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Terry: ...and loading machine, and hitting "Cycle Start," and learning from there is going to be more difficult.

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Mike: From the Center for Occupational Research and Development, welcome to Preparing Technicians for the Future of Work. I'm your host, Mike Lesiecki. In each podcast, we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, and forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

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Our guest today is Terry Iverson, President at Iverson & Company in the Chicago area.

Welcome, Terry. Tell us a bit about your company and about yourself.

Terry: Good morning, Mike. First of all, let me thank you for having me on. And I appreciate the opportunity.

Our company is Iverson & Company, and we're a machine tool distributor, rebuilder, and service provider in the midwest United States based out of the Chicago area. And this is our... I think we're completing our 90th year in business. So, I'm the third generation owner. And in a few days, it will be the completion of my 40th year.

Mike: All right, good. Well, thanks. Thanks for giving us that information. It helps us to know a little bit more about you. Terry, let me start with your perspectives on what is driving CNC manufacturing today. What are the drivers?

Terry: CNC manufacturing today…there's a number of different things that are driving manufacturing in the United States. I think the first element is global competitiveness. We, for the last maybe two or three decades, have been driven by being competitive globally with the world market. That didn't used to be as much of a case going back into, say, the 80s versus the 90s, and beyond.

I think also that there's a skills gap in the average age in manufacturing employment, and the need for—and this is a very popular, widely spoke topic—the need for more young people to join the manufacturing ranks. And so, that is a significant barrier.

There's also, one of the other things driving manufacturing in this country, is there's a compelling argument or point where "reshoring," with people considering the total cost of ownership to bring manufacturing back to the US, it gets right back to one of the initial points. And that is, "Do we have the adequate manufacturing employment with the influx of manufacturing coming back into the US?"

Mike: Yep. As you look at the industry, from your perspective, there are basically four major types of control systems out there in the CNC world. Now for those of us who aren't exactly involved in those every day, what are they and what do educators and prospective technicians need to know about those four major systems?

Terry: Well, being in the industry for the last 40 years and kind of coming on to the scene in 1980, CNC started to populate and the technology drive started to begin in this country right around the time that I started. So, that being said, there used to be control builders that were very prominent that are not as prominent anymore, or maybe left the CNC market entirely. Some of them went into PLC programming and etc. But FANUC is certainly the world leader in control technology. They also make motors, and robots, and much, much more. They're one of the largest CNC technology companies in the world—if not THE largest. But having said that, they, of course, are on platforms for milling, turning, grinding, and others, as well as robotics.

Siemens is another platform. They do very well in the conversational side and in the five-axis machines. Siemens, of course, is a German company. FANUC being the Japanese company.

As far as another control builder Heidenhain seems to reside in the five-axis technology and possibly a little bit more of the grinding, as well.

And then, of course, in this country Gene Haas with the Haas equipment and with the development of their own control, which is based on FANUC format, they certainly have become their own control builder for their own equipment. And so, they've done a great job in the education market. They've also done a great job in the general machining market and manufacturing market as well.

Mike: Terry, you said "Siemens on the communication side." What do you mean in that sense?

Terry: Well, on the conversational side, Siemens does, I think, and this is just my opinion, a really good job in the conversational side. Meaning that they've developed, I think it's called "shop turn" and "shop mill," where you can answer questions and program sophisticated machine tools by filling in data, material, tooling information that you can store. And, not that the other companies don't do the same thing—I think Siemens has a niche in the five-axis technology and in the conversational side. Now, they also have an ISO side like everybody else, but I see that that's one of the value adds that Siemens has kind of risen to the top. But Haas does something similar—I think they call it "quick code." And then FANUC does something similar over the years. But these are just differentiators that I see. And once again, it's just my insight, not necessarily what the industry thinks as a whole.

Mike: Terry, suppose you've got a student in an educational program? Do they need to know about all four of these? Or would a knowledge of one be easily translatable out in the workforce? What's your thought?

Terry: I think that's a really interesting question that I think educators need to consider. And that is, there's different philosophies in a shop where, it depends on your staff, and your technicians, and the people that are teaching the young people. But I think you can go the route of having different controls. And that puts a lot of pressure and a lot of skill requirements from the instructor himself of the class.

Mike: Uh-huh. Yeah.

Terry: If you can't navigate having multiple platforms within your educational institution, I think it's really important to understand the differences. And if not demonstrating the differences, at least allude to, and go to some degree of effort, to try to show what a FANUC does different than a Siemens. What a Siemens does different than a Heidenhain. What a Haas does different than the FANUC.

Mike: Right.

Terry: And so, in education what you'll find is that there is a lot of Haas equipment. It's affordable. It's pretty sophisticated. And yet there's other control platforms and other machining platforms that are more sophisticated. So, I think the better that a instructor or a CTE director can do at differentiating and educating the student—or students—as to the differences and the nuances, the better prepared they are when they're sitting in front of a potential employer to say, "I learned on a Haas." Or "I learned on a FANUC, but I do understand these differences. And I think I could transfer that knowledge base into a different platform with a little bit of tutoring and mentoring by someone on staff."

Mike: Sure. That makes sense, Terry. Let me ask you a little bit more about some of the emerging trends that you see. Things like six-axis technology. Machine intelligence. Industrial Internet of Things. Cobots. What are you seeing out there? What's really emerging that we should know about in CNC-manufacturing machine world?

Terry: Oh, boy. Well, let's start with the Internet of Things. With machine learning, I think what I'm seeing coming and start to come on is "adaptive controls," where the control will sense when you're not optimizing, say, a motor or a drive during a certain operation. And so, it'll increase the feed rate on its own, knowing that you need to maximize the cutting conditions.

Mike: Right.

Terry: Then there's also sensors. And with the emergence of big data in everything that we do: marketing, and web searches, and Facebook, and Google. And all these technology companies are using big data to the highest form of science in an analytical way. And I think the Internet of Things, what that is indicating is that the machine learning through sensors and through data collection, and analytical means will start using that to the manufacturing floor. So, when you look at downtime, when you look at different reasons, and different productivity losses are

identified, that we'll be able to become even more efficient in our manufacturing processes.

So, I think one of the more interesting things that educators have been able to jump into is the additive manufacturing world.

Mike: Sure.

Terry: With the additive manufacturing world, with 3D printing, there is and was such a thing called stereo lithography, which, from my background and exposure, was basically steel and metallic 3D printing. Then 3D printing came into the fold after that, and was affordable technology, and allows young people to really understand manufacturing in some capabilities that never existed before. The fact that you can 3D-print a working model of something from a prototype or research and development facet is just amazing.

Mike: Sure.

Terry: When it first entered on the market, I never really thought that it would be a production-capable, noteworthy process. But I think the longer time goes on and the more technology advances, my initial thought is in error.

I think what you'll find is that at some point, you may see 3D printing in the metallic capacity, for example, on a milling machine, and as a result, it'll 3D print a blank. And then, on the milling machine, you'll have a milling cutter, and drills, and taps, and etc. And then you'll go and machine that actual 3D-printed component on the table of the mill. And then you start implementing five-axis technology. Now you can orient that part that's just been 3D printed and machine it. And, especially from a standpoint of production of a very sophisticated part, or a prototype environment, that's a game changer!

Mike: You think a student in one of our programs should have some level of knowledge of additive manufacturing, 3D printing? Will they be asked that when they go into a job interview? Is that an expectation now of employers? That they'll have some knowledge in that area?

Terry: Yes, and no. I think 3D printing, Mike, is a basic process that is very tangible and can be demonstrated very cost effectively in an educational setting.

Mike: Yeah.

Terry: And it's fairly advanced in concept, in terms of what you get at the end of the day, so to speak. You have an assembled unit that you 3D printed—that actually functions.

Mike: Yes.

Terry: Now, can it live up to the stresses and strains of the actual assembly? Well, in many cases, no. But to be able to visualize a working model that you just 3D printed with very minimal processes above and beyond that, is a huge learning opportunity. Now, having said that, when you go into manufacturing, depending on what their product is, what their processes are, they may or may not do 3D printing. But the concepts you learn from 3D printing are absolutely astounding. And I think as 3D printing advances in terms of technology, it will be more of an everyday process in a lot of different manufacturing companies.

I've heard of manufacturing companies that do nothing but 3D print.

Mike: Yeah.

Terry: And they'll have dozens of 3D printers, and they have them all programmed and running 24/7. And that's an entirely separate business model of itself.

Mike: Right. Let me ask you another question on this sort of "emerging things." Let's talk about cobots for a moment. Are we getting to the point where the technician or the operator's going to stand back and let the cobot run the machine?

Terry: Okay, this is a very delicate subject. And I need to make sure I try to explain myself as best I can.

Mike: Okay.

Terry: There's a lot of people that think that the buzz word that's bad or that's feared in the workforce is "automation, robots, and cobots." And I differ from that standpoint. And let me explain why.

One of the first things I said in the interview is that we're in a global manufacturing setting. And every year it gets more and more competitive. And so, we've been competing against countries around the world whose labor rates are significantly lower than ours...

Mike: Yes.

Terry: ...with the exception of Europe. And Europe has done a really good job in developing the workforce with apprenticeship programs, accepting in their culture, and holding people with skill sets in the vocational set in very high regard. And they've figured out how to be competitive by making very high-end products. And that is how they've been able to compete in the world market. In Asia, and China, and India, in countries

that have just enormous——probably three to four times the population we have, their labor rates have been historically much lower.

And I did a study for my video series that I started, where the labor rate going back in the 70s, was about 125 times more in this country than what it was in China. And over the years, it has gone from 125X to 33X to four to eight times. So, what I've seen is the labor rate in China has gone up astronomically, which starts bridging the gap in terms of the actual labor content.

In this country, with the employment of cobots and robots, what I've seen is——a lot of people, the entry point into our market has been load a machine, close the workholding device, close the door, and hit "Cycle Start." And so, yes, I think the cobots, because they've come down in cost, and they're way easier to program than a traditional industrial robot, that explosion has already started in this country.

And so what has happened is there's going to be more people that are going to be needed to be employed, but as we go more towards that, the entry point is going to be more difficult. So, that's going to put the onus on the educational sector, for technical education and CTE, to bring those skill sets up more rapidly in a more relevant fashion.

So, we need people to do more inspection of parts, we need people to do programming of cobots, or set up of machines. The cobot's not going to program the machine, not going to set up the machine. It's not going to process the part. So, the entry point of the low-cost labor is going to diminish. And what's going to expand, Mike, is the skill set in the market for more skilled technicians that can do more within a company. And the better we do in the CTE field at educating them in all the different processes, all the different setup components of the different processes, in all the different inspection and statistical knowledge, then I think the manufacturing workforce and employment, the pay will be higher, and there'll be more employment. But the entry point will be more difficult because just showing up one day and say I'm here to work...

Mike: Right.

Terry: ...and loading the machine, and hitting "Cycle Start," and learning from there is going to be more difficult.

Mike: Some really good insights there, Terry. Speaking of people in the workforce... You've been a real advocate for careers in

manufacturing through this initiative that you've created, Terry. It's called CHAMPION Now! I'm going to put a link to that—and your book—in the Show Notes. Your book is titled *Finding America's Greatest Champion*. Would you tell us a bit about what you've learned and what works through your CHAMPION Now! experience?

Terry: Oh, once again, a very loaded question.

Mike: Right. Haha!

Terry: You're good at doing that, Mike! Well, let me just say that I did—what I call a deep dive into technical education about early to mid-1990s. And in doing so, keep in mind, in the beginning of the program, I mentioned that mentoring young people has always been a priority for me.

Mike: Yes.

Terry: And so, when I did a deep dive in technical education, it allowed me to... When I was a travel soccer coach, I mentored young people in athletics, but also in life, in terms of how to be a good citizen, a good adult, a good, responsible human being.

And so, in technical education, when I did a deep dive, I realized as a result of my customers saying, "Terry, I just can't find enough people. Or I can't find enough talent. I can't find enough skill level in employees. And every year, every decade, it's gotten worse and worse and worse." So, I came up with the term CHAMPION Now! And CHAMPION is an acronym, which is "Change How American Manufacturing Is Perceived In Our Nation." Everyone chuckles because that's the longest acronym ever.

Mike: Right.

Terry: But I think the more resounding component is that the word "champion" is a very positive term. And manufacturing needs all the positive terms it can use. The "Now!" component to "CHAMPION Now!" is to make a difference and to do something and take action.

So, that being said, that allowed me to become more of a perception-changing entity around the country. And then I really didn't feel that, from a credibility standpoint, until I offered something to the market that nobody else was doing—and I had a pretty vast network over the last 35 to 40 years of manufacturing people, of coaches, of just very interesting people. And I decided to put all these people together that I found fascinating—that each were doing something different—

into a book about what I called "*Finding America's Greatest Champion*."

And so, what I tried to do, and I think the subtitle, I find to be something I'm extremely proud of, is "Building Prosperity through Manufacturing, Mentoring, and the Awesome Responsibility of Parenting." So, what I tried to do in the book is I tried to bring more "value add" than just the book about manufacturing. And bring into the component of two things I feel very strongly about, and that is: mentoring young people through my coaching and through hiring people within my own company and training.

And then also, when I coach young people, I saw that the parenting model in this country has changed dramatically. And not from my viewpoint, from my lens, not from the standpoint of being better, because too many parents are worried about trying to be their child's best friend, than elevating their responsibility, their accountability, and their moral lens, so to speak, because it's hard and it's not as popular between the child and yourself.

Mike: Sure.

Terry: And so, different people that I interviewed for the book either came from the parenting perspective, or mentoring perspective, or manufacturing perspective. And I feel putting them all together is a good value proposition for anybody that might want to read it.

So, in terms of the "CHAMPION Now!" experience, what have I learned? Well, I've learned that I need to continue to add more value, so that more people will want to get involved and participate, because that's the only way change will happen.

Mike: Right.

Terry: I've started a video series of what I call a "Virtual CNC Boot Camp" or "Manufacturing Camp," which I think I have close to about three hours of content at this point. And so that's something that, from a CTE standpoint, would be additional resource to add on to curriculum to tie the relevancy together with what CTE and manufacturing program instructors can use to tie the content of curriculum to relevancy in the real world.

Mike: Cool.

Terry: That might have been more than what you asked for, Mike! Ha!

Mike: No, that's good. Because what's interesting, Terry is you've got a historical perspective here, right? You've been working on this for 30, 40 years. And it helps seeing what you've seen.

What matters. How things can change, as you mentioned. And I think that's really good for our audience. And I'll make sure that we put links to those materials and those resources that people can easily access in the Show Notes.

You know, Terry, it's been quite interesting today. We've really covered the gamut, right? We started with those different systems, those different control systems: the FANUCs, the Haas, and Siemens, and folks, and what our students need to know about those, that at least their understanding of those as they enter into the workforce. So, I thought that was important.

And then to those drivers that you mentioned: the machine learning that's happening in places. The use of big data. And those key things where additive manufacturing is real now. It's a real part of this equation. And that idea that you talked about of a hybrid between producing a part by additive and then milling it further, on the subtractive side. A very interesting concept.

You didn't say that you hated cobots. You said that there's really a role for them, but they're not going to be taking over the machining floor. But it really does change the role. I like the term you use, it "shifts the responsibility" for those operators, for those technicians, into what they're doing now. Terry, I thought that was really important.

And then finally, you talked about an opportunity for the United States and how we can be more competitive. That "big niche" that you mentioned. I thought that was a strong point, strong message for U.S. manufacturers.

Terry, I want to thank you for all the time today out of your schedule, and really giving us a very broad perspective of everything from what's driving CNC manufacturing today to opportunities for America's industry. So, really appreciate the time and comments that you made today.

Terry: Mike, I really appreciate the opportunity. And I'm honored to participate in your interview and your podcast. And, if there's anything I can do for you, please let me know.

Mike: Thanks. I'll make sure we put all those links in the show notes. Thank you again, Terry.

Terry: Thanks very much.

Mike: That's it for today, listeners. You heard Terry Iverson talk about the emerging trends in CNC manufacturing. And when he said, "It's more than loading the machine and pressing 'Cycle Start.'" That's really true. The technician today is more like a

person who orchestrates the machines, the robots, the technology. And that's created a whole series of new career opportunities.

In fact, your action for today is to deepen engagement with industry and education to show how that future of work is changing—changing the view of manufacturing careers and career opportunities for young people.

So, educators invite your manufacturing friends in to talk about this future and the technologies that the students can relate to, like robots, and additive manufacturing, and 3D printing.

Industry members, reach out to your education partners, and engage them in new ways that focus on emerging technologies. Help change the perception.

As always find our podcast on PreparingTechnicians.org, or subscribe on Apple Podcasts or Google Play. A rating and review is always appreciated. Our series is produced by John Chamberlain at CORD. Thank you, John. And the project is led by Principal Investigator Ann Claire Anderson. Thank you, Ann Claire. And thank you, our listeners, for *Preparing Technicians for the Future of Work.*

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