Oklahoma Innovations Radio Show

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Guests: **Rajesh Krishnamurthy**, Oklahoma Manufacturing Alliance/Oklahoma State University

>> From the OCAST Radio Network, this is *Oklahoma Innovations*, a weekly science and technology radio magazine, brought to you as a service of OCAST, the Oklahoma Center for the Advancement of Science and Technology. OCAST is the state's only agency whose sole focus is science and technology. The OCAST mission is to identify and fund promising research and technologies that allow Oklahoma to compete in a global market economy from our own backyard. This program features some of Oklahoma's most gifted scientists, inventors, entrepreneurs, manufacturers, educators and business leaders who all have one common goal: developing technology based economic growth for all Oklahomans. Now, here are your hosts Gary Owen and Chad Mullen.

[Music]

>> Welcome to this week's edition of *Oklahoma Innovations*. Thank you so much for joining this week. Gary Owen along with OCAST's Chad Mullen and we are in Stillwater, OSU territory this week.

>> Yeah. Gary, a little bit-- I'm a little bit like a fish out of water bin. I know you [inaudible] myself, but excited to be here in Stillwater, there's a lot of great things going on in this part of state.

>> This is a-- This is a wonderful part of the state. Of course, Stillwater is a buzzing community and OSU is a beautiful campus. We are at the Meridian Technology Center. Tell us a little about these facilities.

>> Well, the Meridian Technology Center is-- it's a career-- is part of CareerTech system. It's the CareerTech system for the Stillwater area. The particular building we're in is the Business Development Center and it's an incubator for new emerging companies, small tech-- or small businesses, high tech companies that are looking together, foot off the ground. Then in our next radio show, we'll actually hear more about that from Brad Rickelman the Vice Director of the program.

>> We're going to be talking this week about manufacturing. We have-- And OCAST has a wonderful strategic partner which we have talked about and we've interviewed guests, the Oklahoma Manufacturing Alliance. Talk a little bit about that.

>> Well, sure. Sure, Gary. The Oklahoma Manufacturing Alliance we think is, here at OCAST, is just a vital part of Oklahoma's success story. The Manufacturing Alliance is primarily funded through NIST which is the National Institutes for Standards and Technology, and then OCAST. And then they partner with organizations across state, Department of Commerce, CareerTechs, universities to sponsor manufacturing, and it sends some agents and application engineers which we'll hear from in just a minute. We have Dr. Krishnamurthy here who's a-- not an extension agent, but an applications engineer. So we think it's vital in Oklahoma to have manufacturers that look to save money to become efficient with their operations to bring in new technology into

their operations, and then figure out a way to really remain competitive globally, not just within the US or within the state, but globally. And there's a lot of competition. Their OMA--

>> There is.

>> -- is a great partner in helping this company stay viable and competitive and most importantly profitable.

>> Have you had an opportunity to tour some of the manufacturers around the state yourself?

>> I've had an opportunity to tour many of the manufacturers around the state and that it's simply there's couple of things amaze me. One, the level of technology that most of these manufacturers have adopted today. It's not the manufacturing of old where, you know, it's dirty and just a bunch of hard labor going on. It's actually a very clean environment. It's very efficient and very high-tech environments. And then secondly, the other thing, the breadth of products that are manufactured in Oklahoma astound me. I mean, we manufacture pretty much anything you can imagine.

>> Pretty broad. Yeah.

>> Yeah.

>> Yeah. And I've been impressed the few that we've gotten to tour and do programs for, I was amazed at how streamline they are, how efficient they are, how organized they are, you know. I think manufacturing in general, not just Oklahoma, but I think nationwide, we tend to have a perception that it's, you know, it's just a lot of stuff and it's dirty and it's really not. I mean, manufacturers today, they run a pretty slick organization.

>> Yeah, absolutely. I think the amount of robotics, the amount of sensors, the amount of programming that's involved to keep these operations and these machines running is simply amazing and that really their commitment to lean operations, to-- in getting out the waste in the manufacturing process is truly remarkable.

>> That's what makes them profitable, too. That today that because of technology and because of guys like our guest today, engineering has played a key role in using-- integrating technology to help manufacturers see the vision of how to be more lean and more profitable. Let's get to our guest because I think he's going to share some really cool insight to what the alliance is doing and what applied engineering is all about. Why don't you tell us about our guest?

>> Well, our guest, Dr. Rajesh Krishnamurthy is an applications engineer with the Oklahoma Manufacturing Alliance. His position, and correct me if I'm wrong, sponsored by Oklahoma State University, offices at Oklahoma State University. So it's a really good connection between the world of academics, academia, and industry. And so I think Dr. Krishnamurthy brings that connection to it and he's going to tell us all about that and about some of the exciting programs that are going on the OMA. But now, Gary, you want to talk a little bit about a couple of things that are coming up before we get to that, Manufacturing Day--

>> Absolutely

>> --and the conference.

>> Absolutely. You know, most people don't know this. And I did a little homework on. This is pretty cool. There is a-- an event called Manufacturing-- an official Manufacturing Day held in, usually, the first Friday on October. And the mission of Manufacturing Day addresses common

misperceptions about manufacturing by giving manufacturers an opportunity to open their doors and show in a coordinated effort what manufacturing is and what it isn't. And by manufacturers working together during and after Manufacturing Day, manufacturers begin to address skilled labor shortage they face connect with future generations. They take charge of the public image of manufacturing and ensure the ongoing prosperity of the whole country. So I thought that was kind of interesting, Manufacturing Day. And I think this year the marked day was October 2nd, but as I said earlier, Manufacturing Day I guess could be any day if they want, right?

>> Yeah. That's right.

>> That's right.

>> So also coming up, we have an event in Oklahoma where many Oklahoma manufacturers collaborate and I'm proud to emcee the event. It's the 2015 Oklahoma Conference on Manufacturing. This year it will be held at Wednesday, October 7th from 8 to 4 at the Embassy Suites Hotel & Convention Center in Norman, Oklahoma. So if you are a manufacturer listening to this program this weekend, be sure and put that on your calendar, and I'm sure a lot of people who-- already registered because it's getting close.

>> I believe so. And it's a great event. You know, if you're in the manufacturing line of work, you should definitely attend. There's usually an opening sessions. They get to hear some of the kind of the broader things, the broader trends that are happening in the manufacturing world. And then also there are breakout sessions in the afternoon so you can find some topics that's specific to you or your industry. But more importantly, I think as the case of most of these events, the networking opportunity is fantastic. So you get to meet all the folks from the OMA including our guest that we have on the show today. You get to talk with them. I'll be out there. Well, OCAST will have the booth, so we can talk about some of the things that we're doing in that area. But more importantly, you get to talk to fellow manufacturers across state and learn what they're doing, how they're doing with challenges and perhaps I-- we hope, maybe there's some synergy between the companies there as well. So, great event, make sure you attend. You can find out more at okalliance.com.

>> And if you-- whether you live in the Oklahoma City area whether you live in the Tulsa area or you live in the rural areas of Oklahoma where there is manufacturing, you know that all of these manufacturers are key to employment, job growth and, of course, not just punch revenue into the economy which everybody benefits from all that. You know the one thing we don't think about and I want to address Dr. Krishnamurthy about this is the manufacturing process. Everything we use in everyday life is manufactured, from the clothes we wear--

>> Yeah.

>> --to the things that we use--

>> Yeah, yeah.

>> --from-- when you think about computers, when you think about automotive, when you think about cellphones, when you think about simple things like the things we use in our home whether it's soaps, whether it's linens, whether-- I mean, it's all manufactured.

>> Yup. Yeah, it is.

>> So talk about that from your perspective because you do obviously connect with a lot manufacturers because you are an applied engineer. Is that right?

>> Yup. One of-- yup. What--

>> What does that mean?

>> Applications engineering is basically we do technology transfer. So when you bring in a new design or a new product idea, we kind of help them go along with the testing phase and then design, bring it to manufacturing stage and then try to connect it to what the customer really wants and is willing to pay for it. That's part of the lean improvement process too. That's what we try to do in overall general perspective so as an applications engineer.

>> When you talk about not just Oklahoma, but United States manufacturers based on your collaborations, how do we stack up against the international world? Are we more streamline in most cases?

>> I would say I have seen some of the manufacturers that I'm very impressed with what they do and like for example ASCO in Stillwater. It is an international company, but they are in Oklahoma and they chose Oklahoma Stillwater to make their manufacturing facility compared to the rest of the United States. So when you walk in that facility, it's so clean and it's so lean.

>> Wow.

>> That's impressive to see that. And we do have, what I call, a lot of pockets of excellence. We have a lot of work to do, but that-- there's another company in Broken Arrow, Access Optics. They make the lenses that are so small that it's just about the spec of a dust.

>> I think we've interviewed them.

>> Yeah.

>> And they do great work.

>> So tell us about the program you're involved with at OSU, the Applications Engineering Program. How did this all come about? I know it's contracted by the Oklahoma Manufacturing Alliance, so tell us about that program.

>> The App Engineering Program I believe was started in 1997. And we-- OMA contracted to-- I believe OCAST was supporting part of that money for it. And we started out as helping small manufacturers. Our mission is really to help small and medium scale manufacturers with engineering assistance. That's how we started. In a lot of cases where you have manufacturers that are four or five people; they can't afford to have any full-time engineering on staff.

>> Yeah.

>> And that was the whole premise behind studying the App Engineering Program. We currently have about four engineers, including myself and doctors Dane Thomas and Dan Fisher from OSU. They run our program. We're pretty much independent. We're spread across the state by territory and also our expertise. For example, Win Adams in the Northeast and myself, we're industrial engineers background and Doug Enns and Don, like the other two engineers, are more mechanical engineers. So wherever our expertise is needed, we just go across the state and try to help them as best as we can.

>> Well, it's a great program and Gary, there's always a lot to talk about bringing technology in a manufacturing and as displacing jobs and that sort of thing, so we hear a lot about that. And one of the things I'm sure Dr. Krishnamurthy we'll talk about later in the show, the fact of the

matter is many of these manufacturers would not be viable if they didn't bring in this technology, if they didn't figure out ways to do things and we-- with a more lean approach, more automation, more robotics, all these sorts of things. So they're competing globally, they're competing with wages that are, you know, measured in pennies in some cases across the nation. But what they can do here in America, what they can do here in Oklahoma is create a quality product, a consistent product. We have a workforce that produces, you know, a high quality, highly consistent product. And they can do it in a way that they can still be profitable in OMA and the Applications Engineering Program goes along way ensuring that that happens throughout our state.

>> When we come back on our next segment, we're going to talk to Dr. Krishnamurthy about some of the projects that application engineers typically get involve with. And I think you're going to find that it covers a lot of territory. I'm just blown away by looking at the list we have here. So stick around, we're going to learn a lot more about how engineers make-- play a key role in helping manufacturers around the state of Oklahoma when we come back on *Oklahoma Innovations*.

[Music]

>> When I invented my new product, I faced a lot of challenges from securing capital to recruiting qualified employees. It's a very complex path from innovation to the marketplace and I needed some help navigating the process.

>> The Oklahoma Center for the Advancement of Science and Technology and its strategic partners, the Oklahoma Manufacturing Alliance and i2E help entrepreneurs. They support existing and startup companies so they can succeed and create jobs, increase per capita income, and grow the state's economy. In its 26-year history, OCAST has funded nearly 2500 research projects and provided support to hundreds of Oklahoma based companies. The investments made in these businesses yield high returns for our state by strengthening and diversifying our economy. Advancing innovation is investing in a positive future. That's what OCAST is all about. For more information, call OCAST toll free at 866-265-2215 or visit us on Facebook or our website at ocast.ok.gov.

>> Now in its 20th year, this is *Oklahoma Innovations* on the OCAST Radio Network.

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>> We appreciate you joining us on this week's edition of *Oklahoma Innovations*. We're talking about manufacturing and how applications engineers through the alliance, the Oklahoma Manufacturing Alliance, help manufacturers. And, you know, you don't think about this, but we have large manufacturers, we have medium size manufacturers, and we have small manufacturers. And all of them have their own individual challenges. And so that's why we're interested in talking with our guest this week, Dr. Rajesh Krishnamurthy, an applications engineer. And so Chad, I'll let you take on from there.

>> Well, Dr. Krishnamurthy, thank you again for joining us. And tell us a little bit about how does the process start? How do you engage with manufacturer? Are there leads that come to you? Do you reach out to them? We're just kind of curios to find out or if a manufacturer that's listening today wants to engage with you, how would they do that?

>> OK. Thank you, Gary and Chad for bringing me on the show. The way it starts is the OMA manufacturing extension agents are the key to the whole process. They get in touch with the

manufacturers every day and they know what the manufacturer needs are or even if the manufacturer felt like he needs to, in a way, move to a certain area, he would just mention it to the MEAs and that's where the whole thing starts. And the MEAs would contact us and say, "Hey, you know, could you come by and pay us a visit?" And the manufacturer set and set the needs are. And that's how we get started with the whole process.

>> So do you-- Do you do a walk through and do analysis?

>> We do. We do on-site visit and then we would look if there's a problem, is it a specific or is it a bigger problem than what we imagine? There are some times we have to involve other partners like the Industrial Assessment Center. We have done some work with the USDA REAP grants or, you know, we can also have them write grants for it. So that's how we get started in the whole process.

>> Well, that's great. Now, once you have the opportunity to meet with and engage with the manufacturer, what are the some of the services that you provide?

>> Some of the services typically would be a layout, a re-layout process for manufacturing facility. When I talk about layout, it's not just moving equipment around, it involves mapping your people, product, process, and also the information that flows through the facility. A lot of times that seems to be overlooked and people think just moving an equipment is done and that's part of the deal, and we're done, we're efficient now. But all that links that connect to the machine, information and the people and that all need to be looked into. So that's where we try to help a manufacturer. We've done a lot of layout projects. We just finished United Engines project last year, consolidating three of their facilities into one building for them. The other projects could be a-- like energy audit. When we did a layout for Tonkawa Foundry about a few years ago, we noticed that you could apply for a grant for the USDA REAP grant and offset some of the cost from their production equipment. And that was interesting, so we have helped them apply for it. And that's all come this part of a re-layout or building expansion projects that we do. The other type of projects we do is we do, like I talked about information flow mapping. Companies call us and say, "Hey, we need to know what kind of ERP system or a database that we need to buy for our facility." It's not just going out to a car dealership and buying a brand new car, it-- there's a lot more involved. They need to understand what they want to use and what type of data that they want to collect and how it's connected to the people that use them, how many licenses for example and there's so much involvement in that process. So we need to start with mapping of the-- this whole process, how information flows through, and then we give them the map and say, "Now you can go and shop for a new ERP system." So that's being one of the new projects that we are taking on over the few-- past few years.

>> By the way, I want to mention one of the processes that you're talking about when you talk about manufacturing plant layout, you're talking about moving equipment. Now, I can tell you're hands on as an observer and I know Chad can collaborate here as well that when we go visit a plant, we take the tours, some of these manufacturers have got some enormous size equipment. I mean--

>> Yeah.

>> I mean, that you think it's going to take, I mean, a couple of cranes to lift some of the stuff and you're going to move it in a large 150,000 or 200,000 or more square foot plant.

>> Yeah.

>> And you say, “How are you going to move this stuff around?” But what I have noticed is those that have done this, they got wider aisles, they’ve got safety zones better marked around. And this is things that they-- average layperson, if you’ve never been in a manufacturing plant before, it’s amazing what they have to do for safety reasons.

>> Yup.

>> But what you’re doing is you’re helping them maximize usage of square footage. Am I right?

>> Usage of square foot. And also we do look into ergonomics. We do look into safety and we try our best to conform to local OSHA standards in city and whatnot. So that’s the whole process in relaying out a facility. Where we do not get into is we don’t provide a structural design work or the state prohibits us as engineers do that kind of work. But we can give them conceptual drawings and at least that’s a step ahead for them to go to a contractor and get it done.

>> And logistics is an important factor with what you help them with as well, not only transport to and from, but also within the facility.

>> Yup. I got a good-- I call-- I’m a big believer in what I call a system. The system consists of everything, people, product, and customers, and suppliers. So when you change something in one part of a system, you had to be aware that there is something else that also need to be change. They’re all connected. So when we do any project, we try to not just do one part of a project. We kind of question our customers or clients or manufacturers, “Do you really want to do this? And can you check and see what else is going to be affected down the road?” It’s short-term forecasting, long-term planning, and it didn’t lost everything. So there are times when some things can be overlooked and then you end up three, four years from now and say, “Why did we do this?”

>> Yeah. Yeah.

>> “Maybe we need go back to drawing board.”

>> Yeah.

>> We want to wipe those kind of--

>> And costs are the key.

>> Yes, absolutely.

>> It’s very expensive when you start looking at transition. Well, we have not even touched the surface yet when it comes to how does technology fit into this, what’s behind all of that technology and how all of this is integrated. And you’ve got a unique way and I think Theatre of the Mind, you’ll be able to describe this to our audience because I wish this was a visual program because you could see right on his computer how he demonstrates the manufacturers restructure and reorganizations. It’s very cool. We’re going to talk about that when we return at *Oklahoma Innovations*.

[Music]

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>> Research and development, technology transfer and commercialization, creating high paying jobs in Oklahoma is what OCAST is all about. This is *Oklahoma Innovations* on the OCAST Radio Network.

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>> This week on *Oklahoma Innovations*, we're talking about the Applications Engineering Program at OSU contracted by the Oklahoma Manufacturing Alliance which provides on-site one-on-one focused engineering assistance and technology transfer services to small and medium sized Oklahoma manufacturers. Currently, there are four application engineers right across the state by territory and expertise. And our guest, to help us understand this program, is Dr. Rajesh Krishnamurthy and he is an applications engineer.

>> Well, Dr. Krishnamurthy, welcome back to the second half of the show. We're excited to have you here. In the first half of the show, we're talking a little bit about plant layout and design and how to make the most sufficient use of that space. And that's really important from a cost savings measure instead of having to build a new building or heat and cool additional buildings, you may be able to get all of that in there plus it reduces your flow time or your flow days, depending on your operation. But we're talking about, you know, going back and looking at existing operations, now, is this something that a new manufacturer that's relocating the state to take advantage of?

>> Yup. Yes, yes, absolutely. It's either a new manufacture or even a new entrepreneur that come up with a new product and then say, you know, "I need to know how I can set up a manufacturing facility and what should I do." All he needs to do is look-- do some marketing analysis, bring those numbers to us and we can help him set it up, up to the point where he can go and talk to people building those buildings and--

>> Well, that's fantastic. And I imagine a lot of the industrial parts that have marketing groups they probably--

>> Yes.

>> --probably talked about that one, they're luring perspective companies toward the state.

>> Yup.

>> So that's fantastic. Now, you also have another great program called Predictive Systems.

>> Yes.

>> And tell us a little bit about that and how it got started and what it is.

>> Let me start with this little story about a few years ago when I was working on Tonkawa Foundry layout. It's probably about four, five years ago. We were talking about two dimensions of CAD layout. And we were moving stuff around but, you know, Foundry really have the pipes and the tubes and everything that comes on. There are great programs that are out there, but they are expensive. And so once we do a layout and we handed it out to manufacturer, it-- the chance of it getting updated as they do continuous improvement is zero to probably-- unless they have a staff, an engineer, and software to edit it. We were looking on and we were searching for it and Win Adams, my colleague from Northeast came up with that, say, "Hey, Google has this new program which is free called Google SketchUp and we ought to start using it. And it's a three-dimensional program too." So we started playing with it and that's how we started with the CAD 3D modelling part. When we finished started doing a lot of these 3D modeling CAD layouts, it helped regionally for manufacturers to look at it and see-- I mean, this more is pretty close to reality. And the cost of them is absolutely free. You can get a professional version for it for $500, but that's a one-time fee and it's--you know, it has the manufacturer to do more, more and more work. But going back to the story, so the next step was if we had processing times and if we could find a way to have that layout to spit out some numbers for us, that will be amazing. And that's when we started looking into Simio which is a simulation software that we're going to talk about in the next few minutes. The term predictive systems came about was there are not only the simulation software, there are further new technologies that are coming in like optimization programs. In future, if we ever want to-- I just don't want to say, this is a simulation program. That's why we give the name predictive systems. What it means is you actually could take an actual system, which is a manufacturing system, and you model it in such a way that it's a virtual system and you make changes to it. It could be an external change, such as supplier not delivering products on time, or you have quality issues with the supplier or any-- it could be anything. It's not really related to improvement alone, but you can also forecast and say, "Well, like the oil and gas industry, we have now-- what happens if we have the cycles coming and go in over a 10-year timeframe?" Now we can model that if we had historical data for it and say, "How can you staff and how can you grow those cycles of up and down in sales?" So that's what the predictive systems is. Now, instead of you actually doing this on an actual system, you're just modelling it beforehand in a computer and you're getting the data out and you prepared for it.

>> Wow.

>> And so that's why we'd use the word Predictive Systems.

>> Let's talk about the technology behind all of this.

>> OK.

>> You-- I'm a client, I'm a manufacturer, you're coming to my facility, you go through the plant.

>> Right, right.

>> You do some analysis. And I want to be more streamlined, I want to be more productive, I want to get my bottom line more profitable. So you have a CAD system I assume of some sort that you help if I want to make changes of the plant.

>> Yes.

>> Let's talk about that.

>> OK. The software like I mentioned, we use a Simio. And what we do is we take a look at their existing layout and that's where we would start. There are two parts to it. One is a physical dimension is what I call. It's a layout in two scale. We bring that into a CAD program. The second part is all the logics that work behind. How do you schedule your parts to the shop floor? How do you-- How often do you ask your supplier to bring in materials? All those logics is what we want to capture and that-- and then we bring it into it. In short, going back to my 30,000 feet level line, you actually mimic the actual system into your CAD model. And that includes people. We can even have-- we can have people modeled in there. We can go as detailed as every step as we can. So that's what we want-- bring to the manufacturer. Then the next step is what we go through is a sort of what they call as a Kaizen event in lane or we call it as a predictive assessment cycle. We have our own terminology on that. And we ask, what can we change to this and what do you want to see get changed in there? Is it a positive change or is it a negative change, is what we need to interpret at that. So a client usually has a lot of ideas, say, "You know, I was thinking about buying that machine and I wanted to bring it in. Do you think it's a good idea?" So the software can also take financial data, it can actually replicate your profit loss sheet on it if you put in all the numbers right. And so when we make a change to a machine, replaced it with a million dollar machine, we're going to look at how long does it take for you to pay back on it. And also, most manufacturers use just not one products, they have variety of products and then they can actually adjust their manufacturing flow to, say, for me to pay back this million dollar machine, maybe I need to include more products into that and have--

>> Yeah.

>> --the machine run those. How am I going to staff my people in there, is this an automated machine that a person comes in, loads it up and walks away. So he's freed up to do something else. So all those scheduling nuances that we try to capture it in there, so use a better picture for him rather than usually looking at it and say, "Yeah, that machine would fit right there. And maybe it's a good idea." But they do have a gut feel and I'm not saying they're most wrong or anything--

>> Right, right.

>> --they're just validating, saying, "Yup, you're on the right track and maybe you ought to think about it." And those kind of questions is what we answer.

>> One of the issues is always is a concern I think from an employee is "Oh boy, there comes a more robotic and I'm out of a job." Actually, what we have found in touring many of our-- many of the manufacturers around the state is it actually been able to make adjustments within the employment staff for better positions, more streamlined positions.

>> Yes.

>> So talk about that because that's a real key.

>> You know, this software has really helped in another way is when we do a kind of like a Kaizen event and say, "Well, we need to improve our efficiency. And we have people that are involved in that particular assembly line maybe." And we show them and say, "Look at this animation and see if you see any difference in there and see how fast the product flows through." So-- And when you look at the numbers and say, "You still utilize some way or the other. One of the electronic manufacturing company in Stillwater, we just finished a project with them, we were still able to use five people in-- across 11 workstations. And they were able to share them up to a point where they had about 50 some percent increase in output. So the-- It works and we were able to show it and get more confidence in people saying that, you know, "We're just rearranging things and not actually making people lose their jobs." It's a restructuring process is what I would call it.

>> And I would think as employee is that if I'm-- perhaps I've been a machine operator, now I'm going to get a new machine that's going to make my job more efficient and more productive. So there's some new challenges for employees there as well.

>> There's the training part to use that new machines that I believe the CareerTechs have been handling that pretty well in helping them up to speed with newer machines and newer training. The-- To answer your question, most of the time, whenever they look at the numbers and look at how both visually through the animation part of the program, we-- they were able to understand that yeah, this works.

>> OK. We got one more segment to call-- to talk about and we're not done yet folks. There's still lot more to learn about manufacturing and how application engineers help manufacturers become lean and more profitable when we return on *Oklahoma Innovations*.

[Music]

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>> We are talking about the Oklahoma manufacturing sector of our state. And we are talking about how application engineers and technology help the manufacturing sector become more profitable and leaner, better organized I would say is probably the best way we can say. And you certainly shared a lot of it. One of the things I want to tell our audience we didn't get talk about when he was talking about this new technology using-- you showed Chad and I a video before we got into the program, it's very cool to see the animation of a manufacturing plan. If I'm a manufacturer and I'm-- this is my plan, I see it on a computer of-- OK, this is how we can make it better. And he's got trucks moving, he's got conveyor belts moving, he's-- I mean, you just see the whole structure. It's pretty cool.

>> Yup, yup, it is, it is. The Head Country BAR-B-Q is what we-- what you saw was one of those plants. Yup.

>> I love their barbecues, it's wonderful.

>> Yup. They-- We worked on them on their warehouse re-layout and come to find out they want to build a new warehouse, an add on, so store more products in there and both finished in raw materials. Then they found out that they need to actually renegotiate their supplier contracts and get better ordering policies in there. That helped them not [inaudible] in another building.

>> Wow.

>> And so that's a big change. But we never really got to the numbers part when we were showing it to Rocky at Head Country. They were looking and say, "Why are those palettes not really moving?" I mean that was a question. And that kind of made sense because they have been ordering more or sometimes less when they're not-- when they barely needed it.

>> Interesting.

>> So it kept them to stabilize that inventory at least by visually looking at it like you pointed out in the forklifts moving around randomly. And so they're working, they're working right now in creating lanes and working with their suppliers and renegotiating their lead times and so on.

>> Well, Dr. Krishnamurthy, thank you again. Great information and we've heard it save as-- where we just said, it saves manufacturers a lot of money. They don't have to expand. They stay competitive. They keep their process lane. And Gary, I think about when I was growing up, my dad was-- did a lot of auto mechanic working in his garage. Everything was in its place, a place for everything, and so he could fix something quickly. Today, if I have to change the battery and my car takes me 40 minutes to find the one wrench that I need, so there's a lot to have in that.

>> You mean, you didn't learn anything?

>> I have. I'm not. I have to learn many things whether I choose to adopt them or not, that's a difference.

>> There you go.

>> But we've got-- You certainly see the manufacturing and these are profitable. And expanding are the ones that are laid out well, that are structured well, there's not a lot of ways and just chaos in the system. So Dr. Krishnamurthy, if a manufacturer in Oklahoma wants to have you guys come out and take a look, how will they get engage, who would they reach out to?

>> They would reach out to their extension agents and also they could contact me directly, but preferably to the extension agents. And the reason for that is currently, OCAST has a grant to implement lane along with our program which we call the PSI program, Predictive Systems Improvement program. They have a-- And this grant would cover some of the cost for the lane training and also their values doing mapping part and also for our simulation part. The grant would help us was to get more licenses for our software. The simulation part license is a little bit expensive compared to Google SketchUp, but the manufacturer once we're done, when we hand over the soft-- that model filed to them, they can still be able to run it on their own. There's an evaluation software that we can provide with them. They can make changes to it. And the only concern is they couldn't save it if they make changes to it. But going back to the OCAST grant, we-- there are a limited number of clients that we take. We're still looking for more manufacturers to help come and join and we can help them with the lane and the PSI combination.

>> You know, you talk about this-- sometimes I wonder if it's hard to change, you know, teaching old dog new tricks if you will because a lot of these manufacturers have been around a long time. I would think one of the road blocks when you're talking about lean implementation process is to convince plant owner, manager or process to go with the new idea.

>> Right. Right.

>> Talk about that challenge for you.

>> One of the common things and with current manufacturers and current people that we work with when we started out we ask, "So do you have this kind of data?" And it goes back to my first-- in the first segment or probably second segment, I talked about information flow and how well do you collect your data and are you collecting the right type of data? That's the strength to this whole modeling concept is if you want us to mimic your system, we wanted the data to be as close to accurate as possible.

>> Sure, it has to be.

>> Yup. And one of the things over the years we have experienced in doing this, I've been doing this simulation for about 10 years, not with Simio, but even far more worst softwares that I have--

>> I'm not sure.

>> --come across. But this software has cut down the modeling time so dramatically that sometimes it takes you two or three months with the software [inaudible] few minutes probably--

>> Wow!

>> --is what it takes. So the time to help them out, to model it is pretty, pretty less compared to what it had been before. And that's the technology part of it that had progressed so much in both competing power and also the software changes to it. Going back to the OCAST again, so we try to come in and we also do some parts of the data collection and helping them to understand the drive data to collect. Based on our experience, there are-- for example, one of the companies we

worked with, their ERP system didn't have the right kind of data, but they are purchasing an estimation department, had collected the data over the years. So if you think that you don't have data, then you probably might want to look again. This is to the manufacturers, you just have them around and you just had to start looking for it. The other road block that we kind of face is people think sometimes that job shop means every product is different. There is always a pattern and even these days, scientists are coming up with ways to mathematically express nature in its randomness. So there's always a pattern that we can always look for and say, "Well, even though your job shop and every product is different, we still can model your facility." It may not be closer to what they expect, but the numbers are what they care about and that's what comes out the right way. Validation is another part which again goes back to if we didn't have the right kind of data, we have to go back and take a lot more time in validating it. When I say validating it, I would just basically look at numbers from their natural production and say, "You shipped out so and so many parts this week. And let's see if our system will predict something closer to it." And most of the time, from what we have done in the past projects, we're pretty much right on the money with what they have done.

>>We always like to talk to our guests about the future. Granted the Predictive Systems is relatively a new program implanted, we know you only have a few people who've taken advantage of this process, where do you-- what do you hope this program will do for manufacturers? Let's say in your position right now, the next, say, five years, where do you hope this program will be and how it's implemented around the state?

>> The first-- One of the things is we always think manufacturing is about the shop floor.

>> Yeah.

>> There's the logistical factory that goes behind the scenes, which is the paperwork flow or information flow or telephone conversations that actually run that facility. They-- The Simio software has traditionally been-- or this is not new. The technology behind it has been there for about three decades. They've been very successful in banks and in other areas. So modeling the information flow or the logistical transactions as what I call, that part of it along with the shop floor is another thing that we probably need to look into going into the future and say, "So now we got a complete factory. When the order comes in, you know where the signals are sending to and who receives those signals." And that will be a-- if you want to make an improvement, that will be an ideal facility that we want to achieve at some point in time. Right now, because of time constraints and casual constraints, we're just modeling parts of a system or make-- taking assembly line and then the manufacturers are seeing benefit from it. There are some that want to just keep continuing on and do the whole facility. That's where we want to head to, is we-- again, going back to my system's theory, we don't want to change one part of a system and feel like we've done the job. We have to change the whole system and see how the links are connected.

>> By the way, if you're listening and you want to go now, what was that software? The free software he was talking about, the 3D CAD kind of software is called Google SketchUp, is that right?

>> Yes.

>> And it's software. There is a professional version that can be bought that he is-- that's he's using, it's called Simio, it's S-I-M-I-O.

>> That's the simulation software.

>> The simulation software. Yeah.

>> That is the expensive part of it. The difference between-- what we do is you can model a CAD layout in Simio.

>> Oh, OK.

>> But it takes time for us to model it in Simio. So what we do is we take the free software Google SketchUp and we model it up, and then we import it into Simio. So all we need is just do the final work on it.

>>Well, I don't know about you, but I've learned a lot about engineering, still don't understand it.

>> Nothing Google can't do, Gary.

>> I get it.

>> Hey listen, we are out of time. And Dr. Krishnamurthy, thank you so much for being our guest this week. And hope our listeners have a better idea how important it is to be a lean and profitable manufacture using applications engineering programs. Thank you so much for joining us, have a good week.

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