

Smart Fastener Manufacturing: The Connected Factory

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Introduction

Every day we hear people talking about new technologies like artificial intelligence, augmented reality, big data, IoT, 3D printing and how they have changed our life today. All these, so-called disruptive technologies, are transforming the way we work, we do business, we produce products, or we provide services. In this article I will discuss the transformation in manufacturing industry through advanced technologies and its applications in industrial manufacturing. This is an important topic as manufacturers should keep up with the new trends of advanced technologies to stay relevant in a fast-changing world.

What is “Smart”?

Let's start with the word “Smart” that we commonly use as an adjective before several names, such as factory, city, education, farming, marketing and many more. It seems that everything is becoming smart and any industry is looking for smart solutions. Although it's hard to find a single obvious definition for smart environment, when we talk about it we talk about a data-driven environment. The environment, where its components, by leveraging technology, can keep collecting, integrating, analysing and storing relevant data from various internal and external sources to learn, make decisions and take prompt actions.

In any smart industry or solution, relevant data must be located at the heart of the environment. However, not any data is useful for us, that's why we call it relevant data. The data that we could extract value from by turning them into knowledge and wisdom is called relevant (smart) data.

Smart Factory and Smart Manufacturing

Smart factory is an integrated system that links operational and digital technologies with manufacturing data. In a smart factory, machinery and equipment can improve and enrich processes through automation and self-optimization as the whole environment has the capability to learn. The value spreads beyond just the manufacturing of products and goes into functions like planning, supply chain, product development, maintenance, and even after sales market.

However, the central value of the smart factory still occurs within the whole process of producing goods as we call it by “Smart Manufacturing”. The structure of smart manufacturing consists of a combination of innovative production equipment, data, and communication technologies which is capable of being integrated to all components of the manufacturing supply chain. The smart manufacturing is defined as a big jump forward from more traditional manufacturing process and automation to a fully connected and flexible system.

In smart manufacturing, all different parts of production, involved throughout the manufacturing process, are connected to each other mainly via wireless data communication technologies (such as Wi-Fi, Bluetooth, LoRa, etc.). The main reason for having connected devices (IoT) is to collect and analyse real-time or near real-time production's data in order to make the best possible decisions and actions.

Smart Fastener Manufacturing: A Practical Example

In general, the key enabler of smart manufacturing is technology. Analytics engines, sensors, robotics, and many other technologies are needed in order to build a data-driven factory. Sensors, for instance, increase our awareness from different levels of production and provide us with live data about what is happening now in any specific processes throughout the production. The usage of sensors is not just for monitoring but also for taking actions such as preventive maintenance and predictions. Let's assume in a fastener factory using cold forging technology the whole production process has been experiencing a large problem because just a die deformed during the production and failed. The cause of deformation identified as thermal softening which has not been detected before the failure. In this case, simple temperature sensor(s) could help a manufacturer to monitor the temperature of cold forging components and avoid complete failure made by a die. Installed sensors used to keep collecting and transferring data for analyses in order to predict the occurrence of the same incident (deformation of die) which might happen again in the future. Sensors send data to an analytics engine to analyse data using various statistical modelling and machine learning techniques to detect any potential damaging incidents and alert users when those specific incidents might be happening again. Accordingly, operators could do their preventive maintenance or any other relevant actions prior to any potential failure. Although, transforming the traditional automation into a new connected system (i.e. digital transformation) might be costly as factory needs to invest in purchasing sensors and building up the analytics platform, but factor saves significant cost throughout the production process. Smart manufacturing

drastically reduces the chance of facing any critical issues in production and improves quality and reliability.

There are several types of sensors in market with multiple applications which can be used in any fastener manufacturing to assist operators and plant managers for their decision making and effective actions for a dynamic production environment and the desired results. Sensing technology on self-driving vehicles, as one type of robotics, used for material handling in fastener factory, for instance. Using robotics in different levels of production improves efficiency and safety in the factory. Their ability to sense and automatically avoid any unexpected disruptions in work keeps production running optimally. When all major components of production process are connected and talk to each other we could get the real value of data-driven environment.

Industrial manufacturing is moving towards customization and on-demand production, therefore by minimizing production downtime for retooling, rebooting devices and creating a dynamic production, manufacturers can operate efficiently while staying flexible. Smart fastener manufacturing in connected factory makes it possible for manufacturers to automate the required process to produce customized products during the manufacturing process.

Digital Transformation: Your First Big Step

Building a connected factory can be done in various ways through digital transformation. Fastener manufacturers can implement their digital transformation strategies both inside and outside the four walls of their factories. Manufacturers should leverage digital and physical technologies based on their priorities and fields of operations to transform into a smart manufacturer. The new connected factor should facilitate the flows of information between the physical and digital worlds.

Fastener manufacturers could start with collecting and analysing relevant data from different parts of their production process before investing in robotics or costly hi-tech machinery. Harnessing the power of data is the key in smart manufacturing as this assists manufacturers in identifying and solving their challenges, bottlenecks, and potential production threats.

Factories need to be digitally transformed in a way that each level of production can perform data collection and analysis. This will lead the factory into a safer and more reliable plant and creates competitive edges for manufacturers to excel in today's dynamic marketplace. ■

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