

Enhancing Chemical Plant Operations

Becoming Smart Factory Ready

Introduction

Creating an Industry 4.0 smart factory requires time, planning, money and employee buy-in.

Companies are advised to develop a roadmap showing what they want to do before they start. **Improving communication through a digital platform** helps ensure alignment between people, processes, and technology.

Smart factories are facilities using computer technology to transmit real-time status of every machine to a central hub. The data is used to make decisions on the spot, avoid production delays, and provide opportunities to improve efficiency.

In these factories, a combination of electronic sensors connected to a computer network provides a constant flow of information. When combined with artificial intelligence software, the computers make autonomous decisions, improving chemical plant production.

In the United States alone, 86 percent of manufacturers believe that smart factories will be the main driver of competition by 2025.

Source: Deloitte

How it Works

Enhanced communication between machines makes a huge difference when Receiving can tell Procurement what raw materials arrived and when, and when Procurement knows what supplies are on-hand and what needs be ordered.

How it Works

1 Machine A has the materials it needs to create products. Machine B is working on a different product instead of being idle while waiting on Machine A.

Machines A through Z are programmed to perform their jobs and let human workers know when potential problems may occur. Sales knows what finished products are available for shipping and what is in the pipeline. Customers know when they can expect deliveries in the time and quantities they require.

How it Works

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How it Works

Rapidly acquiring & analyzing data from industrial internet of things (IIoT)-enabled devices helps turn standard factories into smart chemical plants.

These plants can view their entire supply chain **from inventory to production to sales**, in real time. Having the ability to keep track of production flow and **ensure the supply chain flows smoothly** is the primary function of specialized software Like **Microsoft Dynamics 365 Supply Chain Management**.

How it Works

Converting an existing plant using older manual devices, takes not only time, effort and money, but also requires extensive analysis and a lot of planning to bring an analog factory up to this level gradually.



How it Works

Critical smart technologies include hardware components for millions—possibly billions—of datasets.



Sensors



IIoT connections
(industrial internet of things)



Factory network
connections & cabling



Data storage
solutions

Company computers—either on-premises or connected via the cloud—require software able to organize and manage the data using artificial intelligence. One of these products is [Microsoft Dynamics 365 Supply Chain Management](#).

Industry 4.0

As part of the Fourth Industrial Revolution, commonly known as **Industry 4.0**, smart factories build on computerization added to manufacturing processes in the mid 20th Century's, Third Industrial Revolution.

More than just automating individual machines, Industry 4.0 smart chemical plants have:

- 1 Dramatically increased data collection.
- 2 Increased automation covering entire production runs.
- 3 Improved flexibility to mass-produce lots in any size.

Industry 4.0

5%

5% Percentage of factories are fully “smart”.

30%

30% Percentage of factories are being updated to smart status.

65%

65% Percentage of factories are making no progress to achieving smart status.

Smart Factory Challenges

Employees accepting ongoing training and developing needed skills. Deloitte estimates a 2 million worker shortage in the US alone over the next decade.

Factory owners face several potential barriers to converting an existing facility into a smart factory running more efficiently with minimal downtime and defects. These barriers may include:

The cost of updating factory floor machines to include sensors and information sharing capabilities. Some existing machines can be modified, while others may require replacement.

Smart Factory Challenges

Networking all data collection points to ensure a smooth, continuous information flow. The information can flow to a central server on the premises or remotely.

Factory owners face several potential barriers to converting an existing facility into a smart factory running more efficiently with minimal downtime and defects. These barriers may include:

Accepting the concept that smart factories cover the entire company, not just the production floor.

Smart Factory Challenges

Ensuring all updated devices are compatible and can be integrated into a complete network.

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Leading the Conversion Change 1/2

Some companies appoint “change champions” to lead their company into the smart factory 4.0 era. These people are often tasked with making the technology updates relevant to workers.

Change champions, which Deloitte’s research suggests, should be from the top-down (e.g., upper managers) and bottom-up (e.g., factory workers), help gain employee buy-in.

Leading the Conversion Change 2/2

Their chief focus is answering the question, “What’s in it for me?” from individual workers’ perspectives. For example, change champions explain how mastering automation gives workers the ability to head off potential problems before they occur. Fewer problems in the production process leads to greater sales.

Change champions also explain how they’ll benefit by gaining new skills smart factories of the future require. Additional training builds skills and that translates to more opportunities for pay and job security.

Chemical Plant Automation Devices 1/5



One step existing factories must take to become smart chemical plants is updating equipment. For example, valves that factory workers open and close manually should be replaced by semi-conductor enhanced valves that do it automatically.

Chemical Plant Automation Devices 2/5

Among the many chemical treating instruments required to provide a smart factory technology with the information it needs are:

- Smart pressure transmitters equipped with microprocessors and semiconductor pressure sensors that can directly measure pressure in pipes.
- Microprocessor-equipped differential pressure transmitters to measure flow rates, pressure and liquid levels of gases, fluids and steam.

Chemical Plant Automation Devices 3/5

Among the many chemical treating instruments required to provide a smart factory technology with the information it needs are:

- Flowmeters for measuring gas, steam and liquid, including vortex models that permit correcting temperature and pressure.
- Level transmitters equipped with microprocessor sensors for measuring levels in liquids.

Chemical Plant Automation Devices 4/5

Among the many chemical treating instruments required to provide a smart factory technology with the information it needs are:

- Control valves such as eccentric three-way rotary valves for mixing or dividing fluids.
- Temperature controllers to ensure temperatures are within a device's operating range and notify personnel of potential equipment problems before they occur.

Chemical Plant Automation Devices 5/5


The combination of electromechanical devices and modern monitoring software lets workers **watch conditions on the smart factory floor from literally anywhere**: an office in the plant or a laptop on the beach.

Computerized positioners lets trained workers know the **deviation between a set valve opening and the actual valve opening**. This knowledge helps workers detect signs of impending valve failure before it occurs.

Creating a Roadmap to Success

Companies wanting to update their factory to a smart chemical plant may want to follow a path similar to these 6 steps:

1 Map a smart manufacturing strategy based on each firm's specific industry dynamics. Be agile and able to change direction when real values begin emerging.


A large, light gray illustration of a person running up a set of stairs. A large question mark is positioned to the right of the person. A blue arrow points from the text on the right towards the person's feet.

Create a smart pilot project with proofs of concept that demonstrate the project's value to the company. Embrace failure and learn from mistakes.

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Define the required capabilities using a scalable data model. Ensure the technology used in one area communicates with that used elsewhere.

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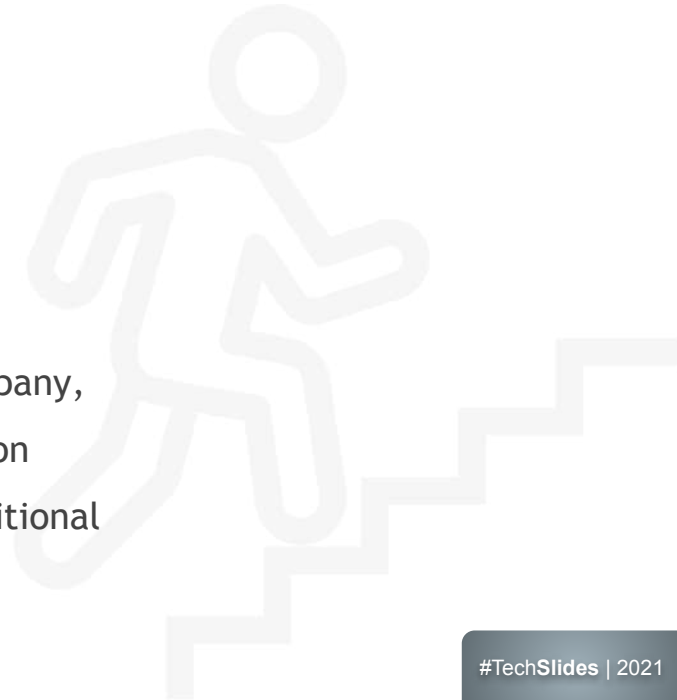
A large, faint, light-gray graphic of a person running up a set of stairs, positioned on the right side of the slide. A blue arrow points from the text of step 4 towards the person's feet.

5 Identify smart manufacturing insights appropriate to the company, such as cross-functional data analytic teams. Share information between teams to avoid duplicating efforts while gaining additional insights.

Creating a Roadmap to Success

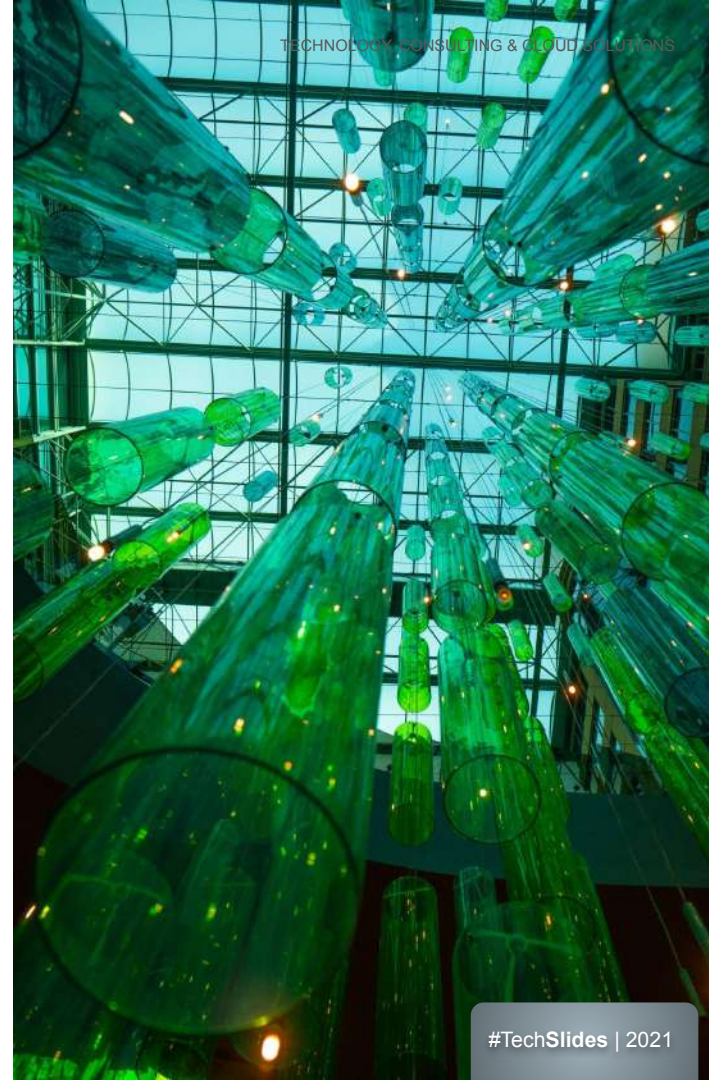
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Key Takeaways 1/3

Converting an existing factory to a smart chemical plant requires time, effort, money and patience. Factory owners and managers must overcome barriers on the way to achieving their goals.



Key Takeaways

2/3
One of the most important tasks is appointing Change Champions at the top (executive) and bottom (factory worker) levels who work together to get the entire workforce on board.



Key Takeaways 3/3

Advancing into the Industry 4.0 era means updating devices to provide a constant flow of data. Companies should create a roadmap showing how they will move from their current position to be a smart factory.



About Xcelpros

XcelPros is a Microsoft Direct Cloud Solutions Provider (CSP), Systems Integrator (SI) and Microsoft Gold Certified Partner for Microsoft Dynamics offering software licensing and services in the Microsoft line of products.

We specialize in the deployment of on-premise, cloud and mobility solutions in industry leading technologies such as Microsoft Dynamics 365, AX, NAV, Microsoft Dynamics CRM, Business Intelligence, intelligent Business Process Management (iBPM), SharePoint and Azure.

Our team is comprised of forward-thinking, experienced Subject Matter Experts (SMEs) and Technology Consultants with decades of business, industry, and regulatory experience.

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Get in Touch

- 1 Contact@xcelpros.com
- 2 Visit us at www.xcelpros.com