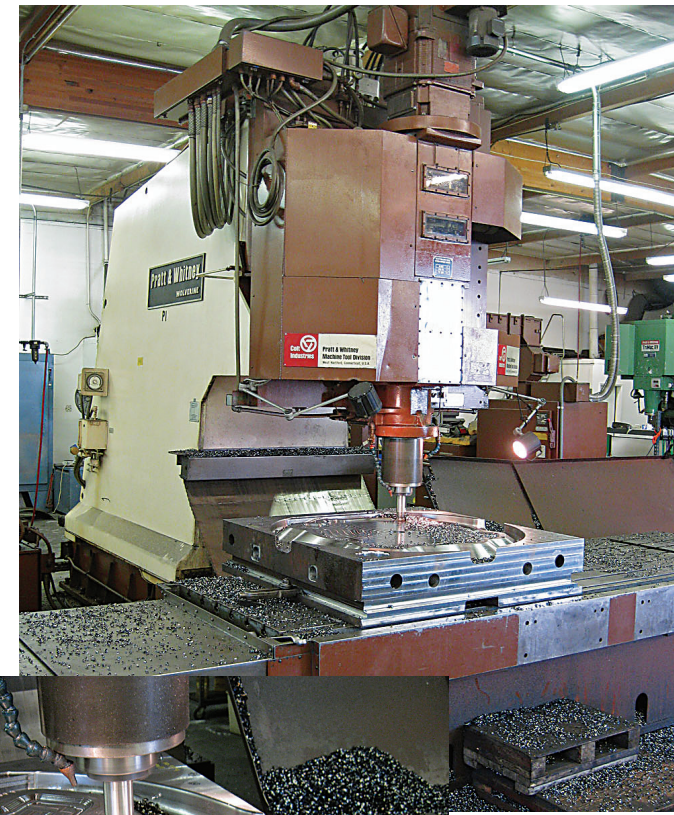
New Life for Old Iron

Retrofitting is an effective and economical option to make new money with old machine tools.

By Alan Richter, Editor



Machines in Motion

A Pratt & Whitney Wolverine milling machine that Machines in Motion retrofit cuts hardened steel.

C.V. Tool's six 1980s-vintage lathes were experiencing a combined 10 hours of downtime a week because of obsolete controls. The controls were difficult to repair and the wires were deteriorating.

The shop thought about replacing the three Cincinnati Milacron and three Mazak "turning workhorses" with new machines, but the units were well-maintained and took mostly light cuts, noted Kenneth Mattson, plant manager for C.V. Tool Co. Inc., Fitchburg, Mass., a manufacturer of hardware for various industries, including steam turbine, nuclear and aerospace. The shop typically cuts bronze, 400 series stainless, Ni-resist cast iron and mild steel.

Because the NC lathes were mechanically sound, retrofitting them with new controls, electrical systems and drive motors on the two axes made sense. Retrofitting the machines would prevent removing them from the shop and incurring rigging costs, so C.V. Tool decided to retrofit, Mattson explained.

The shop looked at several machine tool retrofitters, including one that wanted to move the machines to its facility to scrape ways and perform other rebuilding work. C.V. Tool ultimately chose AHS Machinery Service & Sales Inc., Tylersport, Pa., whose bid was only for retrofitting and therefore did not require moving the machines.

Like others interviewed for this article, C.V. Tool found real value in retrofitting, provided that the machines being retrofit met specific criteria. Mattson described AHS President Robert Sorensen as being the most "realistic" about the process, understanding that the fairly straightforward turning, boring and facing operations C.V. Tool performs on the lathes didn't require all the "bells and whistles" that a new version of the machines' old control would provide. Instead, Sorensen recommended a DynaPath CNC for the six machines, saving about $30,000 per machine compared to the new-version option. After discussing the pros and cons, the shop's operators and maintenance personnel agreed with Sorensen.

Although the machines may be large, the retrofit price doesn't have to be. "The one thing a lot of people don't understand is the cost of the retrofit has very little to do with the size of the machine," Sorensen said. "The CNC doesn't know or care how big the machine is. A small machine with a complex toolchanger might cost more to retrofit than a very large horizontal boring mill with manual tool operation. There's very little

Learn more about machine tool retrofitting

For more information about the benefits of retrofitting a machine with a new control, view a video presentation from Machines in Motion Inc. on www.ctemag.com by scanning the QR matrix bar code on your smartphone (app available at get.neoreader.com) or entering the following URL into your Web browser: **cteplus.delivr.com/1hvdh**.

PLC operation to contend with there."

To minimize production disruptions, AHS retrofit the six machines one at a time over the course of a year, with each taking about a week and a half to complete. AHS did most of the engineering and design work while the machines were still in service.

"The machines tools that weren't getting retrofit were running around the clock [to maintain production]," Mattson said.

Meet the New Control

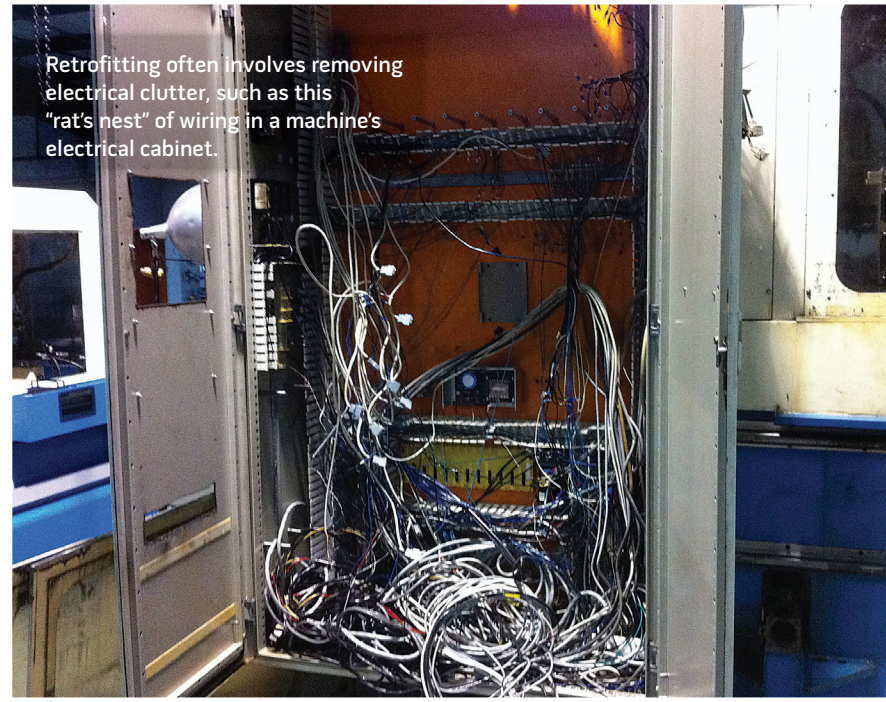
Except for some minor changes to the program format, such as positioning characters differently, programming stayed the same after the retrofits, according to Tony Botti, NC programmer at C.V. Tool. The existing programs required some tweaking to run correctly, he added, but then "ran right off the bat."

Although change can be intimidating—especially after running the same control on the same machine for more than a quarter of a century—the operators found the new DynaPath CNCs were user-friendly and significantly more reliable than the old ones, Botti said. "After a couple days of working with the control, they were able to increase their setup speed."

In addition, the DynaPath is efficient, requiring fewer buttons to push and screens to navigate through compared to the old CNC. "Each screen can do quite a few operations vs. having a bunch of knobs and buttons like the old control did," Botti said. "Operators are able to do their work quite quickly."

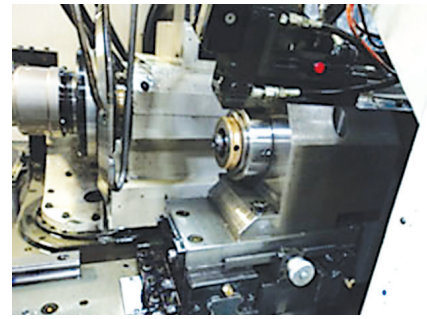
The retrofits also streamlined the equipment, eliminating a stand with a computer and monitor on it, an electrical cabinet and a lot of wiring from each machine. The original computer and monitor measured about 4' high × 2' wide × 1½' deep, and the cabinet was about 5' high × 3½' wide × 3½' deep, Mattson pointed out. Each retrofit machine has a control pendant that measures 2' high × 2' wide × 6' deep and hangs in front of the machine. "It opened up everything," he said. "Even the airflow is better because a couple of these machines are in corners."

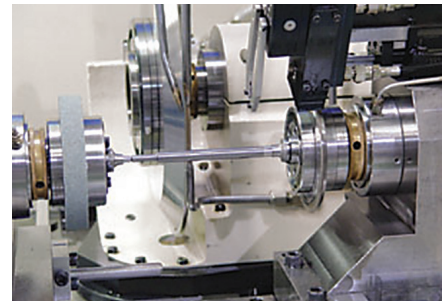
The increased space enables setting fixtures and other tooling closer to the machine, enhancing operator efficiency, Botti added.



Retrofitting often involves removing electrical clutter, such as this "rat's nest" of wiring in a machine's electrical cabinet.

International Tool Machines





International Tool Machines

Before-and-after photos of a peel and plunge grinder International Tool Machines retrofit.

One thing that didn't change is the speeds and feeds for the machines. "Downtime is what we're saving on now," Mattson said.

Retrofit Benefits

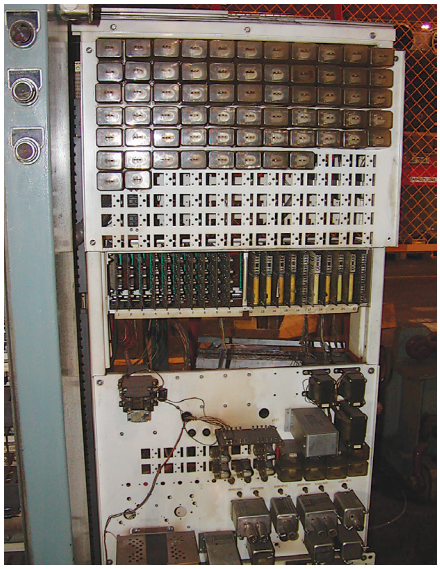
"A retrofit is going to give you first and foremost reliability and repairability," AHS' Sorensen said. "When some of these old controls fail, you can't find the parts for them or, if you do, it takes a long time."

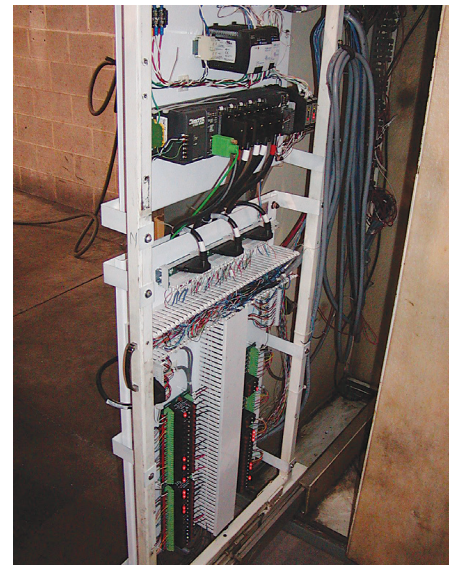
He added that customers often inquire about putting bigger motors on a machine to boost cutting speeds, but that's a mechanical function rather than an electronic one. Besides, getting a machine to cut at 1,000 ipm isn't the challenge. "The problem is the machine wasn't built to operate at those speeds. You're going to have excessive wear at least and you might have more serious problems with heat buildup," he said. "I tend not to promise improvements in cycle times."

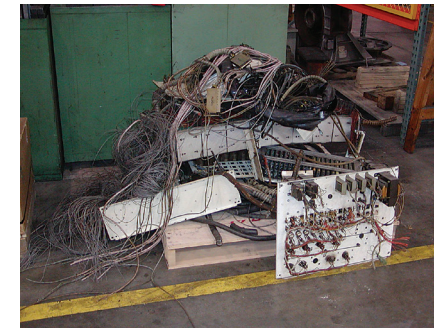
Other benefits retrofitting provides include the ability to monitor machine conditions, such as tool load and oil and bearing temperatures, that the old control might not have offered. The control can then be somewhat interactive and change the feed rate based on tool load, Sorensen explained.

A retrofit can also provide new control features, such as the ability to write and edit programs at the machine, graphically plot on the control screen what the part is going to look like and enable conversational programming. According to Sorensen, those features enable an operator with fewer skills than a machinist to run the machine.

Nonetheless, a retrofit will not radically alter a machine's capabilities. "If I was building a new machine today, I could take full advantage of the CNC," Sorensen said. "On a retrofit, unless we add sensors and







AHS Machinery Service & Sales

These images show the control and electrical system originally in a machine (left), the equipment retrofit by AHS Machinery with standard industrial hardware (middle) and the old hardware and wiring AHS removed from the machine.

some hardware, the new control is limited to doing the same machining operations the old control was doing. It just does them in a more user-friendly manner."

Upgrade to Familiar

Doug Laursen, president of Machines in Motion Inc., agreed that ease of programming is a significant retrofit benefit. The Chino Hills, Calif., company retrofits machines with Centroid CNCs, which come standard with the Intercon conversational part programming language. "It's essentially a fill-in-the-blank processor where you're going to pull up a canned cycle for making a rectangular pocket, for example," he said. "Then only questions that pertain to defining that rectangular pocket appear on the screen."

Laursen noted the requirements and expectations for a retrofit vary by customer. "For the most part, every machine we do is a one-off, and every customer we interface with is a one-off," he said, adding that the list of machines the company retrofits includes lasers, waterjets, grinders, lathes, mills, punch presses and specialty machines.

For example, Laursen noted reducing cycle time is important for a production shop, possibly requiring a retrofit to include an upgrade to AC brushless motors to increase cutting speed. An aerospace manufacturer, however, might be primarily concerned with improving machine accuracy and may want to add linear encoders and scales. A typical job shop may just want to make a machine it was struggling with easier to use.

"A lot of times, they are just sick and tired of dealing with floppy drives and RS-232 (a standard for communication between devices) and want to upgrade to Windows or something that's familiar and easy to use," Laursen said.

Michael Kelley, mechanical engineer for International Tool Machines, Palm Coast, Fla., emphasized how the company's retrofits extend the life of the CNC grinding machines ITM builds, which can be 25-plus years old. "The strategy tends to be economical as the retrofit machine runs almost like a new machine," he said, noting a retrofit is usually 30 to 60 percent of the cost of a comparable new grinder. "Many customers find a high return on investment when an old machine is retrofit."

ITM also says each retrofit is unique and can include replacing the CNC and any worn or brittle wires, upgrading software, updating the mechanical assembly and reconfiguring drives and motor spindles. "ITM tests all the existing electrical components in the electrical cabinet and replaces any that are not compatible with the new control system," Kelley said.

A retrofit will cost less than half the price of a comparable new machine, according to Laursen, and the more expensive the machine, the smaller the percentage a retrofit will cost. "It could be just 10 percent of what a new machine costs," he said.

Retrofit Candidates

AHS' Sorensen noted the best machines to retrofit are mechanically sound, U.S.-built, NC and CNC machines from the 1970s and '80s. "They were built to last a lifetime." Many of those machines, which might have cost $300,000 to $500,000 new, became available when large U.S. factories closed and the machines sold for scrap value, he added.

"These machines can still be found at liquidation auctions and offer a great opportunity to purchase good iron at a low price," Sorensen said. "Many of my customers have done that, factoring the cost of an immediate retrofit into the purchase price."

C.V. Tool's Mattson pointed out that newer machines are often made with "very light metal" and don't have the durability to justify retrofitting. "You can run them for 3, 4, 5 years, but then you are almost going to have to throw them

contributors

AHS Machinery Service & Sales Inc.
(215) 257-0571
www.ahsmachine.com

C.V. Tool Co. Inc.
(978) 353-7901
www.cvtool.com

International Tool Machines
(386) 446-0500
www.itmfl.com

Machines in Motion Inc.
(877) 733-5500
www.cncmachinesinmotion.com

away," he said.

Although converting an old manual machine to CNC is possible, it generally is not the best avenue to take because of the cost. "If you're going to spend the money to do the CNC conversion, you might as well spend a little extra to make sure everything else is in top condition," Sorensen said. That would require a rebuild or remanufacture.

ITM's Kelley noted retrofitting a CNC machine is almost always more suitable than converting a manual one from the perspective of reducing cycle time and enhancing repeatability, and the decision largely depends on what the user wants to accomplish with a CNC machine.

It's not unusual for an end user to believe adding a CNC will be a "cure all" for a machine, especially one purchased used from a seller "who swore it was in perfect condition," according to Machines in Motion's Laursen. "They think they'll have a brand-new machine when I'm done and rarely is that the case."

In contrast, a machine a shop is using is a better candidate because the shop knows what it's capable of. "It's the level of expectation," Laursen said. "They don't have false hopes that it's going to suddenly jump up and dance around like it never did before."

Because, as Sorensen previously noted, a CNC doesn't care how big the machine is, many users suffer sticker shock when inquiring about retrofitting Bridgeport-style knee mills—a common smaller machine. "I don't even quote them anymore because people get insulted when I tell them what it is going to cost," he said. "The truth is the price of the hardware is the price of the hardware. It doesn't matter that it's going on a machine that doesn't cost as much as the CNC does."

Machines in Motion

Machines in Motion retrofit this Cincinnati Milacron Sabre vertical mill with a new Centroid control.

Therefore, retrofitters tend to focus on bigger machines. "I just got a contract for two large Pratt & Whitney lathes," Laursen said. "I'm looking forward to getting those done."

Better Shop Around

It's possible for end users to save money by doing retrofits themselves in-house, but it's not advisable because they may not know enough about the electrical aspects of a machine, according to ITM's Kelley. "The manufacturer would have the proper tools, parts and knowledge of the installation," he said.

Kelley added that it's best to consult the OEM as it has the drawings of the electrical and mechanical layouts. Otherwise, target a company that has experience working with the control being retrofit. "Expect delays if you don't go to an expert," Kelley said.

Targeting a retrofitter with a good track record is sound advice because anyone can buy the electronics and claim to be able to do a retrofit—or at least start it. "We've done a lot of cleanup jobs," AHS' Sorensen said.

Machines in Motion's Laursen suggests contacting the retrofit control manufacturer for recommendations when considering a specific retrofit service company and talking to other customers to get a sense of a retrofitter's work. That should include inquiring about replacement of wiring, relays and encoders. "We usually replace all the electronics because that's the heart and soul of a precision machine," he said. "I suggest buying all new electronics when reliability is critical." **CTE**

About the Author: *Alan Richter is editor of CTE. He joined the publication in 2000. Contact him at (847) 714-0175 or alanr@jwr.com.*

Scott Beller
North/Southeast Sales Representative
(847) 714-0183
scottb@jwr.com

CUTTING TOOL ENGINEERING®
From Cutting Tool Engineering
August 2012 | Vol. 64 | Issue 8
www.ctemag.com