ADVANCED PLANNING AND SCHEDULING IN JAKSCHE TECHNOLOGY

Igor GRUDEN[1], Benjamin HAMZIĆ[1], Heidrun ANDRE[2]
[1]CADCAM Group
[2] JAKSCHE Technology d.o.o.

ABSTRACT

Every production environment needs a plan for its operation, which must be made multi-level, both at the sales and at the level of management, planning and scheduling. There are quite a few software solutions on the market for advanced planning and scheduling or APS. This article describes a DELMIA Ortems solution from Dassault Systèmes, and the implementation experience of this solution in Jaksche.

1 INTRODUCTION

Manufacturing has never been simple. A large number of jobs and processes need to go in line in order to get even the simplest product on the shelf in time with the quality required. When it comes to complex industries like aerospace, automotive, industrial equipment etc. the job is even harder. Constantly growing market demands higher quality standards and lower price, which impose high pressure to production efficiency and agility.

Both of these requirements are related to a "simple" task of production planning and scheduling. Planning and scheduling give overview of the production capability: capacity and load, as a basis for optimization and improvement, while accurate time of delivery is the foundation of agility.

Advanced planning and scheduling (APS) help to accelerate supply chain agility and decision-making processes of an organization. Fast moving competitor strategies with respect to price wars, changing consumer preferences, stable inventory, and distribution capabilities are expected to drive companies to adopt new technologies such as APS to effectively manage business processes.

2 ADVANCED PLANNING AND SCHEDULING

2.1 Current situation

Even though it wouldn't be expected, currently Planning & Scheduling processes are poorly digitized across manufacturing businesses. Planning is done mostly manually which causes a lot of drawbacks like static planning, bad connectivity between IT systems, high time consumption, no collaboration and file-based data.

On the other hand, return on investment in APS domain are tremendous because it helps to solve ever increasing complexity of supply chain and

production process (i.e., cycle times and inventory, productivity, time, customer service level, responsiveness, etc.).

Picture 1: Production plan is easily accessible

2.2 Available solutions on the market

Digital backbone of any company today is Enterprise Resource Planning Software (ERP). ERP is often used for planning, but it is rarely "up to the task". ERPs are applications built with aim to model the company from book keeping point of view: by finances, goods and customer relations. Even the most sophisticated ERPs nowadays still struggle with production planning. Number of factories loose years in struggling to enable/build up ERP to adequately represent production process. But it rarely works. Most of the ERPs were not built to support entirely standard production processes and its data model cannot represent it faithfully.

However, the APS market is still highly fragmented. There is no clear leader that spans across all industries. Different solutions cover different planning capabilities. Some of them cover only manufacturing planning (capacity levelling, scheduling and simulation) while other cover end-to-end supply chain planning (from demand to manufacturing including logistic flow and transportation).

2.3 Key challenges in planning

APS needs to meet numerous key challenges as best as possible, such as:

- Improve customer service, planning adherence, reduce backlogs, give realistic commitments on due dates,
- Reduce waiting time, idle time, set-up time, overstocks,
- Maximize assets utilization and cash flow without additional investment,
- Getting the most of your resources (machines, labor, tools, space, inventories),
- Synchronize production flows and improve supplier reliability,
- Assign the right priority when a resource is shared between multiple programs,
- Dynamically rescheduling production when breakdown or other issues occur.
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All these challenges can become very complex very quickly, especially if we use classic planning and scheduling tools. [1]

3 DELMIA ORTEMS

The power of APS model lies in its ability to faithfully represent targeted real-life behavior. The goal of APS is to precisely model each and every production process with all its constraints and their interrelation and interdependency with other processes. This makes the data model of typical APS highly complex and hard to create. The only way to make it possible is to start with deep knowledge of production process in general and typical issues that arise on shop floor daily. Starting from that it takes years iterative cycles and loads of experience and fine tuning in order to build flexible yet faithful representation of real-world factory and its properties. In this article we will focus on DELMIA Ortems. Ortems team has over 30 years of experience and footprint in over 60 countries. Is supports some of the biggest companies like Novares, Airbus Helicopters, Nexans, Velan and Speed Group.

Thanks to the large number of users around the world, Ortems engineers have been able to develop planning capabilities that meet the needs of planners in various industries.

In Ortems one can model nearly all the constraints, with no need for hard coding. It is a plant centric solution and covers all the requirements - from long term to short term. It operates in a multi-user network framework, and

currently can be implemented on-premise infrastructure only.

Picture 2: DELMIA Ortems planning optimization engines

3.1 Planning features

DELMIA Ortems addresses key challenges described in previous chapter with its powerful planning and scheduling features, such as:

- Constraint modeling – to consider a lot of different physical constraints like: machines, human resources, stocks, suppliers, materials, lead times, tools, maintenance, manufacturing processes, etc.
- Load and capacity planning – to visualize load and capacity of production in bucket detail of user's choice and perform a load-levelling in the medium to long-term in finite capacity, allowing to take actions in case of overload.
- Identification of bottleneck issues – to color visualize overloads, missing materials, performance issues, shortage of labor, work order delays, etc.
- Performance indicators and what if scenarios – with the possibility of saving and comparing different simulations in order to select the best scenario. Changes in planning are immediately visible on performance indicator figures.
- Automatic optimization engines – with fully configurable leveling parameters, such as: bucket and period, alternative resources, limits of primary and/or secondary resources and advance/delay control. Parameters can be used on the whole planning process, separate project or individual work order.

4 IMPLEMENTATION IN JAKSCHE TECHNOLOGY

Implementation of Ortems in JAKSCHE was done by CADCAM Group and it was the pioneering project in the Adriatic region.

JAKSCHE is mid-sized company, with 50 years of experience in the production of fiber-reinforced plastic components for customers in Europe in a wide variety of sectors. The Austrian Jaksche Kunststofftechnik offers digital product development and feasibility studies. The production plant Jaksche Technology d.o.o. is based in Aleksandrovac, Bosnia and Hercegovina. They utilize CNC and Robot cutter machines, but the main resource is manual labor. They employ over 140 employees with different skills: design, engineering, lamination, cutting, polishing, assembly and quality control. Their main tools are molds for different products. Molds have to be produced in different size & shape and afterwards they can be used only a limited number of times.

Therefore, the main goal in production optimization was to improve the usage of molds, which was challenging to achieve, but the result was very effective and useful.

4.1 Drivers

As a production company, JAKSCHE needed to implement a good planning solution to get the

most of their production capacity. Before that, the production leader planned the production manually using Excel and data from ERP and MES systems. Excel is not primarily a planning software so it is difficult to integrate it with ERP and MES system. Overall, manual planning of production in JAKSCHE was difficult and APS solution had to address their pains:

– Planning took a lot of time, up to two to three hours on a daily basis.
– Visibility was poor, especially on the warehouse in terms of not knowing if there is enough material in stock. With increasing the production capacity these problems only increased.
– There were situations where production was inefficient due to slow material supply.
– Human resources manager spent a lot of time adapting to the unexpected disruptions, such as sick leaves.

4.2 Expectations

JAKSCHE decided to implement DELMIA Ortems APS solution to improve their production performance. They set to achieve goals which can be measured:

– Improve delivery of customer orders on time - Customer Service Rate KPI.
– Better manage the human resources. Quickly adapt the plan to expected (holidays, maintenance) or unexpected disruptions (sick leaves, breakdowns).
– Better management of molds, since molds are company's main constraint. There are limited number of molds and their availability should be carefully managed. Molds also need to be regularly maintained.
– Manage the human skills resources using defined skill matrix that links each person with the type of work he/she can perform.
– Enable transparency and good collaboration between production, sales and procurement departments.

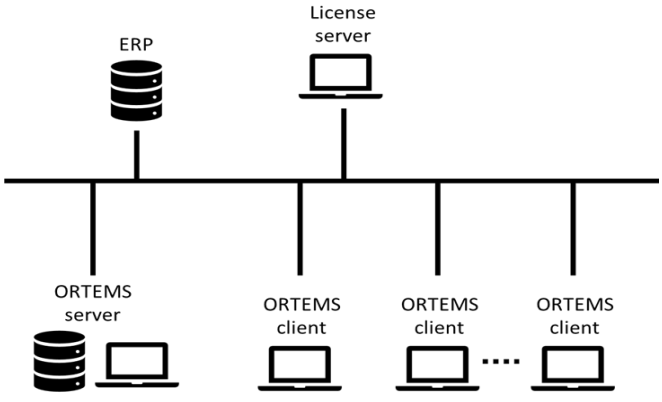
4.3 Implementation

Usually, the implementation of this kind of project takes about 3-6 months and a workload of 120 man-days. The Covid-19 pandemic situation forced the team members to work mostly remotely. Unfortunately, this kind of work is not as effective as working on site, especially in testing phase, so actual implementation was extended for several months.

At the start of implementation, a scope of work (SoW) document is created where all the main elements of the project were defined and agreed between JAKSCHE and CADCAM, such as: the general goal to be achieved, planned activities, project phases and milestones, the team involved, infrastructure as-is and to-be, and expected measurable results. In this phase it was very important to have a good communication and synchronization between teams. Users sometimes think some important information is actually irrelevant, so they do not provide it. They can also use different names for the same element. It is very important to establish a good mutual understanding at the very beginning of the implementation project.

Ortems has three major functional modules - Manufacturing Planner, Production Scheduler and Synchronized Resource Planner. In JAKSCHE the Production Scheduler module was implemented, because it adequately fulfilled their needs.

Ortems IT infrastructure consists of the database server, software server, license server and multiple client computers.



Picture 3: Ortems IT structure

In database all the users and production data are stored. The clients are Windows based workstations, which are all connected to database. Users can log in and use the planning application to the extent of their privileges.

Major part of implementation is connecting to the master data. Master data location is where

users primarily manage data and is usually stored on one location - most often this is ERP database. All other clients connect to it to get most recent and exact data. It is very important that master data is unambiguous, otherwise we can get duplicate and conflicting information. Ortems needs to access data such as sales and forecast orders, work orders, raw materials, routings, production resources, shift patterns, skill matrix, etc.

However, not all the data is always available or exist in non-digital way. This was also the case in Jaksche Technology, where the skill matrix and technical description of operations and routings did not exist in ERP. The solution was to create and implement this data additional to ERP. It was done in Excel as a data-source and connected to Ortems by visual interface configuration (VIC) tool. In future this data could be transferred and further managed in ERP system.

Picture 4: Final phase of operation

In JAKSCHE, Ortems is connected to the Bookkeeping ERP system. The main challenge was getting the detailed description of data stored in Bookkeeping database. Usually, the users do not have the knowledge of what is "under the hood" of the ERP. Additionally, there are a lot of data in ERP database, so it is very difficult and time consuming to just "search" for data. The ERP experts or even developers need to be involved. This is especially important if ERP system is custom made solution. In our case, technical team from—Bookkeeping ERP system was very cooperative and together we were able to quickly identify the location and format of data we needed for planning.

Another challenge we experienced was related to the lamination & infusion process. It was necessary to model workers as primary resources, with their minimum and maximum capacities regarding the surface of the products on which they work. This was easily achieved with ability to model resource in batch mode, where operations for one worker are grouped together, surface sizes add up until sum comply with workload limits.

4.4 User training and support

As a final stage of implementation, the training was done for all the planning personnel and others according to their needs. In JAKSCHE there is one planning user and more viewing access only users. Each of them needs a separate license. Of course, it is possible to add additional licenses for users if necessary.

If multiple users are involved with planning, they have to collaborate simultaneously on a single plan, which is also a functionality very well supported in Ortems. The training usually takes about 10 days depending on scope of training and number of participants. All the technical and training documentation was provided by CADCAM Group.

After the training, the users had to evaluate the implemented model on real data and give the feedback to the implementation team. Several workshops were organized where the team had the possibility to discuss changes or new requests and do the fine tuning of the system.

Picture 5: Training manual for production planner

5 CONCLUSION

As said in the beginning, usability of any model is directly related to its ability to represent the reality faithfully. Using DELMIA Ortems to model the production process of a factory gives to a manager realistic overview of production process, enabling him to model different scenarios in a seamless manner.

Moreover, maturity of an application can be seen in the level of customization required in getting it ready to solve complex tasks. With Ortems, there are very few constraints in even most complex planning scenarios that cannot be modeled precisely without the need for expensive customization.

6 SOURCES:

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