How process manufacturers can prepare for the Factory of the Future

Where information technology (IT) and operational technology (OT) converge

The Factory of the Future for process manufacturing is coming, and it's being built on technology, innovation, and advanced manufacturing capabilities. But what is it, exactly? And what are the technologies you need to know about to help your process manufacturing company embrace and thrive with the change? Keep reading to find out.

Table of Contents

What is the Factory of the Future for process manufacturing?

The definition of the Factory of the Future is evolving; even the name is in flux. Some call it Smart Manufacturing, Industry 4.0, or the Digital Enterprise. While the terms may vary, there's one thing that is clear: The Factory of the Future is the product of fast-changing disruptive technologies hitting process manufacturing like a cyclone. Information technology and operational technology are both seeing drastic innovations, and the convergence of these two forces is creating a paradigm shift. For food and beverage and chemicals and life sciences companies, a fourth industrial revolution is starting now.

Many analysts predict that the stagnation and slow recovery that followed the Great Recession will evolve into a period of expansion for process manufacturers. Although margins will likely remain compressed, tools for greater savings and improved capabilities will make it easier for process manufacturers to achieve profits and growth.

The impact of these technologies and the Factory of the Future is growing. Consider these statistics:

Industry Week reports that 40% of manufacturers believe that smart manufacturing and its foundational technology—the Internet of Things—are within reach and it's the right time to invest.

Huffington Post reports that early adopters of modern solutions that have at least partially implemented smart manufacturing initiatives have documented measurable results:

- 82% reported increased efficiency
- 49% reported lower product defects
- 45% reported customer satisfaction gains

The impact promises to grow and be even more substantial as process manufacturers and their suppliers deploy technologies across the entire manufacturing landscape, from product planning to supply chain logistics. Greater speed, value, innovation, and closer alignment with demanding customers will be the new normal.

Five IT forces driving the modernization of process manufacturing

For process manufacturers, IT solutions are at the foundation of the Factory of the Future. New IT technologies, from cloud computing to the Internet of Things, are changing the way process manufacturers do business—from the plant floor to the back office and throughout the entire value chain.

Process manufacturers should consider harnessing more than one of these IT capabilities in order to fully benefit from the next generation technologies transforming manufacturing.

1. Value chain visibility

In order to achieve greater visibility across their value chain, process manufacturers must eliminate silos and get disparate systems to communicate. After all, data is meaningless if it is stored in silos and if it lacks the full dimension of context and consequence. They need to ensure that real-time access is available to easily monitor the details of the complete manufacturing operation—within the four walls and beyond. For food and beverage, that means everything from sourcing raw ingredients to getting their products on the supermarket shelves.

For chemicals and life sciences, it spans navigating fluctuating commodity prices to delivering on customer-specific orders. Interoperability is the key word here; it's a step beyond simple integration. Data must be able to be *consumed in context* and used for event triggers and actions. A highly modern and flexible ERP system is the starting point for accomplishing this goal.

2. Mobile and social connectivity

Process manufacturing leaders can't be tethered to their offices, desks, and PCs. They walk the plant floor and they make decisions on site, in the heart of the operation. They need 24/7 access to critical data and systems from remote locations. This can range from a maintenance technician who's checking the inventory of a spare part while repairing a critical piece of processing or packaging equipment, to a warehouse manager using a tablet to confirm the location of forklifts and personnel. We live on a planet with over **7.2 billion active SIM cards**—that's more mobile devices than there are human beings.

On the social front, process manufacturers need to take advantage of integrated tools to capture conversations and use those to build a knowledge base and document key decisions relating to product design and customer orders. In a recent **survey**, 61% of CEOs said socially enabled business processes are important to business. **Mckinsey Global Institute** estimates suggest that by fully implementing social technologies, companies have an opportunity to raise the productivity of interaction workers—high-skill knowledge workers, including managers and professionals—by 20 to 25%.

3. Cloud-enabled agility

More than ever before, process manufacturers are being forced to keep pace with fast-changing global trends. New markets, regulations, and customer demands, combined with omni-channel shopping, and growing competition from start-ups are driving process manufacturers to become more agile than ever before. Accelerated product launches, more SKUs, faster order response time, and additional value-add services are among the ways process manufacturers strive to remain relevant and maintain or gain market share. Cloud solutions, because they offer faster deployment and implementation, support manufacturers in these efforts.

Cloud solutions allow process manufacturers to easily add locations, bring on new production facilities, and set up new distribution hubs without needing to invest in hardware and servers. Implementations take weeks, rather than months; and new sites can be online and producing with remarkable ease. With the growth of industry-specific cloud solutions, process manufacturers can find specialized tools that can change and adapt to market forces without the need for customizations.

Analysts are predicting increased cloud deployment, especially as more companies require industry-specific cloud tools. An article in the **Gartner newsroom** states: "The impact of specialist cloud-based point solutions, combined with very strong growth in business process outsourcing, will provide ample alternatives for business users frustrated by inflexible and expensive ERP modules. Over time the current heavily customized ERP implementations will be rearchitected to focus on 'systems of record' functionalities—which should require little customization—while the differentiating processes and innovation activities will use alternative delivery models that are integrated with the ERP system of record capabilities."

4. Data ingenuity

While spreadsheets and intuition forged from years of experience ran the process manufacturing plants of the last century, today data is the force that makes modern process manufacturing cost-effective. Insights derived from data analysis help process manufacturers focus on markets, buying trends, customer attributes, cost of raw materials, time, labor, and operational costs, as well as details about the product in use in the market and consumer opinions. As the Internet of Things moves past today's infancy stage, the role of Big Data will only increase. The challenge, therefore, lies not in collecting as much data as possible, but in setting a data strategy. From managing complex formulations to scheduling the equipment resources in plants, process manufacturers need a clear roadmap for how to turn their data into meaningful actions. Data paralysis is a real threat that must be avoided.

5. Customer centricity

The fifth element of the Factory of the Future for process manufacturing is perhaps the most critical. Today's market economy has evolved into a customer-centered model that stresses speed of delivery, product value, and a positive customer experience. This is especially important for food and beverage companies that must gear their ingredient sourcing needs to meet current consumer trends. Or for chemicals companies that create specific products only for specific customers. Consumers are highly vocal, fickle, and quick to turn elsewhere if they are disappointed. Process manufacturers are not exempt from dealing with easily outraged customers who are willing to share their complaints about a product or service with hundreds of thousands of "close friends" on social media. Modern customer relationship management (CRM) solutions, collaborative tools, online portals, and product configuration abilities all help to provide customers with a positive experience.

Five operational technologies driving the Factory of the Future for process manufacturing

Operational technology is also a vital part of the Factory of the Future blueprint. Automation, material handling, logistics, scheduling, and labor tracking are all operational elements that are receiving careful scrutiny from process manufacturers looking to improve their efficiency.

Faced with extremely thin margins and volatile supply chain costs, process manufacturers are increasingly turning to operational processes for improvements in efficiency and productivity. In many cases, process manufacturers have already cut the typical excesses out of their budgets. Their workforce is lean. They've eliminated non-essential projects and perks. And they have little control over market prices and competing vendors. This leaves operational tactics as the best way to control costs and improve profitability.

Here are five operational technologies that are helping to propel process manufacturing.

1. Robotics

While historically a very labor intensive environment, robotics are becoming more and more important to process manufacturers that are looking to control costs and improve accuracy in highly dangerous and/or seasonal environments, such as for harvesting fresh produce or scheduling the feeding, care, and butchering of animals for meat. The last several years have seen a sharp **resurgence in orders** of industrial robots, roughly tripling in the wake of the Great Recession. The global robotic systems market (including software peripherals and other related costs is estimated to reach $41 billion by 2020, according to Allied Market Research. According to **Time,** online **retail powerhouse Amazon** recently demonstrated its faith in using robotics for warehousing operations when it purchased Kiva Systems for $775 million and announced plans to roll out 10,000 robots into a network of warehouses, a move which it says will realize fulfilment cost-savings of up to $900 million—or up to 40% savings on cost per order.

2. Product innovation

To meet customer demand for new products, process manufacturers are turning to product lifecycle management (PLM) tools. These tools help manufacturers manage the complexity of defining, developing, and approving new products to take to market. Whether this is in a B2C environment to meet new consumer trends or a B2B environment to meet new or existing customer demands, innovation is critically important to the success and growth of most process manufacturers.

Innovation goes beyond just the formula, though. Production innovation has been greatly enhanced by new technologies, including 3D printing. While initially envisioned as a solution for discrete manufacturers, process manufacturers are gradually finding applications for 3D printing that go beyond experimentation—and that instead are relevant, practical, and profitable. These 3D printing tools can be used to rapidly produce product prototypes or packaging. In the near future, for the food and beverage sector, 3D printing could be used to print food itself, **reports 3DPrinting.com**. In addition, 3D printing along with 3D visualization technology can help with designing optimal plan layouts and the building of industry-specific equipment and tanks. According to a recent **Innovations Survey**, two-thirds of manufacturers are already adopting 3D printing. The study also estimates that the global 3D printer market will reach $6 billion by 2017 (up from $2.2 billion in 2012).

3. Closed loop quality control

Process manufacturers are using automated quality control methods to help capture data from their suppliers, as well as information throughout the manufacturing process. Poor quality or the inability to act decisively in the event of an incident can result in multi-million dollar recalls, not to mention serious erosion of a brand's value. Process manufacturers are learning they can deploy sensors and monitoring devices at numerous checkpoints in the production cycle—rather than only at final stage inspection to help detect noncompliance issues early and minimize waste.

4. Planning and scheduling

As customers are increasingly demanding make-to-stock (MTS) products, process manufacturers are turning to more advanced planning and scheduling tools to help them deal with the challenges of working in a short shelf-life and lead-time environment. These tools can be used to model different scenarios and automatically create the optimal production schedules.

With the intelligent tools available in the Factory of the Future, process manufacturers can adjust their equipment resources around their available supply of materials, and balance this against customer demand. By optimizing the flow of materials into products, process manufacturers can use their equipment more effectively and keep up with the delivery of products with a short shelf life. In addition, with daily and hourly forecasting based on available raw supply, ingredients, or materials, process manufacturers can stay on top of orders, while also decreasing waste.

5. IoT-aided logistics supply chain management

The Internet of Things (IoT) will undoubtedly impact many aspects of process manufacturing. Supply chain management and logistics seem to hold some of the greatest potential. Already scanners, bar codes, and GPS tracking are being used to monitor the movement of goods in the warehouse and on trucks to customers. A **recent survey** indicated that:

- 35% of manufacturers currently collect and use data generated by smart devices to enhance manufacturing/operating processes, and an additional 17% plan to do so in the next three years
- 38% currently embed sensors in products that enable end-users/customers to collect sensor-generated data, with an additional 31% planning to do so in the future.
- 34% believe it is "extremely critical" for US manufacturers to adopt an IOT strategy.

Get started on the journey toward the Factory of the Future

This is an exciting time for process manufacturers like you. Economic recovery and global growth point to optimism on the horizon. The Factory of the Future for Process Manufacturing is right around the corner.

The most important take-away is that you need to start now in order to remain competitive in the new process manufacturing paradigm. A wait-and-see attitude is highly risky, putting you in danger of losing market share to an existing competitor or a start-up with a low-cost alternative product.

Your ERP system is the foundation upon which you can build the Factory of the Future. You need an ERP system that has a flexible architecture, so the solution can expand along with your company, and you can easily integrate specialized applications, such as CRM solutions or PLM tools, to meet your changing needs.

You also need to consider your deployment options for the disruptive technologies that will help shape the Factory of the Future. Cloud deployment is the great enabler for solutions like Big Data and the Internet of Things. Cloud deployment offers the agility and storage needed to fully incorporate the vast amount of sensor data, customer account data, product history, and expense data needed to be proactive and in-tune with customer expectations.

Our final advice: Don't delay. Start to plan your strategy. Investments and deployment can follow a phased approach, so you spread out costs and create manageable project plans for your teams. A phased approach also gives you a chance to score some early wins and quick benefits. The sooner you start, the sooner you will achieve a return on your investment.

As a process manufacturer, your company needs to be bold to help define the Factory of the Future—and to reap its rewards. The time—and technology—are ready to make the Factory of the Future a reality now.

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641 Avenue of the Americas, New York, NY 10011

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SL INFORMATION SOLUTIONS
23-6, Block D1, Dataran Prima
Jalan PJU 1/41
47301 Petaling Jaya
Malaysia