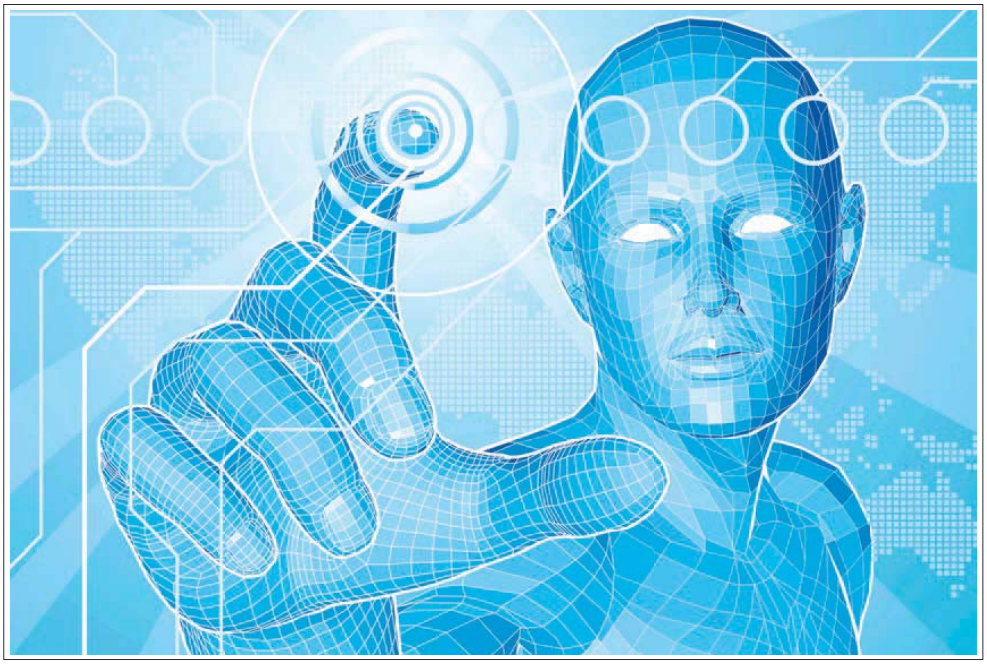
MANUFACTURING EXECUTIVE LEADERSHIP JOURNAL

BOLD IDEAS FOR A BETTER FUTURE / JANUARY 2012/ TWENTY DOLLARS

Factories of The Future



"Lights-Out" Manufacturing:

THE DEATH KNELL FOR JOBS?

Not so, says Zvi Feuer of Siemens PLM. New factories will need staffers who have high levels of education and creativity.

SUPPLY CHAINS' NEXT MOVES

Cambridge University's Paul Christodoulou makes 6 bold predictions.

FLEXIBLE, FAST FACTORIES

A new survey reveals that manufacturers foresee automated facilities serving customers on-demand.

ROUNDTABLE *"The old smokestack image of manufacturing [must change]....The image problem is still an issue."*

—Richard Sade
VP, S&S Hinge

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Out: Smokestacks

In:

Technology-Enabled Agility

Competition and customer demands are forcing rapid digitization and automation of plants. But can manufacturers find the right people with the right skills to make tomorrow's plant come to life? Recently, members of the Manufacturing Leadership Council gathered in Mobile, AL, to discuss these and other questions defining the factory of the future.

Edited by Jeff Moad

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Anthony King
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IN THE FUTURE, WILL PLANTS BE SO HIGHLY AUTOMATED THAT they will require few, if any, people? And if people will continue to be an important ingredient in our factories and plants going forward, will these people need different kinds of skills?

Hagenau: We've all seen the statistics about the job losses in the U.S.: 30% of manufacturing jobs lost in the last 10 years; loss of competitive position versus China and certain other low-cost outsource countries. One statistic that gets a little lost in the shuffle is that the U.S. manufacturing output is at an all-time high right now. So, if you chart actual manufacturing efficiency in the U.S.—labor efficiency or manufacturing output per employee—it has risen dramatically in the past 10 years and even during the Great Recession.

In 2009, I think the statistics were that it took roughly 10 employees in China to have the same manufacturing output as one in the U.S. And if you're dealing with a labor cost that's $1.50 versus $15, that playing field is beginning to get leveled. So, the question is: How much leverage does going to a low-cost country get you when you can produce the same product here with greater automation?

As the U.S. continues to emphasize automation, the labor cost issue will become less [important], and you balance that against some of the issues about Lean manufacturing and green manufacturing. I think then the argument for outsourcing changes. If [we are] successful in continuing to leverage those resources, I think the U.S. can win back some of that market share and, instead of losing manufacturing jobs, actually continue to increase manufacturing output per employee.

Brousell: Does anybody else see more headroom in our ability to increase automation and productivity in our current factories?

Croom: Sure. I would say absolutely there is headroom. The ability of manufacturers to link automation platforms so that they're really getting the agility that you're talking about—not just repetitive manufacturing year after year after year—is important. If their business drives some sort of agility, I think there's a tremendous amount of headroom that varies by manufacturer.

Ford: There's a large convergence of technologies on the plant floor. Traditional automation controllers have had this data readily available for decades, and it's just now that the IT systems are starting to come of age to [be able to] go down and get that information and visualize it in a way that humans can use it.

What we're seeing in automation is that it's really just about data today….

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To maintain agility, you're going to have to empower the human factor much more than you do today.

Brousell: Yes, yes. What about the question of people? If we can't find skilled people to deal with the data coming from those systems and manage these organizations, it now becomes a constraint, right?

Sade: There's no question in my neck of the woods that there is a problem with labor skill sets today. For what we would call a line technician—a press operator, a person in a secondary operation, even down to the shipping and receiving person—the information coming from the customer and how it's digested and requirements given to that operator on the floor have to be understood.

We've gone to our technical schools, to our trade schools, and have asked them to change some of the criteria that currently are being administered for manufacturing. The state is now beginning to take this very seriously because of the loss of jobs and the loss of companies.

But by far, the education coming out of these trade schools, coming out of the industrial classes that these kids are taking in high school, has changed and the criteria have to continue to change.

The other thing is that the old smokestack image of manufacturing [must change]. I'm the Chicago chairman of the PMA [Precision Metalforming Association], and we have really promoted to the kids and to the society that the smokestacks are no longer. We're highly intelligent companies. We offer high technical positions in manufacturing. [But] the image problem is still an issue, and I think a lot of people recognize it and are addressing it.

Moad: What are the areas where you see the most opportunity for digitizing information at the plant level?

King: As far as aerospace and defense goes, there won't be complete digitization, not because we don't want to get there. It's just that we're so far behind the curve that trying to get there in the next five years is just not going to happen.

One of the areas where we're really looking at digitizing and bridging is the design-to-manufacturing [process]. As a matter of fact, our customers today are looking for us to basically simulate not only the design, but also how we're going to manufacture it and how we're going to support it. They want that up front before they even award the contract. So, that's going to drive manufacturers to do some digitization even if they didn't want to, because that's the only way they're going to get new business.

Sade: That's very interesting. I'm seeing in business that the customers are driv-

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—Bruce Hagenau
President, Metcam Inc.

ing that technology to the point where, if you don't do this, you're going to be out. The speed—we call it "speed to the customer"—at which information has to get down to the plant floor is very rapid, number one. Number two, the feedback of that information from the plant floor to the customer has to be done with speed. How do you do it? Well, you want to get in the digital world because you don't want 10 people pushing paper around.

Hagenau: We're also seeing a much greater interest on the part of our customers in complete transparency. You can no longer just go to them and say, "Here's how we're supporting our price. Here's the costing that was put in place, and here's how our estimate was developed." You now have to be able to close the loop and say, "And here are what the actual cycles times are, and we're going to review that in three months and six months and nine months. We're going to review all the component costs that you've got on a regular basis."

If you don't have the systems in place to support that, you'll spend more time gathering that information than you've got to actually quote the part in the first place.

Ford: The whole digitization conversation is interesting in that it's not really a technology challenge for us. It's a cultural challenge and it's a data normalization issue. I think the CIOs out there are still licking their wounds from ERP installations, and nobody really wants to talk about spending the kind of money and the effort that they're going to need to spend. This is a question of when, not if.

King: Our biggest challenge isn't necessarily transforming the information we have today; it's how do we do that and still do what we have to do today? In other words, we still have to manufacture and produce product today, and the same folks who are going to be involved in that digitization need to be involved in that future state. So, what we're running into is actually just not enough time and bandwidth.

Groves: One of the things that we have really tried to make is an environment that makes manufacturing a little more exciting and sexy than it used to be. It's still hard work.

But there are ways that we can bring technology into our facilities and change our facilities to appeal to those younger generations. We've done a few of those things at our facility. There are computer screens in locker rooms, terminals, wireless throughout our facilities, things like that that aren't common. Those things were driven more from our employee base than from our customers.

Brousell: What are your production models now? Are you primarily build-to-order or build-to-stock or engineer-to-order?

Hurst: I've got design-to-order, which is a custom, unique piece of equipment, and we typically see that in our international customers. I've got engineer-to-order, which may mean I have a platform, I've got maybe 60%, 70% of it designed, and the rest of it is what options or features are going to be put on that equipment. And I've got make-to-order, where we're actually doing some inventory positioning

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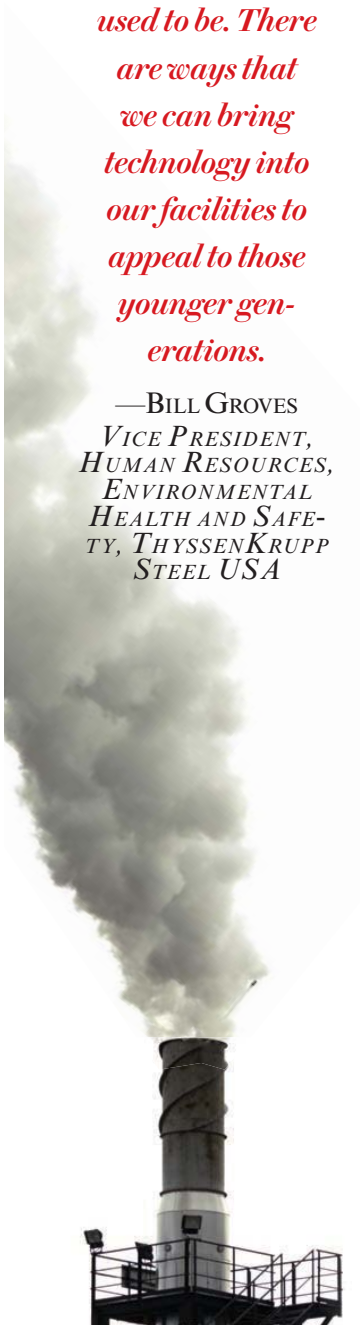

of certain major sub-assemblies, and then, based upon what the different customers want in configuration, we will then build up the final machine and assemble the work where we actually have a fairly steady product.

So, from an information systems standpoint, trying to support a design-to-order to an assemble-to-order and variations in between are monumental.

Brousell: Do you see this kind of multi-varied model continuing, or will it flatten out in any way?

Hurst: No, I think it's going to continue into the future. I think as companies learn how to manage their data and can handle multiple models, maintain that flexibility, and also remain agile and reduce lead times at the same time, I think they're the ones that will come out on top.

At the end of the day, it's a question of having the right leadership talent in place that can handle the complexity of dealing with design-to-order, engineer-to-order product, while continuing to run the base products, all while keeping the workforce motivated. How do you keep them engaged?

Brousell: What are the key capabilities that tomorrow's factory leaders will need? Can you put your finger on it?

Hurst: It's balancing six different generations of people in the same labor pool. It's balancing all of the needs that a generation that's coming up on retirement has. You still need those people moving forward.

But you've got to try to figure out how you put programs in place that also engage a workforce that's coming out of high school right now at 19 and 20 years old. You've got folks on one end that don't have a computer at all in their house, and folks on another end that won't operate at all without a computer. At the end of the day, you've got to get those two groups—and all the groups in between—in the same room to have that transfer of knowledge. It's not going to happen overnight.

Hagenau: I think it's not necessarily that we've got differences in generations, but I think we've got to look at completely new ways of teaching and managing our workforce.

What strikes me is that the overall model of learning is evolving into something that's more collaborative, more innovative, more focused on problem-solving, and something that's focused on a different level of interaction amongst people. You're not just looking for folks who are button-pushers. And the people who are out there push-

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ing buttons, I'm finding, are also eager to embrace some change.

Brousell: But you've still got to move the company forward. Somebody has to make a decision, right? How do we balance the need to get all the troops marching in one line, but yet be more collaborative?

Hurst: I think the idea behind a matrix organization or that cross-functional collaborative-type organization is great. However, at the end of the day, somebody has to be accountable for the decision to be made and for the button to get pushed. If you don't structure the organization properly and make sure that clearly defined roles and responsibilities are in place, companies that head down the matrix organization path are doomed to a lot of indecisiveness, a lot of internal politics, a lot of griping and complaining, and no decisions get made.

Chatha: For decades now, most of the leaders for corporations have been coming from the financial side—CFOs. Their focus is from quarter to quarter. We need to change the culture, so I think we need to find leaders who can balance the focus on quarter-to-quarter results with creating innovation-focused organizations. I think we need to strike a better balance going forward.

Brousell: Business analytics, mobility, cloud computing. Are your companies already moving to embrace these technologies?

King: We're looking at all of those technologies. We have some constraints that the non-aerospace and defense industries don't have with security and putting things in the cloud. We're struggling with and trying to figure out how we can work that, looking at everything from private clouds to actually using what we call a public cloud.

Brousell: Are you concerned about cyber-security? Are you concerned about your IP, your data? Are you concerned about hacking? Are you concerned about the vulnerability of the systems that we are becoming more dependent on over time?

King: Yes. Right now the focus has been, "Let's automate, let's connect things." But we haven't thought about the security implications once you get that all connected. You get people connected right down to your shop floor, which can cause more havoc.

What we're trying to do is work with our manufacturing groups to think about the cyber-security in their architecture and the design up front instead of what we do today: We integrate everything, attach it all together. Then we say, "Oh, by the way, we should go see if it's secure now." Well it's a little late at that point in time, and we really struggle with that, particularly in the aerospace and defense industry.

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—Brent Hurst
Senior Site Manager, Harsco Rail

Ford: There's a lot of misinformation about what cyber-security means to a manufacturing facility. Traditionally, IT has taken the front position in cyber-security, and in that environment, it's much more about data confidentiality, and system availability falls down a little bit lower. On the manufacturing floor, and specifically in some of our heavy process industries, data confidentiality is on the bottom, and system availability and system reliability are on the top. We can do a lot more damage—and physical damage—by blowing a plant up from the inside through the stuff that's installed today.

We've taken a big look at that, and ISA standards committees are moving toward developing the industrial control systems of cyber-security standards. The challenge is getting the regulatory bodies and the other agencies to understand the difference. They think that these things are being handled today so that everybody kind of feels at ease. But in reality, we're not close to being there.

Moad: Are you building new factories? If so, what will they look like?

King: We are building a new one for one of our main products. But we're also doing modernization and a lot of factory reuse because we have a lot of programs that the government is no longer going to fund, so we have those factories that we will just reuse for something else going forward. So, we won't necessarily be building much new infrastructure. Most will be modernization. We'll try to modernize factories so we can actually send different products through the same factory. Traditionally, we have built a separate factory for every product we've built. It sounds crazy in this day and age, but we had been doing that up until about three or four years ago. We were very much product-centric factories, and we're going to process-centric factories.

Moad: Will the U.S. continue to be the epicenter of innovation in automation? Or will other countries like China take over?

Staples: I still believe we lead the world in the production of ideas and turning those into product. The real issue is, do we have a government that supports industry in the U.S., and do we believe that it is vital to the success of this country? Or do we believe that a service [economy] is really the way to go? I certainly don't support that, but I don't believe that Washington has really been supportive of industry.

Chatha: I have been going to China for almost two decades. When they build new plants, they put in a lot of automation. But I think where we are ahead and we are strong is in bringing all of it together, like supply chains. In China, it's still a challenge moving stuff around.

Hurst: If materials are not an issue, we see companies more and more making that decision to build that facility in the U.S. That way, you don't have the cultural issues, and you've got "Made in the USA." You've also got the benefit of standing a better chance of being able to say, "I've got a green supply chain." That's kind of a difficult argument to make if you're dealing with a supply chain out of China or Mexico; they just don't have the same level of environmental controls that we do here in the U.S. **M**

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—Leo Staples
President, International Society of Automation

The Council

Meet some of your fellow members on the Manufacturing Leadership Council

Dean Bartles

Vice President and General Manager, Ordnance and Tactical Systems, General Dynamics

Bartles has a strong track record in manufacturing, primarily in the defense sector, working for Fairchild Republic, General Defense, Olin Corp., and Primex Technologies before joining General Dynamics. He has held both U.S. and international roles, focusing on manufacturing facility startups, plant management, R&D, and program execution. He serves on many industry and public bodies including the Industrial Committee of Ammunition Producers as Chairman Emeritus, the Manufacturing Division of the National Defense Industrial Association, and recently on President Obama's Economic Recovery Advisory Board's Education and Training Subcommittee. Bartles has a B.Sc. from Shepherd College and a doctorate in business administration from Nova Southeastern University.

John M. Gercak

Vice President, Information Technologies, Eaton Corp.

As vice president of information technologies for Eaton Corp.'s vehicle businesses, Gercak is responsible for developing and leading the IT strategy that supports the group's overall innovation, global growth initiatives, and organizational capability. Prior to taking on his current role in July 2009, he was director of IT for Eaton's truck operations. Gercak joined Eaton in 1997 and progressed in various IT leadership roles within North America and Europe. Before joining Eaton, he served in finance, operational, and IT roles for Dana Corp. Gercak holds a bachelor's degree in finance and a master's degree in operations management from the University of Toledo.

Ron Growe

Global Technology Director, Personal Care Global Supply Chain, Colgate-Palmolive

Growe is responsible for leading all engineering and technology programs for a multi-division business in Colgate-Palmolive covering 17 production plants around the world. He joined the company in 1986 and now focuses on driving innovation in areas such as process, product, and equipment, and ensuring that innovations can be applied and sustained worldwide. He has established strong partnerships with R&D, packaging, and commercial partners on new product development, and takes a global approach to driving factory performance and reliability. He has also led key strategic initiatives involving feasibility studies on sourcing strategy and manufacturing capacity. Growe holds a B.Sc. in mechanical engineering and an M.B.A. from Purdue University.

Bruce Hagenau

President, Metcam Inc.

Hagenau co-founded Metcam, a fabricator of precision sheet metal products for a wide variety of industries, in 1989 after a career in management consultancy in Atlanta. He has broad business experience encompassing financial, legal, quality, environmental, Lean, HR, and IT systems, and has worked in a variety of industries including healthcare, insurance, and manufacturing. He has also served on the National Board of Directors of TechAmerica, was a founding member of the Georgia Technology Coalition, a member of Newt Gingrich's High Technology Roundtable, and is a founding board member of the Manufacturing Society of the Technology Association of Georgia. Hagenau holds a B.Sc. in business administration from the University of Tennessee and a master's in health administration from Duke University.