



Machining

CNC Machine Programming: Advanced Skills Are in Demand

Don Sears | Oct 23, 2018

What are the skills needed for CNC machine programmers today and in the future? We explore.

To say that the manufacturing environment is changing would be an understatement. Advancements in machine and factory automation, 3D printing, tooling, and machine-based metrology and analytics are helping boost production output. They are also leaning heavily on engineering and machine programming talent to take advantage of this technological evolution.

In 2018, manufacturing sentiment is strong as reflected in job opportunities, raises and job satisfaction. A recently published compensation **report** from Tooling U-SME finds positivity abounds in the industry: 68 percent of hourly workers and 73 percent of salaried workers saw wage increases in the last year. Similarly, 68 percent are satisfied or very satisfied with their current employment.

"The 327,000 new [manufacturing] jobs over the last year represent the best 12-month stretch in 23 years," **noted** MarketWatch's Andrea Riquier in August.

One job area that is in high demand is CNC machine programmer. CNC machine programming on advanced 5-axis machines blends three-dimensional thinking with high-volume part-making at scale. One part operational, another part creative problem solver, the CNC programmer is crucial to today's manufacturing—and will be for the foreseeable future. The Bureau of Labor Statistics **expects** demand for this role to expand by 16 percent through 2026.

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The Importance of Understanding Processes

Today's advanced manufacturing is complex. It requires a holistic mindset and understanding of how different systems are interconnected and rely on each other to make it work efficiently and profitably, says Joe Vanstrom, a lecturer at Iowa State University's industrial manufacturing program.

During the last recession, wearing multiple hats was a necessity. Now, without enough highly skilled machinists and programmers in the workforce, the wearing of many hats continues, Vanstrom explains.

"When you bring automation into the picture, you're asking a robot to interface with a machine that's generating parts off of code," says Vanstrom. "With the kind of precision parts we are making these days, the old way of just writing G-code by hand is not as easy."

When you look at super-efficient assembly lines of "pick and pull" robots moving parts around and welding and operating in an automated fashion, it's amazing, but it did not happen all on its own, Vanstrom explains.

"Someone had to program that," says Vanstrom. "Somebody had to understand how that will work."

It's not only that you are running CAM systems, but also having an understanding of how to program, say, a robotic arm.

"You'll have to program the end of the arm attachment that picks the part you just made so that it can go on a pallet for a materials' handler to grab," he says. "So you're having to learn a lot more."

Are today's students able to handle all the complexity that exists in today's manufacturing?

"Better than most people I have ever been able to work with," he says. "Most students today understand they live in the most interconnected time we have ever had. They may not have all the skills of previous generations, but they have a wider skill set than most people give them credit for."

The Relationship Between Machine Programming and Automation

It's good news that manufacturing is doing well, but strong activity does not necessarily help companies find all the talent they need to fill highly skilled machinist and machine programming positions. Academic and industry experts we spoke to at *IMTS 2018* and beyond all point to an accelerated volume of automation as the future of manufacturing and **possible solution** to bridging skilled talent needs.

But it will require people who understand how to build and manage the systems of automation. Machine programming is essential. You need to understand the variety of canned cycles and quick codes—and how to design for automated toolpaths.

"The people that can do automation well are the people that understand the processes," says Joe Vanstrom, a lecturer at Iowa State University's industrial manufacturing program.

As automation becomes more and more essential to manufacturing production—and programming becomes a bit more "canned" within controller and simulation software—what are the skills that future CNC programmers will need?

"In the future, software will do more and more of the heavy lifting," says Kevin Finan, a machining instructor at Atlantic Technical College in Coconut Creek, Florida. "But the jobs and skills will change and require higher skill levels than some may be accustomed to ... The jobs of just pushing the 'green button' are in the past."

What Does It Take to Be a CNC Programmer Today?

Educators we spoke to believe it needs to be a mix of STEM and STEAM: You need science, technology, engineering and math skills—but you also need a flair for creative thinking, which means some exposure to arts. They all believe in the value of learning to build parts on manual machines.

"Having a good foundation in math is really important to be a machine programmer," says Finan. "You don't need calculus to be a good programmer, but you do need to be creative."

Atlantic Technical College's program, which has high school and adult students, is only 14 months. Students gain a certificate fairly fast and are ready for apprenticeships and jobs where they can grow their earnings quickly once they prove their skills. In coursework, they learn how to use 3D CAD/CAM software including Mastercam and Solidworks.

Finan admits that he doesn't think students necessarily need four years of technical training today, but they do need a foundation in how parts are made, including learning on manual machines before programming. Originally from Ireland, Finan specialized in machining in high school and did a long apprenticeship in Germany. He has over 25 years of machining and tool-making experience.

"In today's manufacturing, you have a lot of people trying to wear a lot of hats right now," says Vanstrom. "You have the automation people trying to generate the programs, and you have operators down on the floor trying to do process improvements."

You can learn how to use software without a doubt, says Vanstrom, but it doesn't mean you know how to make a good part. For Vanstrom, there is also a business mindset that is needed—and an understanding on how to collaborate with other roles.

One of those other key roles that machine programmers will work with is a process engineer. Process engineers focus on system and efficiency improvements.

"Machine programmers will have to ask themselves, 'Is this the best way to machine this part?'" says Vanstrom. "You will need to interface with process engineers to help determine the best and most profitable way. Margins can be extremely tight."

What are the other skills that are needed? An understanding of technical drawings, for one, since you will be programming based on an engineer's design. But you will need the ability to do more than just programming because once parts are running well on machines, there will be other tasks to take care of, including communication and collaboration with other team members.

"You have to be able to work with people and interact professionally with others," says Finan. "Programmers who *just* program today? I think those days are gone."

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Machine Programmers Are Coming from Different Disciplines Today

"A lot of companies are now hiring mechanical engineers and training them on CNC programming," says Finan. "It definitely works, but there are some elements that can be missing."

The missing element? Understanding practical part-making at a manual level.

In a time of high demand for CNC programmers coupled with the most experienced machinists reaching retirement age, getting technical machine skills quick, fast and in a hurry is a bit of an industry necessity regardless of whether they came through manual machine training or not.

Job advancement with skill development can come very quickly. Jose Anaya, the dean of community and student advancement at El Camino College in Los Angeles, relays that some students who enter apprenticeship programs in his region do not necessarily finish their full four-year degree because they are offered good-paying jobs in aerospace. They can still obtain certifications as they work—but the high demand often leads to immediate job placement.

"The skill sets that are required of future programmers will make you awfully good at a lot of other things," says Finan.

What do you think is the future of CNC programming? Share with your peers.

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