Automation Revolution?

Industry 4.0 and the future of plastics were spotlighted at NPE2018

By Jim Romeo

In the small community of Fitchburg, Mass., the Rocheleau Tool & Die Corp. resides in the same place it has for the past 75 years. The company opened in the industrial New England town during the Great Depression but ahead of the WWII industrial boom. Today, however, the company personifies a renaissance rooted in today’s dynamic and complex industrial environment.

Rocheleau continues to make blow molding machinery. Their sprawling spread at the 2018 National Plastics Expo (NPE2018) in Orlando showcased their RS-90 machinery with variable speed drives and a faster output. These are characteristics that President Steven Rocheleau says are of interest to buyers.

Smart design in today’s plastics processing is not enough. It must combine with digitization, cloud computing, artificial intelligence, the Internet of Things, remote monitoring, big data gathering, and many more genres of contemporary automation, according to Rocheleau.

When it does, you’re really onto something. The industry is heading towards an ever-leaner landscape in the complex world of plastics processing, using complex sensors, cameras, digital data, and complex algorithms to build a competitive edge on the factory floor.

Brouhaha from the Factory Floor

Rocheleau and their many competitors are all in, as the plastics industry is full speed ahead in embracing the brouhaha coming from the factory floor of plastics processing around the world: Industry 4.0.

Industry 4.0 is the moniker for uptrend in automation and rather complex data exchange in manufacturing technologies. It represents a portfolio of topics and technologies that range from cyber-physical systems and cloud computing to digital twins, remote monitoring, and so much more.
Some say it’s old wine in new bottles—increase uptime and decrease downtime; automate and improve using new technology to compete. But the movement incorporates a new dimension of digitization in its finest form; it carefully computes data to drive decisions related to production, maintenance, throughput, and just about everything else. Industry 4.0 uses data and performance parameters in a way that just wasn’t possible in the past.

Using digital principles to automate is the kernel that Industry 4.0 strives to achieve. They are at top dead center for today’s plastics processing industry as the term could be seen, heard and echoing throughout a behemoth Orlando Convention Center at NPE.

Got Data?

Siemens was prominent at NPE demonstrating numerous solutions for plastics processing machinery. Among the solutions were improved programmable logistics controllers (PLC) that enabled rapid diagnostics for control systems on-machine.

Their easy, self-diagnosis of the control module enables quick and easy diagnosis; a technician could quickly know what’s wrong—in fact, it could be linked to remote monitoring and enable rapid parts replacement and labor scheduling. It shaves the downtime to an absolute minimum.

Siemens was full of other solutions (most of which they tout using in their own production lines—practicing what they preach). They prominently displayed their MindSphere interface, a graphical display in an open cloud platform or de facto IoT operating system that capitalizes on the whole gist of remote monitoring for visibility and control of machine operation.

MindSphere is scalable to companies’ industrial operations to link their machines and physical infrastructures to the digital world easily, quickly, and economically. They can harness big data from virtually any number of intelligent connected devices to analyze and uncover transformational insights, enhance their offerings, and launch new business models.

It’s important to have the right tools and technology to exploit the big data that is gathered. In fact, Siemens own market research indicated that one-fifth of the respondents stated that they analyze more than 60 percent of the production data they collect, meaning a significant amount of data goes unaanalyzed.

“Value is not the data,” emphasizes Ed Housler, OEM business development manager for factory automation for automation at Siemens. “The value is what’s in the data.”

MindSphere exploits the idea of utilizing predictive analytics, which gives an indication of what component, subsystem, or boundary within a machine, equipment or system is heading for failure. Siemens’s own research found that 76 percent of efficiency experts and 98 percent of rev-
enue re-inventors stated that they use predictive analytics to forecast performance of production equipment or processes in most or all parts of their organization.

The predictive analytics that MindSphere affords provides the user and process champion with an early warning of an impending failure, with enough time to prevent such a failure with corrective maintenance or another action.

Predictive analytics rely on tools and interfaces such as MindSphere to prevent downtime. Downtime, explains Housler, is one of the most expensive distractions from process efficiency and the impetus of being well-wired to compete. Solutions like MindSphere represent a value proposition with a handsome payback—when they truly help prevent downtime.

Technology company MachineSense has chosen MindSphere, the cloud-based, open Internet of Things (IoT) operating system from Siemens, for its predictive maintenance and analytics for industrial machinery, components and infrastructure systems including pumps, compressors, and electrical supply.

MachineSense’s research revealed that unplanned machine downtime is costlier than ever for machine builders. They utilize MindSphere to analyze electrical component performance and predict when maintenance is needed before a component breaks down. Preventing unplanned downtime helps their customers reduce costly repairs and unplanned downtime.

MachineSense provides its clients with machine wearables—sensors that are placed on recently serviced machines at a customer site. Data hubs are placed within 30 feet of the wearables and are connected to the customer wifi network. Through the customer router, the data goes to MindSphere where analytic and trend tools track and interpret machine operating conditions.

MindSphere’s apps and visualization options allow machine builders to read the trend charts and continuously track the condition of their equipment. Additionally, account users can elect to receive alerts regarding the status of their machines via email or text messages.

**Digital Twinning**

Sensors and wearables all help provide visibility and control. But another concept to enable remote monitoring and produce visibility and control, also presented by Siemens, is digital twinning.

Robotics were prevalent at NPE2018 and are integral to the automation and process improvements long in the works for the plastics industry. Exhibitors demonstrated their functionality and efficiency as attendees watched their quick and rapid motion, now part of many plastics processing operations worldwide.
What exactly is a digital twin?
A digital twin refers to a modeled, digital replica of some physical asset—a machine or equipment, along with that asset’s processes and associated systems. The model is virtual but has valuable usage. The digital mirror of the asset affords a dynamic real-time “pulse” of the machine using IoT.

Research and advisory firm Gartner Inc. more precisely defines a digital twin as a virtual counterpart of a real object, meaning it can be a product, structure, facility, or system.

The digital twin not only allows for monitoring but also provides accurate prognostics of a machine’s reliability, functionality, and analysis of possible upcoming failure modes. Plastics processing machinery is ideal for digital twinning and allows process operations to be carefully monitored for a most fluid and continuous operation, free from disruption. The digital twin concept is early but has much promise.

Gartner predicts that by 2020, at least 50 percent of manufacturers with annual revenues in excess of $5 billion will have at least one digital twin initiative launched for either products or assets. In addition, the number of participating organizations (202 respondents across China, U.S., Germany, and Japan) using digital twins will triple by 2022.

“There is an increasing interest and investment in digital twins, and their promise is certainly compelling, but creating and maintaining digital twins is not for the faint-hearted,” said Alexander Hoenpe, research director at Gartner, on the company’s website. “However, by structuring and executing digital twin initiatives appropriately, CIOs can address the key challenges they pose.”

According to a 2017 research report that surveyed some 200 manufacturing executives conducted by London-based Longitude Research on behalf of Siemens, U.S. manufacturers follow one of two paths: “the efficiency experts” and the “revenue re-inventors.” As part of the study, manufacturers are able compare their own digitalization status amongst their industry peers through a benchmark online survey.

Right Technology. Right People?
One comment gleaned from the floor of NPE was the necessity of skilled people to operate the new age of machinery. But behind every process and operation that will embrace Industry 4.0 is a roster of leadership that must embrace it and lead their people and processes to implement it.

Solomon van Blokland of the executive recruiting firm Odgers Berndtson says the fourth industrial revolution in global manufacturing has an effect on selecting senior leaders and the decisions they make regarding performance standards and strategic partnerships.

“The increasing competitive market of the plastics processing industry and customer demand for higher and flexible performance requires these leaders to further vertically and horizontally integrate production,” says van Blokland. “In order to survive in the competitive market like the plastics processing industry, senior leaders increasingly need to have an adaptive skill set. We screen these senior leaders on their exceptional level of capabilities and experience, viz., empathy in quickly managing (innovation) experts and teams outside their own field of knowledge.”

He adds that it’s important for them to build alliances with partners far beyond their own knowledge and who eventually could disturb their current business model.

This means finding partners who are not risk-averse but dare to invest ahead of competition and are sensitive to the company’s strategy and market circumstances, as well as provide trust and the ability to integrate cobots, artificial intelligence, and employees at all levels within an organization.

The Future of 4.0
Global competition will likely come to rely on the principles and processes that Industry 4.0 affords. But when it comes to manufacturing, this digitization regresses to the mean around data and analytics, cloud computing, the Internet of Things, and more.

“Efficiency experts,” as Siemens’s research team calls them, are noted as pushing hard and fast on digital technologies such as connected sensors, virtual training, and artificial intelligence, with the motivation of embracing this approach to increase uptime and efficiency and keep their employees safe—in essence, to do what they’re designed to

With many different types of robots and more functionality available, their utility is greater than ever as plants and processes automate and expand.
do, only faster and cheaper.
By contrast, “revenue re-inventors” identify themselves as both financially and digitally ahead of their peers and find motivation for digitalization in opening up new markets and reinventing themselves and what they sell.

“It’s probably not surprising to see mid-sized companies delay in embracing new technologies, but even Fortune 500 companies sometimes hesitate based on various barriers,” wrote Raj Batra, president of Siemens’s U.S. digital factory division, in a research report. “Companies are aware that digitalization is driving industry forward and that it is essential in long-term strategy and planning to remain competitive in a global economy. Innovation and technology is available today that will enable a digital path to success.”

According to the research, the top five digital technologies implemented by manufacturers include cloud computing at 85 percent, connected sensors in plants at 65 percent, connected sensors in products at 59 percent, 3D printing at 39 percent, and advanced data analytics tools at 34 percent.

Phil Briggs, the fluid connector division manager of Stäubli North America, says plastics processing is ripe to fully embrace and benefit from Industry 4.0.

According to Briggs, plastics processing companies are encountering more stringent demands on the design and quality of injection-molded parts along with a wider range of product variants, which leads to a reduction in batch sizes. This has created an increasing frequency of mold changes, which hinders productivity efforts. An Industry 4.0-connected smart system directly addresses these issues.

“Stäubli’s Industry 4.0 injection molding process with pre-heating station, automatic mold transport/exchange, automatic magnetic clamping system, advanced coupling technology for fully automated connection of all media, power and signal circuits, and the world’s fastest safe robots with automatic gripper changing system represents the future of injection molding,” says Briggs.

He adds that the merits of the automation comes with smart integration. “All components of the process coordinate and relay their status at every step,” he says. “Stäubli integrates sensors that detect the condition of the mold, the molding force of the magnetic clamping system, and a variety of other factors and feed that data into the process. Any faults, like a failure to reach the correct operating temperature, will be recognized early so the fault can be corrected, thereby maximizing efficiency and safety.”

**Where to Next?**
Technology is influencing the forward direction of industrial production. Adam Smith, author of The Wealth of Nations, advocated for minimal government intervention to promote capitalism. This may be somewhat counter to
our present environment of tariffs and a cloud of trade wars and strong emotions by many domestic and abroad.

But Smith advocated that capitalism advances by “rational self-interest.” Perhaps the advent of Industry 4.0 is just that. It’s not a means of supplanting the worker on the factory floor but rather empowering them--to best contribute to the productivity of plastics engineering.

Leading2Lean developed the lean manufacturing solution CloudDISPATCH, a solution focused on operational excellence for multinational manufacturers and works alongside legacy systems. Keith Barr, the organization’s president and chief executive officer, says that while current technological advances in manufacturing have been generally branded as “Industry 4.0,” they think of it in terms of Manufacturing 4.0.

“Industry 4.0 is an idea that describes the rise of automation, robotics, and smart technology but omits the role for human workers,” says Barr. “Manufacturing 4.0 [an emerging term] in contrast, is a dynamic era where unlocking and multiplying human ingenuity is central to manufacturing, increasing efficiency, inspiring a new generation of skilled workers, and creating bottom-line profitability. We have seen in the plants that use our solution that unlocking human potential starts with increasing visibility at all levels of the company, especially on the plant floor. Plant floor employees have the ability to innovate and solve costly production problems if they’re given the right information in real-time.”

Bar says that establishing a higher level of transparency is also key to engaging people on the floor. “When people can see what their peers are doing and what production issues may be happening, accountability to solve those issues increases,” says Barr. “Transparency brings a need for workers to analyze, comprehend and make decisions. Suddenly, workers are empowered. They are freed to identify efficiencies and develop innovations. In these cases, technology isn’t replacing humans. It’s enhancing human performance.”

ABOUT THE AUTHOR

Jim Romeo is a freelance writer based in Chesapeake, Va. For more than 20 years, he has contributed numerous articles to various publications on the topics of logistics, engineering, software and supply-chain management. He earned his B.S. in mechanical engineering from the U.S. Merchant Marine Academy, and an MBA from Columbia Business School at Columbia University. Contact him at freelancewriting@yahoo.com.