Can Smart Factories Ensure Continuity of Business Even Amid Crisis?

White Paper

aranca

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Section 1: Introduction

The COVID-19 outbreak and resultant lockdowns have negatively impacted industrial and manufacturing sectors across the globe. Traditional manufacturing industries have especially been hit hard as a major part of their activities is labor-intensive. They cannot function remotely like industries that are technology-based, or advanced automated manufacturing facilities. With challenges such as limited availability of workforce amid lockdowns and disruption of supply chain, these factories are struggling to maintain production in line with capacity and meet demand. This is especially true for sectors where demand is high, such as those producing FMCG, packaged food and medical supplies, scarce supply could dent the brand image among customers.

To deal effectively with the disruption caused by the pandemic, companies are actively embracing new technologies and the concept of smart factory being one of them. Smart factories are highly automated, flexible, less dependent on manual labor, and have higher operational safety features due to the use of advanced tools assisting manual workforce. Also, they are better equipped to handle operational challenges, particularly those arising during crises. This article provides an overview of what constitutes a smart factory and how it can help in responding to public health emergencies such as COVID-19.

Section 2: What is a Smart Factory

A smart factory is an integrated manufacturing facility, which is automated, digitized and connected by smart technologies. Technologies such as cloud computing, IoT, AI, robotics and big data are deployed to ensure functions run autonomously, without or minimal human intervention, and machines can learn and self-correct for optimizing performance.

Besides the features listed above related to production, the smart factory concept also includes connecting digitally with supply chain, logistics, product design and other stakeholders.

The infographic below provides a quick snapshot of the eight key aspects of the smart factory concept and corresponding technology enablers.

SMART FACTORY SNAPSHOT
8 Key aspects of smart factory

Robust Automation

Techology Enablers:
- Robot / Cobot
- MES/SCADA
- Additive Manufacturing
- Smart Sensors
- AI
- IIoT
- MES

Predictive Maintenance

Technology Enablers:
- Predictive Analytics
- AI
- Smart sensors
- IIoT

Connected Factory

Techology Enablers:
- Smart Sensors
- MES, ERP
- IIoT
- Data Analytics and Cloud Storage
- AI

Man-Machine Collaboration

Technology Enablers:
- Augmented Reality (AR)
- Virtual Reality (VR)
- Voice command
- Cobots

Real Time Information Management

Techology Enablers:
- Industrial IoT
- Wireless Data Capture
- PLC, SCADA
- Smart Sensors
- Augmented Reality (AR)

Flexible Autonomous Transportation

Technology Enablers:
- Drones
- AGV's
- Shuttles
- AI
- Data Analytics

Modelling and Simulation

Technology Enablers:
- Digital Twin
- Smart Sensors
- Cameras
- Data Analytics
- Cloud computing

Performance Optimization

Technology Enablers:
- Machine Learning
- Big Data Analytics
- AI

- **Robust Automation**: A step beyond simple automation, it refers to a completely connected and flexible system where robots are deployed for various tasks. This is the need of the hour, considering the increasing demand for customized products and services and frequently changing requirements. Advancements in AI, computer vision, and sensor technology can help robots multitask effectively and become interactive as well as more modular. Digitalizing manufacturing processes with the help of advanced technologies, for instance, in additive manufacturing, is important to adapt and respond quickly to changing needs.

Technology Enablers	
▪ Robots & cobots	▪ Additive manufacturing
▪ Manufacturing Execution System (MES)	▪ Smart sensors
▪ PLC/SCADA	▪ Artificial intelligence (AI)
▪ Industrial IOT	

Advantages	
▪ Increase productivity	▪ Improve quality
▪ Enhance efficiency	▪ Make production flexible
▪ Reduce cost	▪ Reduce material wastage
▪ Improve control over workflow	▪ Minimize human intervention

- **Connected Factory**: All components of a factory (resources, inventory, machines, etc.) are connected for better control over processes and to ensure optimal usage. Location of raw materials, transportation, flow of production, and the final product can be tracked with the help of sensors and the data can be integrated in a cloud with connection to MES/ERP systems. Access to historical data and ability to correlate it with outside data can make the system more robust. Moreover, it upgrades the systems for predictive maintenance and to deal with fluctuations in demand. While designing a connectivity infrastructure, choosing appropriate protocols is critical and factors such as range, bandwidth, data rate, interoperability, scalability, security, and power consumption need to be factored in.

Technology Enablers	
▪ Smart sensors	▪ Data analytics and cloud storage
▪ MES, ERP	▪ AI
▪ Industrial IOT	

Advantages	
▪ Simplify tracking and tracing	▪ Are capable of coping with fluctuations
▪ Give better control over processes	▪ Reduce inventory

- Optimize performance

- **Real-time Information Management:** The connected infrastructure facilitates real-time data visualization by aggregating data captured from multiple sources, such as production process, quality testing, and inventory, in line with important performance metrics and analyzing it to generate meaningful business insights. Decision-makers can use the insights to plan and respond to requirements.

Technology Enablers	
▪ Industrial IoT	▪ Smart sensors
▪ Wireless data capture	▪ Augmented reality (AR)
▪ PLC, SCADA	

Advantages	
▪ Improve visibility and control	▪ Help in taking quick decisions
▪ Optimize operations	▪ Simplify tracking and tracing
▪ Improve productivity	

- **Modelling and Simulation:** Digital twin of factory simplifies the planning, modelling and simulation of the factory infrastructure, production set-up and products. It is, therefore, possible to simulate and test a new product, process, or changes in set-up, etc., at an early stage and evaluate the benefits or challenges at a much lesser cost.

Technology Enablers	
▪ Digital twin	▪ Data analytics
▪ Smart sensors	▪ Cloud computing
▪ Cameras	

Advantages	
▪ Optimize process parameters/plant performance	▪ Reduce risk
▪ Facilitate predictive evaluation of production decision based on analytics	

- **Predictive Maintenance:** Historical and real-time data obtained from sensors can help in predicting failure/damage. This can optimize maintenance, without affecting ongoing work in real time, and improve the working life of components.

Technology Enablers	

▪ Predictive analytics	▪ Smart sensors
▪ AI	▪ Industrial IoT

Advantages	
▪ Reduces downtime	▪ Balance production

- **Man-machine Collaboration:** Interaction between human workers and machines based on the use of smart technologies enhances the ability of the workforce, improves safety and simplifies collaboration of information. AR-based technologies increase accuracy and decision-making capability. Employees are digitally connected and wearable devices, such as smart glasses, help them in performing their activities better. Cobots and humans can work together efficiently on complex jobs, which would not only reduce man hours but also improve quality. Moreover, with the help of virtual technology, employees can be trained.

Technology Enablers	
▪ AR	▪ Voice command
▪ Virtual reality (VR)	▪ Cobots

Advantages	
▪ Ensure output with zero defects	▪ Make the work environment safer
▪ Facilitate remote control	

- **Flexible Autonomous Transportation:** Automated guided vehicles (AGVs), shuttles and drones ensure quick delivery. Autonomous vehicles can reduce dependence on humans in interplant or intraplant logistics drastically. Also, these vehicles can be reprogrammed for different routes, speeds, loading, etc., as per the requirement, which makes them flexible options for transportation.

Technology Enablers	
▪ Drones	▪ AI
▪ AGV	▪ Smart sensors
▪ Shuttles	

Advantages	
▪ Decrease human intervention	▪ Ensure faster delivery
▪ Facilitate remote handling	▪

- **Performance Optimization:** The objective behind using smart technologies is to optimize performance across the broader network of machinery, resources, business processes and supply chain. Also, these help in predicting failures/damages and foreseeing risks; accordingly, corrective steps can be planned well in advance.

Technology Enablers	
▪ Machine learning (ML)	▪ AI
▪ Big data analytics	

Advantages	
▪ Minimize inventory	▪ Improve quality
▪ Improve operational efficiency	▪ Reduce energy consumption

Considering the advantages listed above, in the rapidly changing environment today, smart factory systems are the need of the hour.

Section 3: How can Smart Factories Respond to Challenges Posed by COVID-19 outbreak?

COVID-19 has forced governments across the globe to implement lockdowns, restricting movement of people and goods. Smart factories can function even in a highly constrained environment such as currently, given their various features.

- **Better visibility**: Smart factories are connected. There is data flow between plant machine, planning system, inventory and supply chain providing real time visibility of operational parameters and simplifies evaluation of critical performance metrics. Analysis of this information provides various business insights, so that we can quickly respond to changing requirements.

- **Flexible manufacturing**: A flexible automated production cell can be easily reprogrammed or repurposed to suit demand. With the help of modular automation technologies, like industrial robots, the same machineries can be modified to match different production requirements according to changing demand.

- **Intelligent technologies**: AI and ML can be employed to manage fluctuations in demand, predict supply disruptions and plan in advance. Advanced analytical technologies can help in deriving meaningful business insights from data which can then be used in preparing effective strategies. These technologies ensure optimal utilization of resources during critical times.

- **Fully autonomous**: Automated production lines and flexible autonomous transportation technologies (such as AGVs, shuttles and drones) eliminate human intervention and are capable of controlling an entire production line on their own.

Section 4: Successful Business Case - Hytera

Hytera, a leading provider of private professional communications solutions globally, has managed to beat the odds successfully in the current challenging environment, setting an example for others. Despite the issues associated with the COVID-19 pandemic, such as limited availability of workforce, social distancing, and disruption of supply chain, the company's production remains unaffected. This is attributed to Hytera's intelligent manufacturing center in Shenzhen, China, which is equipped with cutting-edge smart manufacturing technology. The company invested in intelligent manufacturing and supply chain solutions back in 2013. This is a perfect example of how a smart factory can ensure continuity of business even in adverse circumstances.

Hytera deploys a manufacturing execution system (MES) that streamlines the entire production process through real-time information. The production line is flexible and can be quickly reorganized to meet different product manufacturing requirements, ensuring fast response to changing market trends and customer demand.

Intelligent manufacturing and management systems, automated dispensing, assembly and functional testing ensure precision and high levels of efficiency. Plus, the packaging system is automated, and products can be monitored remotely. The factory is also equipped with smart warehousing and logistic systems.

Due to flexible manufacturing processes, Hytera was able to switch production to disposable face masks to address the global shortage of medical gear caused by the COVID-19 epidemic.

Focusing on investment in R&D and aggressively pursuing the smart factory strategy helped Hytera to upgrade its intelligent manufacturing processes to the Industry 4.0 stage in 2019. The company now has more than 10 smart production lines. Hytera aims to digitalize and automate all manufacturing processes to comply 'smart' manufacturing standards. This business case perfectly demonstrates the significance and capabilities of a smart factory. It is high time manufacturers fast-tracked their digital strategy and prioritized smart factory initiatives, as this would ensure they are better prepared to deal with dynamic scenarios and challenges in future.

(Source: Hytera website)

Section 5: Conclusion

Smart factories not only improve overall productivity but also render the work environment safe. Automation and digitalization have become the new reality. The COVID-19 pandemic has re-defined processes and tasks; it is time to think out-of-the-box and switch to digitalization. The USP of a smart factory is its capability to respond on time and adapt to changing requirements, such as new services and products, and customization based on customer and market demand. With robust automation, big data analytics and growth in cloud storage services, smart factories are making organizations more powerful. Arguments over long payback period will be outweighed by the necessity to ensure continuity in business. It is quite likely, therefore, that after the crisis, a new perspective will emerge, reflected in the surge in smart factories.

About Aranca

Founded in 2003, Aranca is a global research & advisory services firm working with clients worldwide across financial markets, industry sectors and technology domains. Aranca brings to play the strong combination of best data and best talent to empower decision makers with intelligence and insights, enabling them to reach better business decisions. Our multi-disciplinary expertise is designed to cater to clients of all sizes across a wide spectrum, from Fortune 500 companies and financial institutions to private equity and high potential startups. In the MENA region, Aranca works with some of the top family groups, private equity and investment management firms with strong focus on strategic corporate and financial advisory services.

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