SOLIDWORKS

HOW SMBS CAN GAIN THE SMART MANUFACTURING ADVANTAGE

Practical solutions address day-to-day repetitive problems, without a huge upfront investment

DASSAULT SYSTEMES

INTRODUCTION

Smart manufacturing does not require much by way of introduction. Referred to by a variety of terms - Industrial Internet of Things (IIoT), Industry 4.0., smart factory, connected factory, factory of the future, digital transformation and smart manufacturing - it essentially involves extracting, monitoring and connecting data from industrial equipment and its related processes in real-time to optimize production and maintenance.

With machinery and processes connected to a smart manufacturing network, users are able to gain insights from the data being collected in real time to help drive better decision-making. This leads to increased agility, accuracy and efficiency, which helps reduce risks and lowers costs.

CHAPTER 1:

WHAT HOLDS SMALLER MANUFACTURERS BACK FROM IMPLEMENTING SMART MANUFACTURING?

While the benefits are many, smaller manufacturers often feel Smart Manufacturing initiatives are out of their reach, too costly and disruptive to implement. This impression is often validated by larger players, who, having implemented the technology for a number of years already, report on fully automated, lights-out operations in their plants and factories.

While this may be the "holy grail" of Smart Manufacturing, it is not a starting point for smaller companies. They need a practical and accessible solution that will enable them to reap the benefits of agility, efficiency and reduction in costs—all without a huge upfront investment and disruption to their operations.

Rather than sophisticated robotics and fully automated operations, what's needed from the technology is practical solutions to help address some of the day-to-day repetitive problems they experience such as, how can I ensure I'm not running out of products or have an overrun on parts again? These may seem very basic problems to address but solving them will play a key role in helping these businesses run better.

Smart Manufacturing solutions also need to take into account legacy equipment. Most factories feature a mix of older machines operating side-by-side with more modern equipment, with both performing similar roles. There's no reason to replace these legacy machines. They may not be equipped with native integrated sensors and digital capabilities, but can be easily retrofitted with basic sensors. This means that in practical terms, a Smart Manufacturing solution can include legacy equipment and the ways in which data can be extracted from them.

EXAMPLES OF HOW THESE KEY BENEFITS MAY LOOK IN AN INDUSTRIAL SETTING INCLUDE:

- **Real-time monitoring of raw material consumption increases efficiencies.**

Monitoring machine data leads to improved accuracy of a manufacturing bill of materials (MBOM). As a simple example, on the shop floor assumptions can be made in terms of how long it takes a certain machine or process to make a part. But with real-time verifiable data from that machine, there is proof in exactly how long it takes. Based on this information, schedules can be modified to ensure available resources are used more strategically, further boosting productivity and efficiency.

- **The digitalization of manufacturing improves accuracy.**

In the past, a physical mechanical counter on a machine would reveal how many times it cycled in a particular shift. This information is then manually inputted by the operator into the ERP system. This often leads to inaccuracies or errors as the operator may forget to do it or simply not input the information properly. Now with a direct connection between the machine and the system, accuracy is guaranteed.

- **Freeing up the operator's time to do more value-added tasks.**

With data now flowing from the machine directly to the system, it reduces the amount of manual tasks required on the shop floor. Gaining time in this way means that operators can get involved in more value added tasks or it may also mean reducing the amount of shifts needed, resulting in further cost savings.

- **Proactive, not reactive, to changes arising during production.**

Data coming from machines, even if it's just simple data such as cycle

count, provides insight into production that could alert the user to a problem. The sooner the problem is dealt with, the less likely a serious failure will occur, which could result in costly downtime. Maintenance then becomes a proactive, preventative measure rather than a reactive break-fix initiative.

- **Lowering the factory's environmental impact.**

The more efficient a factory's operations, the less electricity is required to run machines, helping to not only reduce energy costs but also the overall environmental impact of its operations. Additionally, digitalizing manufacturing reduces the amount of paper needed on the shop floor as all this information is now displayed on a digital dashboard.

CHAPTER 2:

SMART MANUFACTURING ONE STEP AT A TIME

While Smart Manufacturing might be new to some, manufacturers have been using data for years to make improvements. For instance, continuous monitoring, or the collection and analysis of machine data, has been carried out by manufacturers for decades. What is new, however, are the technologies that enable this to be done much quicker, more efficiently and, crucially, in real time. With devices and machines connected in a network, data is being collected automatically.

The first practical monitoring step can be as simple as monitoring a machine's cycle count. For instance, in an injection molding machine, the cycle time is the total time needed to complete the stages of the molding process, from closing the mold to ejecting or releasing the part. Previously, this information regarding how many times the machine cycled in a shift or in a day was displayed on a physical cycle counter usually on the outside of the machine. This information was then inputted manually into an ERP system.

Today, with the injection molding machine connected to the Smart Manufacturing network, this data is collected automatically and shown in real-time on a centralized dashboard where it can be easily monitored.

Monitoring cycle counts may seem a very simple use of Smart Manufacturing, but this basic information that conveys whether or not the machine is running and how fast it is running is crucial to creating a production report. It also means that rather than having to wait for that information to be available at the end of a shift or the end of the day, planning decisions can be made based on real-time data coming from the machine. This information can be viewed from any computer on the network, even remotely.

Monitoring the cycle counts and times on a machine will also provide vital information on the condition of that machinery. As such, this data will help alert the operator if a part is likely to fail. That means that users can prevent failure with proactive measures, rather than the machine failing and having to carry out reactive measures. This is known as preventative maintenance, and even by monitoring simple data, manufacturers are able to prevent downtime, which often results in a huge loss of revenue for small manufacturers.

CHAPTER 3:
NEXT STEP IS MONITORING THE PROCESS

The next step is monitoring the actual process. A simple example of process monitoring is having multiple injection molding machines in a single area on the shop floor with each machine being slightly different. While the operators can easily grasp that difference, what is less easy to grasp is how the data coming from each machine is different.

With an ERP system created specifically for manufacturing, such as DELMIAWorks, the RealTime Process Monitoring tool displays data in a common format across all those different machines. Users now have a comprehensive and realistic view of the shop floor, which can then be used to make intelligent decisions that can lead to productivity gains.

Once a return on investment (ROI) has been gained and benefits reaped, the Smart Manufacturing solution can then be extended out to encompass other processes and machinery within the factory. Through incremental steps Smart Manufacturing can be implemented across the entire factory.

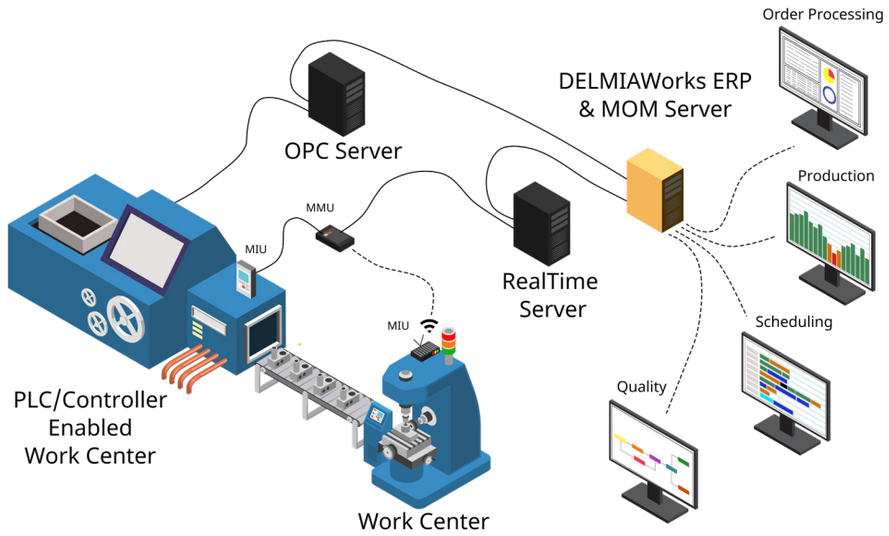
CHAPTER 4:

HOW DOES A SMART MANUFACTURING SOLUTION WORK?

Smart manufacturing takes the concept of networking and connecting multiple devices and machinery within a factory or industrial environment to share data – locally or remotely. In practical terms, a lot of that data is already available or can be easily harvested. While data can come from sensors, it can also be extracted from existing PLC and SCADA/HMI systems, which is an available source of information as it is already collecting various data points from that machine. This data is then connected via various wireless protocols (such as Wi-Fi, Bluetooth and 5G) in order to exchange data with each other.

The basic structure of a smart manufacturing network looks like this:

- The sensor-equipped devices and hardware are each connected to the local network via wireless protocols.
- In turn, the local network is connected to the cloud or internet via a secure Edge Gateway.
- Cloud-connected servers receive and process the stream of data from the shop floor (for instance, operating temperature and vibration). This data can be analyzed so as to gain insights into the factory's operations.



Crucial to the flow of data from and between these different connected devices are data protocols, which are communication standards that enable connected devices to exchange data. This data is transmitted to a local server or to a cloud application where it can be analyzed by the user. The challenge in Smart Manufacturing is that different industrial assets within a factory can have different asset protocols, such as OPC UA (OPC Unified Architecture), MODBUS or PROFINET, that need to be integrated. However, integration issues are becoming less of a challenge as the more standardized OPC UA data protocol becomes more widespread. This open machine-to-machine communication protocol is becoming a common standard for industrial equipment that supports both cross-platform industrial automation data sharing and promotes interoperability of systems.

TIME TO GET STARTED

There are many benefits to be gained from implementing a Smart Manufacturing solution, such as agility, efficiency, accuracy and a reduction in downtime. However, many smaller manufacturers and SMEs have yet to implement smart manufacturing as many perceive that it will entail radical change and disruption to their operations, not to mention a costly investment. But it doesn't need to be this way. By taking smart manufacturing one step at a time and bearing in mind certain considerations, benefits will soon be reaped.

While it will, of course, take an initial investment to get started, this investment will prove to be a fraction of the cost that's been experienced due to downtime, low quality and inefficient manufacturing.

Are you ready to learn more? Be sure to download **3 Steps to Start Your Smart Manufacturing Journey eBook.**

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