Boosting Productivity Today with Tomorrow's Technologies

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While technology conversations frequently have a future focus, plenty of manufacturing companies are using the IoT, Big Data and more to reimagine the workforce of the present.

(IW – Jill Jusko: 2-29-16) Big data. The Internet of Things. Smart devices. Advanced robotics. The manufacturing world is abuzz with the promises of increased productivity, better information and improved margins at the metaphorical hands of these technological advances.

However, two things often are missing from these conversations, and one is the element of time. While much of the conversation is about the future benefits of these technologies, the truth is the future is now, at least in part. Manufacturers are deploying these advanced technologies today, and their use will only continue to grow. Pratt & Whitney, for example, has big plans for Big Data. Yet its benefits have already been proving instructive for years.

The second element perhaps missing in these conversations is enough detail about the human element. How does the introduction of these advanced technologies – and many more — change the workforce's relationship with manufacturing? How do they build a better workforce, as well as a better workplace?

Ed Rodden of food processor SugarCreek can tell you that connected devices will aid in building a safer workplace. Japan's Denso believes in IoT's potential to augment employee involvement in continuous improvement. And General Electric talks about robots in terms of partners. In short, these new technologies are reimagining the workforce's relationship with manufacturing and will continue to do so.

Communicate and Connect

Like many companies, SugarCreek keeps its eye on building a better enterprise. Recently the food processor began production at its newest manufacturing plant in

pursuit of that aim. The 418,000-square-foot facility, located in Cambridge City, Ind., is noteworthy on several fronts. One, it is nearly four times larger than any of SugarCreek's five other locations. Two, three high-volume cooking cells, including what the company says is the nation's largest sous vide line, will allow SugarCreek to compete in food categories it couldn't previously. And three, it's been developed to take advantage of advances in technology, including the Internet of Things and collaborative technologies.

"The IoT … is a bit of a buzzword as many companies, including manufacturing operations, have been connecting things for many years. What's different today is the enormous variety and numbers of 'things' being connected," says Rodden, SugarCreek CIO. "At [Cambridge City] we built our network to maximize the ease and opportunity of connecting things."

"For us, the most important things to connect are people, as collaboration, in all of its forms, is a key driver to success," he says.

Rodden's words aren't so different from those of Koji Arima, president and CEO of Japan's Denso Corp. In remarks at several events, including the 2015 Frankfurt Motor Show, Arima discussed how the auto supplier would build momentum. He, too, takes a human approach to IoT. "The key is people. The operating principle is to achieve sustainable momentum by getting everyone involved in making continual improvements and in achieving breakthrough innovations," he said, according to a press conference transcript.

Importantly, "A crucial dynamic is the cyber linkage of the Internet of Things. That linkage integrates the motivated people at our production workplaces around the world. Everyone shares information in real time, as if they were all working under the same roof. That speeds our progress in transforming production processes and in transforming products," he added.

Arima describes the cyber linkage as "synergistic." "Our production workplaces invigorate each other in a virtuous circle of problem finding and problem solving."

The Denso CEO noted that Denso has 150,000 pieces of equipment on 2,500 production lines at 130 plants. They are not all integrated in the desired single,

global production platform — yet. The company's goal is to complete that in the next few years.

Connections at SugarCreek's Cambridge City location include a network that supports internal collaboration via a wide variety of devices, from tablets, telephones and applications like Cisco's Jabber, which allows instant messaging and video conferencing among those devices, to external collaboration with vendors who can remotely yet securely access and diagnose machinery. Process sensors and machine data are connected to the network, via both wired and wireless fashions.

Video cameras are used extensively in SugarCreek's operations and on its networks. Approximately 250 high-definition cameras at the Cambridge City facility assist in the safety of people and food, and also provide a wealth of analytics. "We are using video software to look for objects that don't belong in a product stream, or for the presence of people in areas they should not be in," Rodden says.

And speaking of safety, the CIO said the company is preparing to implement RTLS, or real time location services. Specifically, SugarCreek will place "tags" in the bump caps everyone must wear at the facility. These tags will track the location of all personnel in real time. It's being done primarily for safety purposes, Rodden says, and in a video he describes an evacuation scenario in which everyone's location can be accounted for.

That said, "it will also allow us to evaluate job designs and gain a much deeper understanding of where labor hours are being consumed," he says.

Pratt & Whitney's Big Data Play

As you can well imagine, Pratt & Whitney is no newcomer to big data. The aircraft engine manufacturer, a United Technologies company, has more than 10,500 engines in service and it has been capturing and analyzing data associated with those engines for decades. But where once upon a time—data storage and computing power being what it was—only several hundred parameters could be analyzed, today that number has grown to thousands of parameters. And Pratt & Whitney says its aftermarket efforts, engine maintenance specifically, will be better for it.

Big data, the company says, will allow it to enhance its ability to predict not only when and what type of maintenance is required, but also how a wide variety of factors impact engine performance. “It’s not just about the maintenance. It’s really [about] optimizing the operation for the customer,” explains Eva Azoulay, vice president for Pratt & Whitney’s Engine Services business, which manages maintenance contracts for a variety of airlines and other customers. “Their focus is to keep the engine flying. So, to the extent that I can plan [maintenance] … and to the extent that I can mitigate the number of times it has to come off for maintenance without putting at risk the reliability, that’s our goal.”

Two contributing factors to the heightened expectations are a new product and a new analysis and modeling tool. The product is Pratt & Whitney’s Geared Turbofan family of engines, which recently entered service equipped, right from the start, with far more sensors than older models and therefore able to monitor a broader view of engine performance as well as performance by specific components. And its historical record will be complete.

The new modeling and analysis tool is an initiative launched approximately 18 months ago. Collecting more data is one thing, but how you use that data is the important thing. Pratt & Whitney is using the tool to build a better predictive model, using data collected over time from the engines, as well as actual maintenance records. If you’re curious about how nitty and gritty the data can get, consider that Pratt & Whitney will be able to analyze the impact geography, pollutants and even specific airports have on engine performance, and optimize maintenance practices using that knowledge.

Azoulay says the predictive model will continue to evolve as the breadth and amount of data grow, and analytics helps connect the dots among factors that impact engine performance. Today’s model is basic, she admits. “Are we going to have a better one tomorrow? Absolutely,” she says. “We’re investing on the product, on the integration and on this analytical capability. And we’re not doing it alone—we have a third-party like IBM, we have universities, we have our own United Technologies Research Center. We’re going to pull on all that capability to help refine … the analytical piece because otherwise it’s just a lot of data and it’s not telling us anything.”

General Electric: Robots as Partners

John Lizzi, manager of the Distributed Intelligent Systems Lab at General Electric, believes robotics has reached an inflection point, comparable in some respects to that of personal computing in the early 1980s. Then it was Steve Jobs, Bill Gates and others who took computing – which had long existed – and transformed it into the ubiquitous tool it remains today. Similarly, he notes, robotics has existed for a long time in manufacturing – primarily caged and offering benefits of high speed and high precision – but a confluence of trends, including cheaper sensors and improved computing power, is changing robotics traditional role.

"The number of applications, the number of use cases where we can start thinking about applying robotics expanded significantly in the last five years, and I think that's just going to continue in a significant way moving forward."

For example, consider Stinger, the swimming robot developed by GE Hitachi. Unlike humans, Stinger can swim in the reactor pool of a nuclear power plant. During scheduled refueling and inspection outages, Stinger is being used to conduct maintenance inspections and perform basic cleaning tasks, while its human operator remotely guides its action from a safe distance away. Similarly, Lizzi points to crawling robots that are inspecting pipes, others that skim the sea floor to examine cables and still others that crawl inside gas turbines to assess and repair. GE's own maintenance service operations are employing robots' unique capabilities.

Also in the mix of emerging robot trends are collaborative robots like Rethink Robotics' Baxter, designed to operate safely with humans on a production line and trainable to perform a host of tasks.

"We [at GE] believe that robotics are going to be partners that we rely on in very much the same way we rely on our smart phones," Lizzi says.

Advanced technologies are both the present and the future of manufacturing, in the field, on the shop floor and across the enterprise. Notes SugarCreek's Rodden: *"Technology is and should be an enabler of people inside the workplace and out."*