Andea GUIDE:

PRODUCTION PROCESSES -

REPETITIVE MANUFACTURING

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MANUFACTURING IS MORE THAN JUST PUTTING PARTS TOGETHER. IT'S COMING UP WITH IDEAS, TESTING PRINCIPLES, AND PERFECTING THE ENGINEERING, AS WELL AS THE FINAL ASSEMBLY.

- JAMES DYSON

Why forcing the door that is already open? Andea Guides answer the most burning questions on manufacturing. They provide the readers with suggestions, recommendations, and insights on the industry's latest trends covering various topics such as Repetitive Manufacturing, Complex Assembly, Logistics, Quality Management, and Plant Maintenance.

All of the Andea Guides are based on the "**Meet the ExpertS**" webinar series that connects Andea experts with industry professionals enabling them to stay up to date on Andea's solutions, ideas, and vital developments.

WHAT IS THE FUTURE OF REPETITIVE MANUFACTURING?

We see the future of repetitive manufacturing tightly linked with IoT, increased automation, and gathering more data to drive the production process. We can call it data-driven manufacturing. Future manufacturing will be more and more reliant on detailed planning, which, when done correctly, can help in minimizing machine setup time and the associated costs of this potentially lost machine time. Based on the machines' data, we can do things like predictive maintenance and all kinds of business-related analysis to make the production process more efficient and reduce machine downtime.

Additionally, we see that the traditional mass-production model is starting to be replaced by mass customization. Instead of concentrating on the conventional “make-to-stock” production model, we see more and more companies move towards a “make-to-order” model because their clients don’t want to do or have what their neighbor has.

Thus, the production line needs to adapt much faster to configuration changes and be more agile in general. The times of Henry Ford, who once said, “Any customer can have a car painted any color that they want, so long as it is black,” are long gone.

Starting from the industrial revolution or even earlier, the three manufacturing principles are: faster, better, cheaper. Companies want to produce fast, with minimum waste and good quality, and as cheap as possible so the product can be available to a larger group of people. It wasn't easy to achieve without making substantial quantities of the same part in the past. This mantra has not changed, but with improvements in technology and systems, we can start to achieve these principles and provide the product variations wanted in the market.

IS OOTB THE ANSWER TO REPETITIVE MANUFACTURING OPERATION?

The Out-of-the-Box solutions topic is a subject of another Andea Guide. You can download it here:

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First of all, we observed that companies deciding to install OOTB solutions often need to adjust their processes to the solution's requirements. There are also Out-of-the-Box solutions dedicated to the specific type of production.

For instance, if you have a packaging line with a roto-packer, a conveyer, and a palletizer, you will use an existing OOTB solution supporting such a line without modifications.

However, sometimes the company is obliged to respond to some specific client needs, such as:

- **additional label with a particular logo,**
- **shipping information printed directly on the product label,**
- **specific tests executed during production,**
- **or calculation of specific KPIs.**

In such cases, the company needs to ask the software vendor to modify the solution. It may take a long time to alter the solution according to the requirements. Sometimes software vendors may even claim that it's impossible. In the case of a platform-based solution such as the Delmia Apriso, the installation is not as prompt as in the OOTB's case since the companies need to develop the full functionality.

However, since you can tailor it to your unique needs, there can be as many specific scenarios as required. If the company has qualified people in-house, they can even modify the solution on their own. So in the longer perspective, considering potential customer-specific requirements, a platform-based solution is a better option, in our opinion.

HOW TO ORGANIZE REPLENISHMENT?

We observe a trend of more and more utilizing MES to drive replenishment in real-time.

The manufacturers can do it in two ways:

- **for fast-moving parts where components need to be delivered frequently to the line, we can use Electronic Kanban to make sure there is a consistent replenishment of the elements,**
- **for slow-moving parts, MES can drive replenishment based on the scheduled quantity.**

Sometimes component warehouse is far away from the production, and companies often organize “Intermediate Zones” or “Pre-production Supermarket” warehouses to keep smaller inventory close to the output. Then the Reorder Point Principle replenishes this intermediate warehouse. It means that each component needs to have a dedicated location. When the number of pallets or quantity drops below the reorder point threshold, MES will trigger replenishment order creation for that part.

Also, we usually recommend companies to have a “Preparation Phase” of the Production Order. For instance, if they are not going to make the whole production quantity and finish the order earlier, they can start preparing a new order at a particular time before finishing. It can give a signal to replenish new material.

To help you visualize it better, let us share a real-life case with carton boxes’ assembly replenished using classical Kanban.
The problem was that every changeover required a call to the carton area leader with information that one of the production lines will change the product in the next 15 minutes. However, the people often forgot the call or brought the wrong box, so we advised a solution to pass the “Order Preparation” signal to Carton Assembly Area so shopfloor operators could see the actual demand.

HOW CAN MES IMPROVE THE ACCURACY OF YOUR COMPONENT CONSUMPTION AND THE CORRESPONDING INVENTORY BALANCE?

There are a few ways to consume components. One example is backflush. Based on the quantity of the finished good and the Bill of Material, the system calculates the components' theoretical amount. You perform this activity when declaring finished goods. Until then, you see the parts as WIP (Work In Progress).

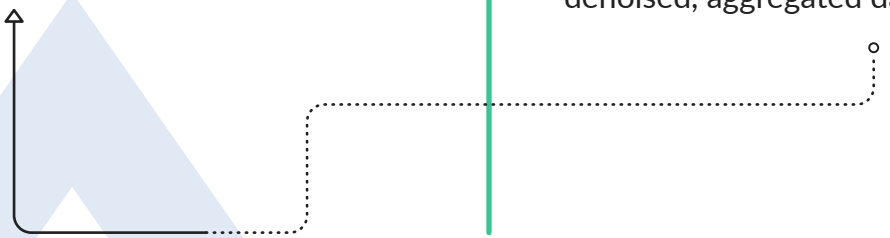
The backflush is typically done based on the FIFO principle, so it may not be too meticulous. However, historically that way was the preferable one by the ERP systems. The challenge with this approach is that the BOMs may be imprecise, leading to inventory inaccuracy.

Nowadays, we see more and more machines, especially in repetitive manufacturing, allowing us to record real-time component consumption at the point of use and with the actual quantity. For instance, if the component is in the silo, the silo is often equipped with a flow meter to measure the exact amount sent.

We also recommend embedding inventory reconciliation into the process to improve inventory accuracy. You can do it at the end of a shift or a production order, assuring correct inventory balances at the end of a run and the suitable consumption of components per order.

HOW CAN INTERFACING MES TO THE MACHINES SUPPORT REPETITIVE MANUFACTURING?

In the previous question on the future of repetitive manufacturing, we mentioned automation becoming more and more prevalent in the industry. The automation benefits start with sending the process or recipe data to a machine automatically when the process order starts.
It automatically allows us to switch the required process parameters on a device on-the-fly based on what needs to be produced without manually performing these tasks. We can also gather, in real-time, data regarding production quantities, defect quantities, machine speeds together with multiple parameters and quality measurements.
It helps us control the production process by helping reduce lost time and improving the product's quality.



Another more frequently utilized area is the use of Data Historians or Operational Historians. These are time-series database applications that developed significantly in the last decade.
In the MES systems' past, historians have been used to store large numbers of process data and compare the current process conditions to the past. MES utilized historians as another type of data source, like SQL data, OPC, LIMS - to name a few. It has changed, and historians have now grown into powerful real-time calculation engines that allow a context-specific analysis of many assets. It can be critical and vital in scrutinizing machine performance by the use of SPC analysis. MES should not read only the raw data anymore but can benefit from getting denoised, aggregated data from data historians.

ABOUT ANDEA

Andea specializes in delivering MES services and solutions, from conducting technical assessments and implementing strategic manufacturing systems to managing global MES rollouts. Our employees are process experts in production and logistics, quality management, and production data analysis. We have successfully delivered hundreds of global manufacturing system implementations in various industries, including Automotive, Aerospace & Defense, Packaging, Medical Devices, FMCG, and Industrial Machinery & Equipment.

In 2020 Andea decided to expand its portfolio with APS (Advanced Planning and Scheduling) solutions by signing a partnership agreement with Dassault Systèmes as the only authorized DELMIA Ortems vendor in the Polish market. Since then, Andea has been distributing the product on their home market and providing implementation services worldwide. With this expanded product portfolio, Andea provides its customers with solutions that support a more comprehensive range of manufacturing processes.

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