer more connectivity choices in the form of MTConnect or other protocols for easily connecting machine tools to the Web, making it possible to optimize programming decisions and production.

“At EMO in Milan a few weeks ago, it was clear the machine tool industry is going toward soft control panels. You’ve got basically an industrial iPad controlling the machine tool,” said Jim Kosmala, vice president, Engineering and Technology, Okuma America Corp. (Charlotte, NC). Okuma is one of several machine tool builders that develops its own proprietary control system.
Simplifying Machining Tasks

Previewed at FANUC’s open house in Japan and unveiled at EMO Milan in 2015, the latest look from FANUC America included its new HMI for the company’s line of CNC controls. The new HMI is scheduled for official roll-out in early 2016 and the system is said to be much more than a cosmetic face lift, according to FANUC, with completely redesigned hardware and a user interface featuring a flatter design with ergonomically positioned keys.

FANUC’s new look coordinates across the entire line, with the same user view on its entry-level 0i-F CNC all the way to its high-end 30iB series controls.

“The HMI itself is a new take, with better graphics, better transitions—it’s better from the operator’s perspective,” said Paul Webster, CNC engineering manager, FANUC America Corp. (Rochester Hills, MI). “The consistency of Fanuc’s always been a strength.” The new HMI has a more-friendly look, with a Home screen, he added, and built-in cycles that are aimed at job shops.

“The built-in cycles just help you through the standard G-code cycles, telling you in a graphical way what to do,” Webster said. “It makes it easier to create programs in standard G code. The new HMI is also coming with a new look. The plastic’s a darker, deeper color, and the keyboards are more of a flush surface. It modernizes the whole look.”

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Maximum usability is the foundation of the Max5 CNC that was introduced in August 2015 by Hurco Companies Inc. (Indianapolis). Packed with features, the Max5 control includes a keypad that is adjustable up to 90°, a 19” LCD screen with touch-screen navigation that includes a second folding auxiliary screen with die-cast stainless hinges, which is standard on most models in the company’s 65-model lineup.

“I think today’s machinists are looking for a control that is easy to learn, quick to set up, and that will offer them some flexibility in the way that they program their parts,” said Michael Cope, Hurco product technical specialist, CMTSE. “Not all jobs are suited for conversational programming, just like not all jobs require the need for programming in NC with CAD/CAM software. Just like machinists need many different types of tools in their toolbox, they also like to have many different features and benefits in the machine controls that they program and operate. The right control, especially for shops that manufacture a high mix of parts, will provide the versatility for the machinist to determine the best way to approach the part.”

Snazzy interfaces for CNCs are not an afterthought these days. Okuma’s open-architecture Windows PC-based OSP-P300 machine control has had an easily operated touch-screen interface now for a number of years, noted Okuma’s Kosmala. “Everyone is switching to a new interface to control a machine tool,” Kosmala said. “People are attracted to the smartphone type of interface. When people walk up to any machine tool, immediately they’re saying to themselves ‘Yes, I can run this’ or ‘No, I’m going to need training.’ The younger generation is saying ‘Yes’ to machines with soft screens that look like something familiar.”

CNC controls are an ever-evolving platform for machining, said Wayne Nelson, eastern region manager, Fagor Automation Corp. (Elk Grove Village, IL). “Among the features getting the most attention are simplifying the HMI and operator interface,” Nelson said. “Fagor Automation knows that the HMI and operator experience can always be improved for specific applications. The control has to have the ability to be custom tailored for and by the integrator or even the in-depth applications and service personnel.” This is not an option, Nelson said, but a standard feature of Fagor’s line of CNCs including the models 8055, 8060, 8065 and 8070.
“This opens the door to streamlining setup and operations to practically any approach,” Nelson added, “leading to increasingly productive operations, happier operators, and better timely alerts for maintenance.”

For many smaller shops, easy-to-use programming that is reasonably priced is a key factor in CNC decision-making. “While much is always made of the things that help big shops and companies, the smaller shops are often left out because of the cost of investments,” Nelson said. “In small shops across the USA, the most important thing is a real practical conversational programming capability. In a job-shop environment dominated with one-offs and very small lots, a single operator can be productive beyond all possible expectations of only a few years ago. Full CAD/CAM systems are expensive.
and require a lot of learning. Fagor Conversational Controls are both conversational and G-code capable."

**Software Drives CNC Productivity**

Nothing adds functionality quicker to machine controls like new software, and several CNC makers recently added new packages or updated existing software that add key capabilities to machinists’ toolbox. In September 2015, Okuma added to its OSP-P300 control’s software with its new OSP Suite, which Kosmala said is similar to having a Microsoft Office suite for machine tools.

The new OSP Suite features a bundle of open-architecture applications for enhancing Okuma machine tool users’ productivity. The suite adds operating efficiency apps, allowing users to customize the touchscreen for three different operators, and digital manufacturing features give users manuals, checklists, and process sheets on orders stored in the control.

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OSP Suite also includes Okuma’s ECO Suite, which takes advantage of the Okuma mechatronic approach in the design of its control and machine tools. ECO Suite uses ECO Idling Stop functionality to stop energy-wasting machine tool idling and nonessential functions. Its Thermo-Friendly Concept technology automatically stops the cooling unit if needed, while maintaining machine accuracies, and the software gives reports tracking energy consumption and savings. “OSP Suite on your machine tool is like Word, Excel and PowerPoint is on your PC,” Kosmala said. “Microsoft gives you the Windows environment and those applications for 70% of what you do. Okuma gives you the OSP environment and OSP Suite for
70% of what you do in making parts. For that extra software, that’s where the Okuma App store comes in."

The Okuma App Store gives its users a unique way to take advantage of productivity-enhancing third-party software that is available through the company’s Partners in THINC. “One cool app is the Part Flip Monitor,” Kosmala said. “If you flip your part, it’s very useful. Often, the number one source of scrap for some shops is when an operator forgets to flip a part, or maybe he flipped it twice. This is a little app that helps a lot of operators that have to flip a part every 30 seconds for eight hours a day. A few hours into the day, it’s easy to lose track of whether the part was flipped or not. This reminds them so they won’t scrap a part.”

Hurco recently released some new control features, called AdaptiPath, Job List, and Stream Load, Cope said. “The AdaptiPath feature allows the operator to program high-speed toolpaths conversationally, and produces the same type of toolpath generated by expensive CAD/CAM software packages that are equipped with high-speed programming capabilities,” he said. “This technology will greatly increase the amount of metal that can be removed in a given period of time, and will greatly reduce cycle times.” Due to the enhanced chip control offered by the constant engagement cutting technology, pockets can be machined at full depth, he added, thereby eliminating the need for multiple peck cuts, and will also allow the part to be machined with air, and without the need for coolant in many cases.

The Job List gives Hurco customers the ability to link together a series of programs, to run in sequence, with or without operator intervention, Cope said. Hurco’s Stream Load feature allows extremely large programs to stream directly from the machine’s hard drive, without the need for DNC or drip-feeding to the control.

While machinists all look for ease of operation, programming flexibility is especially critical, particular in job-shop environments, noted Ryan Legg, product marketing manager and Solution Partner manager, Siemens Industry Inc. (Elk Grove Village, IL). “We are also starting to see a transformation in the area of the machine control HMI. Technology we have seen for a while in the consumer sector is migrating to the industrial sector, such as multi-gesture interfaces which we are all familiar with on our cell phones, tablets, etc.

“We address these topics at Siemens with our Sinumerik Operate user-friendly standard HMI as well as shop-floor programming flexibility with our Shop-Mill and ShopTurn shop-floor programming packages,” Legg said. Features such as Animated Elements make programming and operation very intuitive, he said, by more easily visualizing the machining process and being prompted to enter the appropriate machining variables.

Heidenhain recently updated its RemoTools software development kit (SDK) with version 3.0 for users to add proprietary protocols to their machines adding functionality like that of MTConnect, said Julian Renz, TNC product specialist, Heidenhain Corp. (Schaumburg, IL). “MTConnect is a good tool, but it’s limited in terms of what you can extract from the tool,” Renz said, noting the company’s proprietary tool allows users to extract more data from the control, from PLC machine parameters to spindle speed and feed rate. The RemoTools SDK works with standard programming languages including C++ and Visual Basic.

OEM-Developed CNCs’ Advantages

Only a few CNCs are developed by machine tool builders specifically for their own machines, but those that do see distinct advantages in an OEM-built control over independent CNC developers. “In one word, the answer is mechatronics,” Kosmala said. “In order to optimize your electro-mechanical machine and control as a system, you have to engineer both the electrical and mechanical together in harmony. On a generic ‘vanilla’ control designed with the intent for use on a wide range of builders and machine types, it might be more difficult to achieve a similar optimization.”
With Okuma’s mechatronic approach, the company leverages and harmonizes the mechatronics of the machine tool and the control, Kosmala said. “That’s so core to who we are,” he said. “With our Thermo-friendly concept, Okuma machines are designed to expand in the same plane, and our TAS [Thermal Active Stabilizers] in the spindle and throughout the machine allow us to see different hot spots and react to those readings accordingly.”

Using an OEM-built control offers huge advantages, Cope said. “Not only does this mean there is one source of accountability for service, it also provides the unique opportunity for interaction with the engineers who wrote the software, and who invented the control technology on your specific machine,” Cope said. “Over the years, the Hurco control has been improved by the direct feedback that we receive from our customers.”

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If a customer submits an enhancement request to make things easier for them, Hurco’s engineering staff will review the request, he said, and add it to a future build of the software. “This type of control enhancement just wouldn’t be possible with a machine tool that simply added a third party control to their machine,” Cope said.

Another advantage of Hurco controls is upgradeability, he added. “Typically the technology cycle for a machine control is about five years. Once your control has reached its fifth birthday, it is usually considered to be ‘out-of-date’ technology,” Cope said.

“However, Hurco controls don’t have this problem because our control software, called WinMax, has an open architecture. Although the customer needs to weigh the cost, we often upgrade machines with controls that date back further.
than five years. This means the control that is on the machine you buy today, won’t be obsolete in a few years.”

CNC Connectivity with the IIoT Future

There’s a big buzz about the industry right now with connected machines, and the Industrial Internet of Things (IIoT), and CNC developers see great promise in leveraging Big Data coming from the shop floor. Connected machines was a hot topic at EMO, Kosmala said. “Everyone’s talking about it, and I think what you’re going to see is a lot of small companies getting into it.

“Right now, I’ll shoot from the hip and say within five years, you’re going to see the many small companies in today’s fragmented market distilled down to a few large companies leading the IIoT effort,” Kosmala said. “The Microsoft and Apple of IIoT will emerge, and step up and define this for the industry.”

An open-architecture PC control like Okuma’s OSP has an edge in this developing IIoT industry, he noted. “All these IIoT and IoT companies, whatever they do, they’re developing on PCs.”

Many Okuma customers also have older machines prior to the P300 PC-based control, which need MTConnect to connect these older machines. “We need MTConnect to connect to all of our legacy machines,” Kosmala said. “For all P200A and P300 control vintage machines, there is an MTConnect app on the Okuma App Store [at www.myokuma.com], which is all you need. Download and install that free app, and you are running MTConnect on your Okuma, no hardware required.”

The terms Industry 4.0 and the IIoT are basically the same concept, Siemens’ Legg said. “There are so many approaches to this emerging at the moment. At Siemens, we are positioning ourselves by not only offering our own direct solutions such as our Sinumerik Integrate for Production software suite, but also supporting emerging control neutral protocols such as MTConnect, through our Solution Partner, TechSolve.

Connected machines and controls stand to have a great effect on the industry, Legg added. “The ultimate effect, when deployed in an effective way, will be increased productivity and greater visibility into manufacturing data,” he said. “Downtime can be drastically reduced by deploying proactive maintenance methods as well as having the ability to be alerted instantly via text message or some other method regarding a machine’s current status. The OEE of a machine and even an entire plant can be analyzed more thoroughly and accurately. This can allow manufacturers to potentially pinpoint bottlenecks in their process and take actions to improve. The possibilities are really limitless.”