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ADVANCED PLANNING SYSTEM IN SMALL BUSINESS

Abstract
Achieving dramatic improvements in productivity, customer satisfaction and profitability result from applying the latest advances in planning and control systems. The paper presents application result of advanced production planning on the small business.

1. ADVANCED PLANNING SYSTEM – APS

Traditional planning and scheduling systems (such as Manufacturing resource planning) utilize a stepwise procedure to allocate material and production capacity. This approach is simple but cumbersome, and does not readily adapt to changes in demand, resource capacity or material availability. Materials and capacity are planned separately, and many systems do not consider limited material availability or capacity constraints. Thus, this approach often results in plans that cannot be executed. However, despite attempts to shift to the new system, attempts have not always been successful, which has called for the combination of management philosophy with manufacturing.

Unlike previous systems, APS simultaneously plans and schedules production based on available materials, labor and plant capacity. APS has commonly been applied where one or more of the following conditions are present:

- Make-To-Order (as distinct from make-to-stock) manufacturing,
- capital-intensive production processes, where plant capacity is constrained,
- products 'competing' for plant capacity: where many different products are produced in each facility,
- products that require a large number of components or manufacturing tasks,
- produc[1]tion necessitates frequent schedule changes which cannot be predicted before the event.

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2. SHOP FLOOR SCHEDULING

Shop floor scheduling is an important task in managing a production system. Complex decision must be made which impact global objectives such as meeting delivery due dates and minimizing inventory of cost.

Attempting to consider all of the variables, which determine the effectiveness of particular schedule, is highly interrelated and has not been possible in most manufacturing operations.

In case of manufacturing cost decreases, there are major productivity improvements to be realized by making the production scheduling for process more effective. The quality of a production schedule involves many sometimes conflicting, objectives. While maximizing throughput is certainly an important consideration, an ideal schedule will also have the following characteristics:

- Delivery due dates are met.
- Inventory costs are maintained at acceptable levels.
- Equipment, personnel and other limited resources are well utilized and have balanced workloads.
- Adaptations can be making quickly in the event of an unexpected change (equipment failure, raw material shortage, etc.).

Production planning and scheduling play a key role in helping management achieve its goals in this ever changing and competitive environment. The primary objectives of production planning and scheduling in modern manufacturing environment are next:

- Produce on time what has been planed and promised.
- Minimize work in process.
- Minimize inventory of finished goods.
- Maximize the utilization of capital assets and other resources.
- Increase throughput by reducing makes time.
- Minimize the cost of production.

3. SCHEDULING TECHNIQUES

It is difficult to optimize a schedule over all these characteristics in practice. From most production schedules choose one to emphasize depending on current production objectives. Generally, trade off must be made to reach a balance between the objectives. Production scheduling is done in many ways in practice.

The most common methods of scheduling are purely manual techniques. In the most straightforward form, the department foreman, or the machine operator, select the job to run next from those jobs waiting in front of the machine. The criteria used in this circumstance often reflects the measures by witch be is evaluated, and may not reflect overall business objectives. Job status control boards are also used visually layout schedules.

A more analytical approach to scheduling is sequencing by dispatching rules. This method uses rules, which priorities the jobs waiting for processing. The effectiveness of the schedule may vary widely depending on the particular rule selected, the type of production facility, and the mix of jobs to be produced. It is difficult to predict the performance of dispatching rules by

traditional methods. They are also limited in the scope of what they consider and are often hard to implement on the shop floor.

Managers have historically disliked that they had to wait a long time for analysis. With the computing capabilities and graphics constructs that are now available managers not only can get quick response for analysis of work order scheduling or work order release, they can also receive the information in an easily understood form. Major advances in databases technologies have been mad and the computer is now a common sight on the shop floor. These improvements make the access and manipulation of data for real time factory control a real possibility.

4. DESIGN AND WORKING WITH THE APS SYSTEM

On the demand division TOMA Industries, has been designed electronic planning board "RV". Data of order (customer, order number, batch size, due date) are downloaded from "PPS" system into "RV" and all information of product operations (processing times, set-up time) are held in the "RV" database.

Capacity planning,
horizont:
1 months to 1 year

PPS

Sequencing and scheduling
horizont:
1 hour to 1 month

RV ↔ Schop Floor Control

Product data management
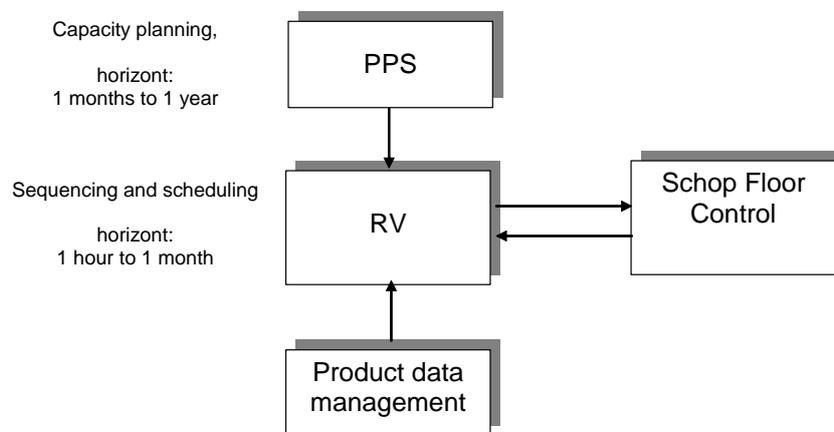
Fig. 1. Production Planning Process

The production planning process has two layers (Figure 1). The top layer represents long-range scheduling or traditional production planning and control. This layer, forecasters estimate the capacity and resources needs based on estimated sales or orders for relatively large time horizon (information loaded from "PPS" system).

The second layer represents detailed or operational scheduling here the time frame is on the order of hours to several days and hours. Exact sequencing is determined for each machine. The scheduler concentrates most of his effort on this layer.

System "RV" can be used as a graphical MPS (Master Production Schedule) where orders are loaded with product information, which provides a finite schedule. This step is performed repeatedly until the schedule meets a prescription objective. This objective may be handed down from management, such as minimizing production costs, short lead times (Figure 2.).
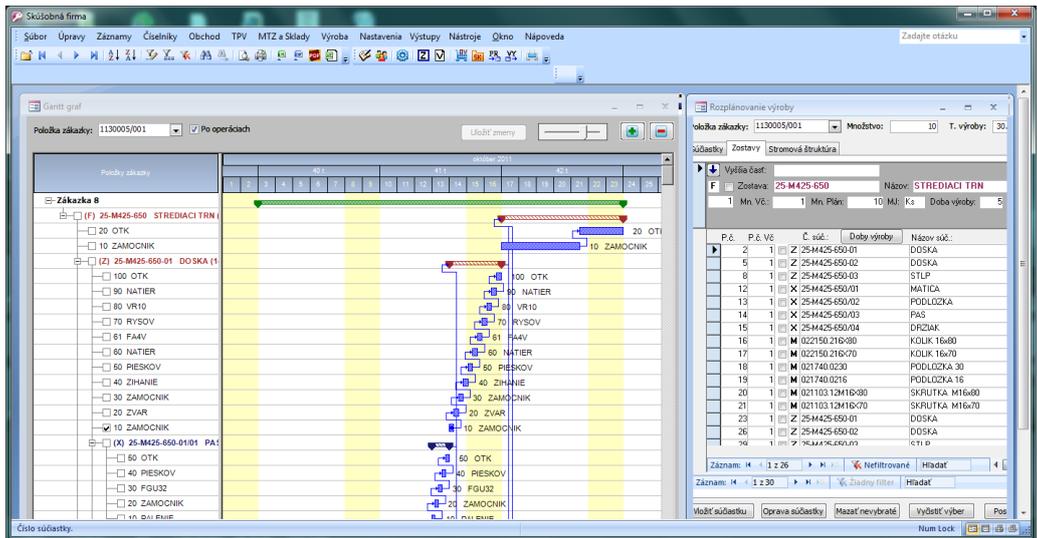
Fig. 2. Production Planning System – "PPS"
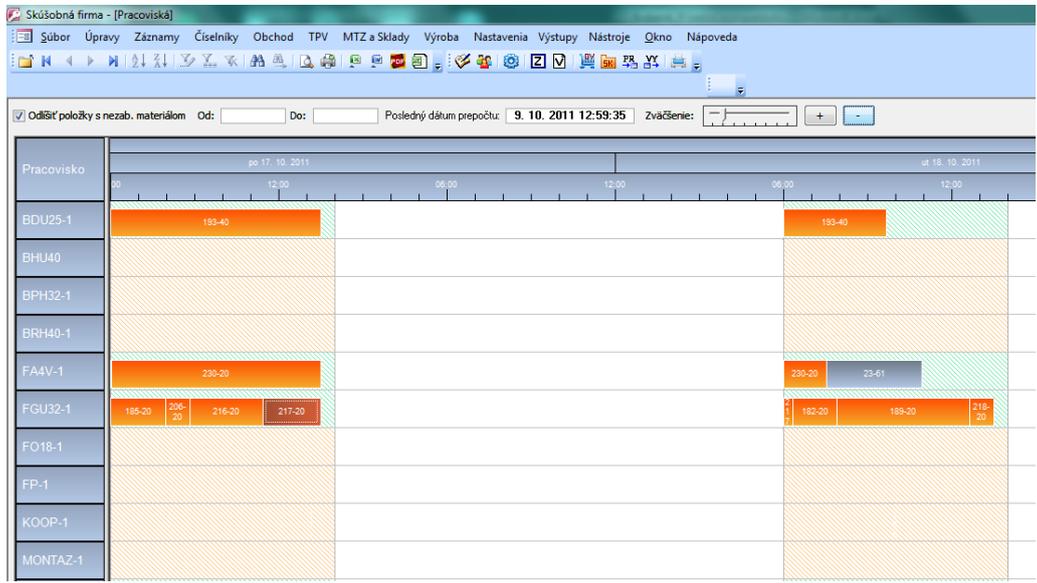
Fig. 3. Advanced Planning System – "RV"

The heart and soul of design of "RV" is the sequencer (Figure 3.). The sequencer is essentially an electronic planning board where resources and the operations scheduled for processing on each resource are displayed. In the bottom half on screen, the sequence overview displays each resource and the operations scheduled on them in an easy-to-read Gant format.

Above the sequence overview individual resource windows with colorful icons used to represent the loaded operations.

Sequencer process:
1. System loading orders with product information (number of orders, quantity, bill of materials, due date, technologies).
2. System sequencing orders by type of production technologies, due date.
3. Making batches from orders by minimizing amount of set up time.
4. Forwarding jobs all batches on time line for each machine, when machine is not busy, jobs waiting.
5. System analyzing objective (meet of due date, minimum amount of set up time, work in process, lead time).
6. If schedule does not meets a prescription objective, it possibilities unload jobs and changing a sequence, operators changing a batches, variants of technologies and enter actual operation times.
7. When a schedule is ready to be released, "RV" offer you basic alternatives of printed reports available.
8. New orders added, back to step 1. (Figure 4.).
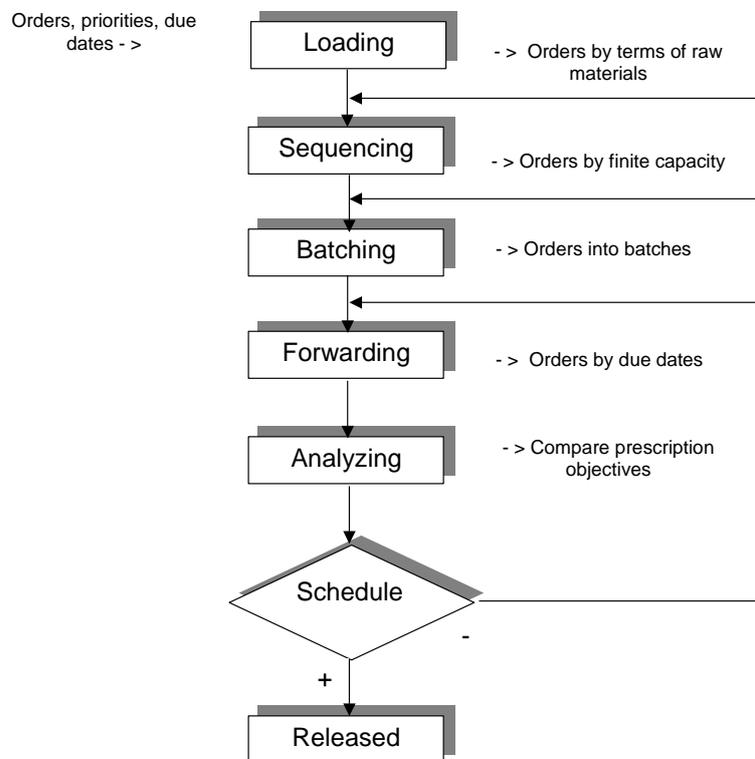
Fig. 4. Sequences of planning

5. CONCLUSION

Interactive scheduling in Advanced Planning System, which have been presented, to generate a feasible schedule and to revise the existing schedule make a schedule very quickly with identify the critical and non-critical resources. Dispatcher has interactive tools for effective planning changes in shop floor in time.

The effectiveness of the proposed concept has been test in real manufacturing process. Manufacturing has been undergoing a significant change over the last decade and will continue to change for the foreseeable future. Some of the changes are as follows:

- System reduces number of delay orders and shorter lead-time by better mix of orders.
- Many variants of sequencing allow to meet of due dates.
- Lead times is minimizing by decrease amount of set up time.
- Demands to deliver Just in Time minimize work in process and reduce costs.

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