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Dave: I'll be honest. The manufacturing today is incredibly exciting. We've been looking at some of these changes for a couple decades. The technology has really caught up with the changes that we thought would occur in manufacturing. It's happening these days. So, it's such an exciting place to be. So many manufacturers need employees. And I think these are incredibly fun jobs. They're challenging jobs. They're exciting careers.

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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, 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 Dave Vasko. He's the Director of Advanced Technologies at Rockwell Automation. You know, Dave, in addition to a lot of things, I know you've got 75 patents out there. That's pretty great! Would you mind telling us a little bit about what you do at Rockwell? And also, for those of us that aren't that familiar with Rockwell Automation, give us a brief overview on the company's initiatives.

Dave: Sure, Mike. Thank you. So, Rockwell Automation is the world's largest company dedicated solely to industrial automation and information. At Rockwell, what I do is probably the greatest job in the world: looking at technology gaps that we have in the company and how to

solve those. So, I manage the teams working on applied research. We look at problems that we're going to be having in the future. And we try to develop solutions to those problems, look at those gaps, and develop them enough that the development teams can then take those and deliver products, services, solutions around that.

Mike: That's excellent, Dave. As I was looking at some of the remarks that I've read that you've made, here's one: "As we think about preparing technicians for the future, automation systems need to become more intuitive and more simple, so technicians can use them more productively." Dave, that makes a lot of sense. What does that mean? Tell us first about automation systems, how they're evolving. And then number two, what technicians should need to know and be able to do.

Dave: So, we're bringing a lot more technology on to the factory floor. And this is generating huge productivity gains. It's increasing the quality. It's doing all kinds of incredible things. But it's creating a lot of complexity for the technician. So, part of the responsibility is making it simpler for the technician. So, when they interact with the systems, they can be more productive quicker. They can help to install, service, maintain, and predict when things are going to fail. So, that's definitely part of what we need to do and bring those automation solutions to the technicians themselves.

The training, I think, is a key aspect of this. They're going to require different skills than they've had in the past. They're gonna need software skills, without a doubt. They're going to need the ability to configure networks and, in cybersecurity systems, firewalls, in order to just do their jobs. They're going to need things like collaboration skills and communication skills—be able to work with people in other disciplines going forward.

Mike: Dave, how did they get these skills? Well, I guess there's two things, right? You could have someone that's currently in the field. Currently a working technician. So, let's call it "upskilling."

And then there's those students who are in technology education programs that are going to emerge into the workforce. So, let's start with the current employees. How do they upskill to meet these needs? Is it built into the machines? Do they go to vendor training? How does it work?

Dave: Yeah, there's a lot of training that's available. There's either vendor training, a lot of the schools are doing training. We've even started training classes ourselves. We actually have Academy for Advanced Manufacturing. And that's actually taking people that may have had some technical training, primarily it's geared towards veterans, and providing them with the skills they need. And there, it's a 12-week program. It's very much "hands on." So, every day they come in there. They do hands-on training. They work with programmable controllers and the industrial networks, and the sensors, the drives. And they solve real application problems. And they do it in a teaming environment like they would in a workplace. That's been a very successful program. We were trying to scale to 1000 people per year and to get more people involved, because I think it's a tremendous opportunity for technicians in industrial space.

Mike: So, you offer that Academy to your customers? employees? Or how does it work?

Dave: We have veterans we bring in. We actually screen veterans. We bring them in. And it's primarily for our customers. Most of the technicians go to our customers. And the people coming into the program, they actually get a stipend for going through the program. All the training is paid for. And the placement is very, very high.

We do require a little bit of flexibility as far as where they'll actually work. But we have companies that are interviewing all the way through the process to make sure they have a job when they get out of that.

Mike: Okay, so I'm gonna keep going on this one, Dave. On that Academy, do students learn about AI (Artificial Intelligence)?

Dave: In that one, they don't. So, what that program is, it's really a 12-week jumpstart and you have the basic skills you need. We train people on Rockwell Automation equipment, but those skills can be applied to any equipment. So, we give them the basic skills they need. And really, over the next year, when they're working at a job, they'll get the additional skills they will need for that particular plant.

Something like AI, I think is important for people to learn, particularly people that are in the industry today. I think it's important to actually learn AI though, because we see so much of that coming into the workplace.

And I see so many misconceptions about that. There's a lot of hype. There's a lot of opportunities there. I would recommend everybody go through basic training there.

One I'd recommend would be: University of Helsinki has an "Elements of AI" class, which is just exceptional. It's free. If you haven't touched mathematics in a decade, it'll probably take you about 30 hours to go through it. But very well done. I'd highly recommend that really, to anybody to be able to sort through what is real, what's going to impact, and what is just hype.

Mike: You know, I think I'm going to put a link to that in the Show Notes for our listeners, Dave. University of Helsinki. What was the title of the course again?

Dave: It's called "Elements of AI." That's the initial course. But they also introduced a follow-up course to that, if you want to go to the next stage and go a little deeper. But yeah, I'd recommend that to anybody.

Mike: And let me ask your opinion about technical education programs around the country. There's many manufacturing technology programs at community colleges, automation programs, robotics. I'm not sure all or any of them—well, some of them, I suppose—have an "Introduction to AI" course. Should all of them have that?

Dave: I think it's important to do that. Just because I think there's a lot of misconceptions. And even, you watch the things on the media. You follow different articles. And there's people all over the board saying that we're going to have self-driving cars in 2017. And other people say, well, we'll never have them.

Mike: Yes.

Dave: And I think the truth is somewhere in between, but it's important to understand really the differences. So yeah, I would recommend that. I don't think that's the first skill they should learn. But I think it's definitely important, particularly as you look to the future. Because those people that are able to work with artificial intelligence and leverage it are going to be so much more impactful in what they do. And I think that's the key: people using those tools, like AI, to be able to do the jobs better.

Mike: You know, we're on this discussion of training approaches. Educational approaches. What about things like just-in-time training? Or sometimes, a tool or a piece of automation equipment... Can it actually have some training embedded right there on the tool today? What's your sense of that?

Dave: Yeah, we're seeing this emerge more. And I think that's gonna be a trend in the future. It's impossible to really train people for everything that could happen in the factory. Some of these things, I'm thinking of things that may not happen all the time, just-in-time training may be more appropriate.

So, we're seeing things like augmented reality getting much more inexpensive, much better resolution, and quality there.

And I can see that we'll see just-in-time training evolving from that. And some of that may be tailored, maybe somebody wants to have a checklist. They've done this 100 times, but they want to make sure they're doing it right. So maybe they'll ask for a checklist, to walk them through something.

It could be somebody that maybe wants to see a video of how this should be done, and the video would be delivered to them. Or it could be somebody that really needs an expert to help them out. And in that way, maybe an expert would get online and actually watch what they're doing. And that expert could be a person, or it could be some sort of AI that's helping along with that experience.

But that training really needs to be a lot more flexible to allow the technicians to be productive. And to learn how they want to learn it.

Mike: I like your key because a lot of the things that you say end up with the words, "helping those technicians become more productive." I think that's an important theme of what you're talking about.

You know, Dave, I heard you use the term "location independence." Does that mean working remotely? Or what does that mean?

Dave: Yeah, working remotely. We see more and more of this. We see less people standing right at the equipment, but more people working in the background. Helping out with the equipment.

So, used to be we would fly experts around to help them troubleshoot or to do those transitions when we're going to initial commissioning. And that could be done remotely. And with the tools that are coming in place, particularly with some of the augmented reality tools coming in place location independence really is possible.

Mike: So, a machine goes down. Does that also mean bringing in, let's say, an expert troubleshooter? Or somebody from a tool maker? Vendor? Bringing them in remotely onto the scene?

Dave: Yeah, precisely. And what we could do, we could analyze the machine and do that remotely. So then when we bring that expert in, that expert actually has the context of what the state of the machine has been, where it is now, and they can then walk a technician on site through the procedures of troubleshooting and getting it going again.

Mike: Think about those technicians. I mean, I know we expect them to do everything from preventive, to predictive maintenance, to troubleshooting, to getting that piece of gear right back up and running as soon as they can. But what other expectations are there for these technicians now? And in the future—next year or two? What do you think?

Dave: So, I think one of the big things we're seeing is just the commissioning. And how that changes. So, we're doing things with digital twins and with virtual reality to be actually able to create these manufacturing lines virtually before we ever commission them. And the expectation is that the commission will go much faster. That the productivity will match the design productivity. And the quality will match the design quality or the highest quality. And the technicians will play a part of that, actually trying things out ahead of time. Doing debugging while still virtual, instead of having to move equipment around. And that's gonna be so much more productive. Actually, I think it's gonna be a lot of fun using those tools!

Mike: Well, I think so too. That really does change the role for a technician, doesn't it? It really brings them into making things happen. Making everything more productive.

Dave: Yeah! The other thing is that we see the technicians helping with the continuous improvement. As things are in the factory, as they have information they need, being able to make changes to optimize the solution right there.

Mike: Excellent. That's a great comment. All right. So now let's talk more about these technicians. Are technicians being augmented by cobots? What's the relationship between technicians and robotics (cobots) out there on the factory floor? Is it changing? What is that relationship? How can we better understand it?

Dave: Yeah, so the cobots are a way of supplementing or enhancing the skills of the operators. For those operations, which are very repetitious, they can be taught to a cobot. Either a technician or an operator can teach that to a cobot. And that's actually very simple to do.

If you're ever at a automation fair, stop by the cobot booths and try programming one of these cobots. They are very easy to program. And they allow these highly repetitive jobs to be done automatically. And the technician would definitely play a part in that and helping decide when those would be applied and how those would be integrated into the systems.

Mike: Isn't it funny, Dave, I went to one of those automation fairs, I guess it was maybe 2015, I can't remember exactly. The word "cobot" might have been used, but they certainly weren't around everywhere. And then, I think, around 2018, and since then, they're everywhere! Isn't it amazing how fast that's changed?!

Dave: It is! It is! And we're going to see something else emerge. We have cobots, which are fairly slow and low force. And that makes perfect sense.

And then we have traditional robots. We're going to see the hybridization, really, a mixture of these two emerge as well.

The downside of the cobots is that they're very slow. They don't move as fast. So, we'll see traditional robots which will take on cobotic modes. They'll be able to operate very high speed when people aren't present. And then as people come into the work zone, those will slow down to a slow speed, a low force operation, so they can work closely with the people and really supplement them as well.

Mike: I hadn't thought about that! It makes a lot of sense, doesn't it?

Dave: Yeah, it does. And I think we'll see that more in the future. And then you're going to see more mobility with the cobots and the robots. So, they'll actually be interacting with each other and with people in the plant. And we'll need to ensure the safety of the workers as that occurs.

Mike: Dave, you talked about teaching these cobots. In many of our programs around the country (I'm talking now about community and technical colleges), programming is part of the course, whether you're doing ladder logic for PLCs, or you're doing some other simple types of programming. Do you think technicians will have to do that more or less in the future? I mean, what's going to happen when it comes to programming?

Dave: Yeah. So, I think where possible, we'll try to do much more of it automatically. So, we will have like with cobots, or robots, you will demonstrate where things need to be. And they could do the programming themselves. We are seeing some spatial programming, where you are putting different pieces together, and they're automatically working in the desired manner to achieve an outcome. But an increasing use of libraries. So, instead of starting from scratch, if you're doing consumer-packaged goods or beverage application, you may be able to use libraries that get you much of the way there. So, those things will be present. But we will see the technicians working to try to optimize those things.

And there will be some programming that occurs. Particularly looking at possible errors that occur, error routines. I think it is very easy to put systems together and to have them interact for initial operation, but some of those error modes and putting those checks in place are still going to require people to spend more time with this. That is where a lot of the programming occurs.

Mike: I know this sounds like a funny question. But we're at a, let's say it again, a two-year associate's degree and only there's only a certain amount of credit hours you can cram into those things before you reach the limit. So, if you add new things, you're faced with taking something out. Sometimes it's a tough decision. And I'm just wondering, if you had to give advice to a college program, how much computer science and IT should be in an automation program or a manufacturing program? What's the balance there? That may not be an easy question.

Dave: It's not. And this is something we struggle with. And you really have to set priorities. So, within our own program, we have to work with the customers that need the students. And we have to decide how to do that. We try to get them with the basic skills they need, where they can then build on that and help to learn in the future. I think that has to be some IT skills, though. Almost everything we're doing these days is going to rely on connecting manufacturing equipment with the IT. And the people that have those skills are going to be in demand for quite a while. So, I think that those are some things they definitely need a basic understanding of.

Mike: Dave, it's interesting that you said this. In the last couple of podcasts in our series, this same theme has emerged: the convergence of OT and IT. And you're amplifying that message again, in a very strong way. And I think what you're saying, if I can paraphrase it is: the ability of either existing technicians, or technicians that are entering the workforce to continuously learn, to continuously improve. Boy, that's got to be a key skill that they have to have, doesn't it?

Dave: It is. It is. And I think it's true for all workers. But I think particularly with the technicians, as things are developing. It has to be continuous improvement. To be actually be looking at what's most important. Learning things. Picking up new skills. That's going to be part of it.

Mike: You know, Dave, I really appreciate all of your comments today. As I reflect on some of the things you've said there's a thing that just sticks out as crucial: this ability to commission, right? The expectation that the technician is going to be an important part of commissioning. Maybe a new process line. A new technology. A new piece of equipment. That expectation is important.

That concept of location independence. The ability to not only work via Zoom, but to operate equipment remotely, or in another room, or at a distance.

And then to interact with the automation, whether it's cobots, or other highly automated systems. The ability to interact with them.

And then this final concept we talked about is: what about programming? Can you actually do something automatically? Can you run error-checking routines? It's a different approach to programming and sitting down and writing lines of code. At least, I think it is.

Dave: Yeah, it definitely is. That's important. And when we've seen some of that even in an operator. I know, in Japan, we've seen for years and years operators have actually gone through and helped to optimize the programs. But I think it's important to have that basic programming skill as well. But I think you hit on the key points there.

Mike: It's just great, Dave. Dave, thank you so much for spending your time with us today and giving us your insights. We're going to link in the Show Notes, several of your comments. Is there a link to that Academy for Advanced Manufacturing? Is that something that we can look at?

Dave: Oh, absolutely.

Mike: I'll make sure I link to it and some other things as well. Dave, I know you have your own podcast. Its titled "State of Industry." Right?

Dave: Yep. "State of the Industry."

Mike: Right. I'm gonna link that in, for our listeners, in the Show Notes, as well. So, I appreciate all of your insights today, Dave, thanks very much.

Dave: Mike, thank YOU. And I appreciate you talking about these skills. The manufacturing today is incredibly exciting. We've been looking at some of these changes for a couple decades. The technology has really caught up with the changes that we thought would occur in manufacturing. It's happening these days! It's such an exciting place to be! So many manufacturers need employees. And I think these are incredibly fun jobs. They're challenging jobs. They're exciting careers. And I do appreciate all your help in telling the story and really helping people to make the transition. Or to become more productive in these areas.

Mike: Excellent, Dave. Thanks again. We'll talk to you.

Dave: Ok. Thank you.

Mike: That's it for today, friends, you heard Dave today talk about many things. And that included things like "location independence." The ability to, not only work remotely, but to operate tools and process technologies remotely.

He talked about the role of technicians growing to expedite the commissioning of new automation systems in industry.

You also heard things like the potential for automated programming. You know, it's sometimes difficult to write these PLC programs, right? Potential for automated programming. Lots of things that are driving change in automation and in industry today.

So, thank you, Dave, for all those insights. Several things in the Show Notes will link to the Academy of Advanced Manufacturing that Dave mentioned.

And also, Dave has his own podcast. So, take a look at that. We're going to link to the Show Notes.

And here's your action for today: Dave has illustrated in their academy how you can identify the things that a technician is capable of doing once they graduate from a program. You can see that list. It's not a long list. It uses "industry speak." It identifies those things and words that industry will understand. So, your challenge is to look at your programs, whether they're education programs, workforce development programs, and update the list of the top things that program graduates will be capable of "successfully executing." Make sure you use industry speak in your language. That's your challenge for today.

Our podcast is produced by John Chamberlain at CORD. Thank you, John. Appreciate your help very much. The project is led by Ann-Claire Anderson. Thank you, Ann-Claire. And thank you, our listeners, for *Preparing Technicians for the Future of Work*.

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