Advocacy Clips is a weekly compilation of relevant news articles from around the country on subjects that impact the metalworking industry. These articles are compiled by Bracewell & Giuliani, NTMA and PMAs public relations firm. **Please forward this e-mail to a colleague who may have interest in these topics.**

In This Issue:

Moving From Dumb Manufacturing to Smart: Catching the Fourth Wave

Moving From Dumb Manufacturing to Smart: Catching the Fourth Wave
Industry Week
By: Charles Horth
1/27/2017

This is the third of my three posts on moving from dumb manufacturing to smart.

In the previous blog, we discussed Waves 1 and 2; this one will cover Waves 3 and 4. The four waves are layers–each builds on the one before.

Collectively, they drive first-time-right quality.

Wave 3: Improve quality management with centerlining

Traditional quality management measures outcomes–end products. Is the chocolate donut the right weight? Does the car door close properly? Are the tissues the right size?

But the flaw in this system is readily apparent–by the time you detect quality problems, you've already squandered time and resources on making flawed products.

By monitoring inputs rather than outcomes, centerlining takes a more proactive approach. The idea is to control the key parameters in the input, thereby run to target, and achieve the right output–do the right thing, consistently and continuously. Monitor what comes in, to gain consistency in what comes out.

Of course, you cannot eliminate quality measurement of finished products–particularly those, such as pharmaceuticals, with intense regulatory requirements.

But by decreasing the variability of key inputs, centerlining considerably decreases waste. Not to mention the amount of time spent dealing with isolated islands of data that arise from log sheets and lab data. As well, centerlining enables efficient short orders, and the ability to run a variety of products through the same equipment.

Leveraging the 80-20 rule

As always, the 80/20 rule rules: by determining the best settings and ranges for the important variables and eliminating variance in a handful (say 20%) of parameters, you can decrease 80% or more of errors. Think of it as a pre-emptive quality strike!

And returning to the theme in the first of these three blogs, centerlining is one of the ways that smart manufacturing moves from art to science. In order to achieve that perfect cake, the oven temperature must stay between x and y, the flour must weigh between p and q, and so on. It's measured, it's digital, it's scientific.

Still in its infancy!

Yet while most leading companies have adopted centerlining, the majority of manufacturers have not, certainly not to any significant extent. It's far from uncommon in plants to have three shifts that have three ways of making a product–basically the definition of dumb manufacturing.

Centerlining never stops

The thinking is that if there's a discrepancy or variation in output, there's a reason, and the reason should be attended to. Proper centerlining is ongoing, allowing for changes in equipment, raw materials, or any other factor.

Wave 4 – ERP integration

Wave 1, visibility, is about connecting to the shop floor control systems. Wave 4 is about connecting to the business systems: e.g. ERP / SAP / Oracle.

Simply put, ERP systems exist to count money–not kilos or production numbers. Your ERP tells you what you want the plant to do: how many widgets to make, and when. Your MES (Management Execution System) tells you, in real time, what was actually done. What you produced, what materials you used, how much was wasted.

But until you have connected these two, you'll be scheduling manually (and yes, using an Excel spreadsheet is still manual). Plus doing material management manually. In a world that keeps moving faster, your reaction time is slower, not to mention based on less accurate information.

Catching Wave 4 offers many business benefits–you will:

• Reduce overruns and under-runs
• Ensure right (released; matching Bill of Materials) material is being used
• Ensure right amount of material is delivered to lines at right time
• Ensure that schedule updates are communicated quickly to lines
• Ensure that lines can still run if ERP is off-line for prolonged period of time
• Provide detailed traceability from ingredients through to finished goods.

Once you connect your MES with your ERP, you've closed the schedule integration and material management loop. In fact … you've closed the gap between the shop floor and the office floor.

Now, you're closely linked with your customers. You receive an order; the plant produces based on the information in the order; the output is shipped and invoiced. With the fourth wave, your opportunity to deliver the right thing, at the right time, profitably, takes a giant leap forward.

In summary

Smart Manufacturing–enabled, expanded and extended by the Internet of Things–merges operation with information technology. It enables insight in real time, and action, allowing everyone on the shop floor to base decision-making on readily available information.

The four waves I've described are the roadmap to get there.

Artificial Intelligence Driven Robots: More Brains Than Brawn

Automation and robots for manufacturing have come a long way since Unimate was introduced in the 1960's. The machines that manufacturers are using today are smaller, safer and able to perform more than a single task without expensive programming. While these innovations have significantly increased the value that automation brings to manufacturing, what's coming online now will transform the industry in ways that we've not seen since the first industrial revolution.

The 4th industrial revolution or Industry 4.0 will be built on robots that are more brains than brawn. These robot integrate physical and cognitive ability to do more than heavy, highly repetitive tasks. In the sophisticated, highly automated environments where manufacturing takes place, these behavior-based robots – fueled by new innovations in artificial intelligence (AI) – are changing the way factories are organized, operate and perform.

Building the Industrial Internet of Things from the Bottom Up

Advances in technology have always been the catalyst for transformation in manufacturing, but this time the technology is less about mechanization and physical automation and more about cognition. The Industrial Internet of Things makes it possible for manufacturers to orchestrate the production process in completely new ways. It also will automate – on a large scale – the analysis of mission-critical information in a continuous flow to enable informed, real-time decision making. It's an exciting time, but it's also daunting, and manufacturers are not simply going to go whole hog on rolling out an information-driven operation. They are skeptics, remember? The vision of Industry 4.0 will be achieved – in large part – by software-driven robots with innate cognitive abilities.

With AI, robots can work semi-autonomously on a much wider range of tasks. Beginning in the work cell, robots with "smarts" built-in draw from a cloud-based database of "lessons" and information to:

• Recognize equipment and parts in a work cell and perform applicable behaviors and make "auto-complete" suggestions, e.g. recognize a tool or piece of equipment and be able to use it correctly
• Use pattern matching to suggest error handling best practices
• Apply a database of corrective suggestions to help task designers (that would be the robot's human colleague) find ways to modify a task or work cell in response to a fault
• Analyze motion profile and behavior against a global fault database to identify opportunities to optimize a task

Just as smart phones and other internet-of-things-enabled devices receive software updates that add new features and functionalities, so too will robots expand their abilities. Optimizing production at the work cell level is only the beginning. Robots will eventually share information and insight that improves performance factory-wide and ultimately, across global operations, with the ability to:

• Learn from self and others
• Correct self and others
• Collect, analyze and share insights from data collected on the factory floor and from robots in other locations

Innovation: Only As Good as the Value it Provides

We've all seen the crazy stories about artificial intelligence and its potential to destroy life as we know it. The reality is that there is significant value that AI-driven robots deliver to manufacturers now, and even more so in the future, such as

• Drive continuous process improvement and improve quality

• Reduce costs and improve margins
• Accelerate the NPI process
• Build factories that can produce highly customized products at mass market prices

We're seeing customers rolling out the work cell-based model in their factories with robots at the core. How do you think next-generation AI-driven robots will change manufacturing? What opportunities and challenges do you see?

Strengthening the Ability of Women in Manufacturing Leadership

Strengthening the Ability of Women in Manufacturing Leadership
Industry Week
By: Katheen Buse
2/7/2017

The business case for more women in manufacturing leadership is strong. Research has shown that there is a verifiable link between women in leadership and improved business performance.

So what accounts for the fact that in 2017 women make up 47% of the U.S. workforce and 52% of all professionals and managers, but only 29% of the manufacturing workforce and 5% of manufacturing CEOs?

Studies conclude that the under-representation of women in manufacturing is a complex matter which extends to societal and cultural expectations and so precludes finding a simple solution.

However, there is hope. Our work is showing promise in how to address the various aspects of the problem. Study after study supports the fact that women are less likely to believe in their ability to achieve than their male colleagues. Some call this a confidence gap. This is not surprising, especially in the manufacturing industry, as women are subject to bias and barriers related to stereotypes about women's roles. And when it comes to manufacturing leadership, women have few role models.

In our work with women in manufacturing, we have conducted a number of research studies to identify the underlying factors that enable women to persist and succeed. Among those factors is the woman's belief in herself to achieve, which our studies show to be found in women who 1) can articulate a personal vision that includes their career and 2) have developed a high level of self-efficacy.

Personal Vision

A personal vision is a holistic description of one's desired future. It is grounded in one's values, identity, strengths and dreams. It encompasses personal goals such as health, family, career achievement, skills attainment, and intellectual and spiritual growth, as well as developing and maintaining important relationships (e.g., with one's spouse).

Developing a personal vision is particularly difficult for women. Many women are raised to take care of others and to focus on the needs of the people around them. It is especially difficult for professional women to find any time to focus on themselves. In our work, we have found that women who are able to articulate a holistic vision for themselves are more likely to be committed to their careers and to advance to leadership. In working with women to develop a personal vision, we have found that they become energized by their vision. These women recognize that they have support and enlist those around them to help achieve their goals.

Here is a quote from a mid-level leader in manufacturing who worked with us to develop a personal vision:

"As someone who keeps my dreams and goals to myself, I've been consciously more vocal about my desires for my future. At work, I've expressed my short-term goals to my manager, so that he will hopefully assist me in reaching that goal. At home, I've talked to my family and close friends about my longer-term goals, so they can keep me honest about them, and help me achieve them. It's liberating, and a tiny bit scary, because it means I have to live up to my dreams and goals, or be willing to explain why they've changed."

Self-Efficacy and Confidence

In our early research, we found that women who achieved in manufacturing were likely to be more confident in themselves than women who left the male-dominated workplace. This was surprising because all the women we interviewed had achieved much in their lives and in their careers. Examples of what we heard included this from a technical director who had more than 30 years of experience in manufacturing:

"If I believe I can do something then I can do it. And just because somebody tries to stop me, it's usually not enough."

We heard the opposite from the women who left. This was from a woman with an 11-year engineering career who now teaches business at a community college.

"I had very little confidence and I kind of waited for the other shoe to drop that somebody was going to find out what was going on. And so if I had a boss who wasn't confident in me, who treated me with no respect, then I got into that completely."

Confidence and self-efficacy are related terms, but success is inherent in the definition of self-efficacy – the belief in one's ability to succeed. These beliefs determine how one thinks, behaves, and feels. Confidence, on the other hand, is not necessarily linked to success. An individual can be confident that she will fail.

The good news is that self-efficacy can be developed by anyone at any time with intentional effort, through one or a combination of these four factors:

• Accomplishments
• Role models
• Positive affirmations
• Renewal

When faced with a challenge, those who develop their beliefs to succeed through accomplishments build on past successes to achieve even higher goals. Their thinking is, "If I did that then, I can do this now."

Seeing others being successful, and having personal contact with role models, also helps build confidence to succeed. Positive affirmations can be conveyed in words, gestures or rewards for a job well done. There is a small body of research that shows women are more likely to develop self-efficacy when they see role models and receive positive affirmations from others.

Renewal is important because it reduces anxiety. Renewal can increase hope and optimism. It allows us to move toward our goals while also maintaining a work life balance.

What Can Leaders Do?

Anyone who has worked in manufacturing knows that women role models and positive affirmations in the workplace are likely to be scarce. There is often a focus on "continuous improvement" where nothing and no one is ever good enough.

Leaders can help women develop a belief in themselves to achieve by supporting mentors and sponsors. They can encourage employee resource groups, especially those that support women's advancement.

Leaders also can offer women professional and leadership development, especially programs that include the development of a personal vision. Additionally, leaders can ensure that women obtain interesting and challenging work that will help increase their self-efficacy, provide continuous learning and lead to higher-level opportunities.

What Can Individual Women Do?

Women who want to achieve in manufacturing should seek out challenging assignments, ask for help when it is necessary and reflect on past accomplishments. If positive affirmations are important to you, seek out others who can provide what you need.

If women role models are not available in your place of work, join a resource group. We recommend the following:

Women in Manufacturing, Society of Women Engineers, Women in Automotive, Women in Metalcasting, and Women in Materials Engineering. Seek out professional development opportunities. Read books on increasing your belief to succeed.

Children's Book Teaches IoT by Being IoT

Children's Book Teaches IoT by Being IoT
New Equipment Digest
By: John Hitch
2/3/2017

As a kid you have wondered how the heck the refrigerator knew to shut off the light when the door closed. Was there a little gnome in there whose sole purpose was to monitor this? And where did he go when the door opened? If your parents were jerks, maybe this myth was perpetuated for far too long, when they could have just pointed out the push button on the door frame.

Our world is exponentially more complicated and automated now than when you grew up, even if you can't rent a car yet, and it's all connected by the Internet of Things, the midichlorians of the machine world. The only constant is that kids ask questions–constantly. Imagine trying to explain to a four-year-old how you can control your fridge now from your phone, or how you can command your AI personal assistant to turn on the air-conditioning or play music.

IBM's most prolific female inventor, software engineer Lisa Seacat DeLuca, did. The result was a colorful book full of yeti, leprechauns and fairies who run our machines behind-the scenes. It doesn't just teach kids about IoT. It is IoT, because the included NFC stickers allow parents to interact with the book via a smart device.

"The Internet of Mysterious Things is probably one of the nerdiest children's books," says DeLuca, who launched the book on Kickstarter in late January. "I like to say it's the children's book with a touch of technology, because you can tap on the hidden creatures on each page to launch more information about the story."

So now your kids will think an invisible man controls your Nest thermostat and a diligent fairy inhabits your Amazon Echo...until you go online and get the real story, distilled for a younger audience by one of the world's foremost authorities of software engineering, and busiest mothers, with two sets of twins.

DeLuca previously wrote A Robot Story: Learn to Count to Ten in Binary in 2013, also a Kickstarter project. So far, The Internet of Mysterious Things is two-thirds funded with 25 days to go. the early bird price is $30, or $45 for both books. For $5,000, DeLuca will come to any continental U.S. classroom to deliver 30 books and speak about computer science careers.

The book won't ship until May 2017, but tech gurus are already lading praise on DeLuca.

"DeLuca explains all the modern technology around us in a child-friendly, consumable way that still keeps the most important thing intact–the mystery of technology. In our STEM challenged age, a must read for parents who realize technology is important to their kids." – Holger Mueller, VP & Principal Analyst, Constellation Research

"I love this book! The Suess-like phrasing, rhyming couplets, give the information on the Internet of Things personality and make the descriptions more child-friendly." – Marsha Collier, Author and Futurist

Because the books are linked to the the Internet via the NFC tags, more information can be added on as IoT creeps into more of our world.

"As technologies evolve the content will to," DeLuca says.

While DeLuca knows how vital it is to teach kids about the emerging smart machines that could total 30 billion by 2021, she makes known on her Kickstarter page how much more important it is to keep your kids' heads in the real world, not the cloud.

"The story ends by giving us a glimpse into the future and encouraging everyone to look up from our devices so we don't miss out on these amazing creatures right in front of our eyes," she writes.

TOP