

ADVANCED PLANNING AND SCHEDULING TECHNOLOGY PAPER



Advanced Finite Capacity Planning and Scheduling Helps Package Products Get More From Its Assets

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Introduction

From its headquarters in Pittsburgh, Pennsylvania, Package Products Inc. has been manufacturing folding carton packaging for the Bakery and Deli industries for more than fifty years. These industries demand high quality innovative designs with superior graphics. The company is particularly known for its SUNBRITE product line used primarily in upscale in-store bakeries and delis, but produces a full line of customized private label packaging as well. A primary objective of Package Products is to be recognized and respected by its customers for quality, reliability, and service.

The 1990's saw Package Products become a victim of its own growth and success.

1. As the company grew and prospered, its manufacturing operations became harder and harder to manage.
2. Management methods that had worked well when the company was smaller were becoming unwieldy.
3. Growth often resulted in manufacturing frequently encountering capacity constraints. These constraints hindered efficiency and jeopardized future progress.

The 1990's also presented Package Products with a more difficult business environment. The company had always operated in a niche market, where a high level of responsiveness to customer wants was crucial. In the early 1990's, not only had Package Products' customers become even more demanding, but their competition had gotten better as well.

So, at the very time Package Products' market was forcing the company to be more attuned to its customers, internal capacity and management constraints were hindering that responsiveness. The company turned to advanced finite capacity planning and scheduling (APS) software for help.

Existing Systems and Methods

The Package Products' folding cartons pass through between four and eleven process steps before they are ready for shipment. A typical product starts as pulp board in roll form. The pulp board is cut into sheets. The sheets then go through printing presses, where up to 4-color images are applied. Ink on the sheets is dried before the sheets are die-cut. Die-cut sheets then have cellophane windows applied. Finally, die-cut sheets are glued into folding cartons and prepared for shipment.

In the early 1990's, Package Products' staff managed this manufacturing process, and other aspects of their company, with a business system developed in-house. This system was not designed to hold detailed process information and contained extremely simplified product family routings. The system had no scheduling capability, but did provide some capacity planning functionality. It could load production backward from due dates infinitely. This process allowed staff members to compare available and loaded hours for a given week on a department-by-department basis.

In a very crude, high-level manner, Package Products' capacity planning system allowed staff members to spot imbalances between demand and capacity. The system confirmed that Package Products needed to do something to deal with capacity shortages. However, it did not help the company's management team develop an appropriate course of action.

Historically, Package Products attempted to manage its capacity at a detailed level and schedule its production through manual means. The scheduling manager used a traditional scheduling board. Each significant production machine was listed on the board. In Gantt chart format, magnetic strips of varying lengths represented the duration of the various jobs scheduled on the machines.

In the past, Package Products' scheduling board was adequate. Given the company's current size and the demands of its marketplace, this was no longer the case. It took huge amounts of effort to maintain the board. Even with this effort, there was no way to understand and respond to the effects of changes on the shop floor and in customers' requirements.

The scheduling board approach was symptomatic of a larger problem that the company faced. There was no central focal point of readily available manufacturing information that staff members could turn to help make decisions.

The business system held some data. In Package Products' system, this data was rarely detailed enough. Other data was held in the heads of various people throughout the organization. This data was never accessible enough. To fill the void, staff from the customer service, purchasing, inventory management, sales, design and manufacturing departments all turned to the scheduling manager for help. Armed only with a magnetic board, he could not provide the level of assistance that they needed.

Alternatives

Package Products' staff briefly considered "traditional" solutions to its problem.

1. The company could have worked overtime to build up larger finished goods inventory balances. They could then satisfy customer demand from stock. However, staff members knew that there was no guarantee that customers would want what was in inventory. They also knew that overtime costs, inventory-carrying costs, and obsolescence costs would be great.
2. Alternatively, the company could have enlarged its existing building and added more production equipment. Staff members realized that this was a risky solution. They weren't even sure the company was getting the most out of its existing assets. Furthermore, they weren't sure that future demand would support additional investment.

General Manager Alan Beckerman had the vision to send the company down another path. Rather than investing in brick and mortar or inventory, Alan challenged his staff to better leverage their existing investments. He proposed a software-based solution that would not only get the most out of their physical assets, but also would tie together and use their existing data and information and help them justify the addition of assets in the future.

To those ends, Package Products formed a project team to act on Alan's vision. It consisted of the Manager of Information Systems (IS), the Scheduling Manager and shop floor supervisors. The team decided that the scheduling function should continue to be the informational hub of the manufacturing organization. It also developed parameters for the type of scheduling system that should be selected and how it should fit at Package Products.

The team decided not to replace the existing business system. The system obviously lacked some information and capability needed to support scheduling. However, in other areas of the company it worked quite well and contained much valuable information. Any new scheduling system should work with the existing business system.

Given Package Products' current capacity constraints, the team members knew that they had to select a scheduling system that they could implement quickly. Team members also knew that much of the data that they would like to use in scheduling was in the heads of people who worked throughout the organization. Therefore, the scheduling system should be able to initially work with minimal data while they gathered and entered more detailed information.

Finally, team members knew that they did not want "black box" scheduling software that purports to generate "optimal" schedules at the push of a button.

1. First, at a bare minimum, such software requires highly detailed information that they did not have.

2. Second, such software requires a lengthy and expensive programming project to try to replicate the scheduler's decision process.
3. Third, when shop floor and market conditions change, the software must be reprogrammed.
4. Fourth, and most important, such software prevents scheduling staff from using the software to interact with their data and learn about their manufacturing operation.

Package Products' manufacturing operations are fairly complex. Many process steps with alternate machines and with varying setup and runt times are involved. This complexity makes it impossible for any one individual to totally understand the operation. Team members hoped to obtain software that would allow the scheduler to try out different scheduling solutions quickly and easily. Through this what-if analysis, the scheduler could pick the best scheduling alternatives. In addition, he could learn how their factory responds under different conditions and make recommendations to improve manufacturing data, procedures and processes.

Once they decided how scheduling software should fit at Package Products and the general features it should have, team members began a review of commercially available scheduling software. The purchased TACTIC, an advanced finite capacity planning and scheduling software system developed, supported, and marketed by Waterloo Manufacturing Software of Wellesley, MA. TACTIC met all of their criteria for scheduling software.

Implementation

Package Products' staff implemented TACTIC quickly and without difficulty. The staff purchased the fastest PC available at the time. They also led a review of historical data held in the business system to confirm assumptions on process steps, change over times, and run times. More detailed than the information used for capacity planning in the business system, this information formed the basis of a routing database loaded into TACTIC.

Next, the team received three days of implementation and training assistance from Waterloo Manufacturing Software. By the end of the third day, they were generating schedules that were good enough to provide to the shop floor.

Scheduling and IS staff members have never stopped improving their schedules or their scheduling procedures. As they hoped, the scheduler has used TACTIC to interact with data and to totally be aware of the information that is driving the schedules. To aid in this procedure, the scheduler reviews and enters manually into TACTIC much input data. The ability to easily interact with the data has enabled him to spot data inadequacies and inaccuracies quickly and to continuously improve the quality of his schedules.

While data flows into TACTIC are purposely not highly integrated and automated, the opposite is true with output from TACTIC. Package Products firmly believes that information is not information unless it is communicated. Therefore, once the scheduler has generated a final iteration of his schedule, it is automatically uploaded from TACTIC to the multi-user business system. A program applies this data against the open work order file. The program automatically generates an exception report and sends the report as e-mail to a predefined cross functional group. This group consists of personnel from the sales, customer service, maintenance and production departments. The report highlights orders that are late and those that may be scheduled for completion too early.

Ongoing Use

Package Products' staff members follow daily procedures in their use of TACTIC.

1. First, the scheduler updates the previous day's production, enters new orders, which include preventive maintenance orders, and modifies due dates and quantities of existing orders.
2. He then quickly generates an initial schedule that reflects the data changes he just made.
3. He then analyzes the schedule, identifying problems and improvement opportunities.
4. He then tries what-ifs, such as adding capacity through working overtime or improving efficiency by grouping like work together to reduce set ups.

Package Products staff members have designed their use of TACTIC around this what-if analysis. The software has in no way replaced the scheduler. Package Products strongly believes this is not advisable. Rather, the software is a tool that has increased the scheduler's value to the organization. The scheduler uses his extensive knowledge of the organization to come up with alternatives, and the software's speedy what-if feature to see the impact of the alternatives. He also uses the software to communicate to the rest of the organization. The scheduler saves alternate what-ifs in TACTIC in different files and presents the options to the management team for review.

Package Products has procedures in place where management must approve certain schedules before they are issued to the rest of the organization. For instance, a scheduler may not schedule late work unless he first reviews the cost of alternatives with management.

After management approves the day's schedules, a program uploads them to the business system with the exceptions flagged: such as work scheduled late. Not only do these uploads give sales and customer service visibility into potential problems, but they allow them to quickly, easily and accurately provide customers with the status of their orders.

However, Package Products uses TACTIC in more than just a daily mode. Periodically, the scheduler uses planned orders based on historical data to generate schedules that go out three to six months. These longer-range schedules allow the company to take action now to eliminate capacity shortfalls in the future. For instance, the staff will often pull jobs forward in time to reduce overtime in the future.

Package Products' management staff also uses TACTIC to analyze proposed improvements to production methods. For example, management has added new equipment to a sample TACTIC model of their factory. The results of scheduling this factory have allowed management to confidently approve or deny the purchase of additional equipment. Similarly, management has used TACTIC to analyze the impact of potential changes in staffing levels.

Benefits

TACTIC has helped Package Products to adjust to unforeseen occurrences on the shop floor and frequent customer changes. These adjustments have allowed the staff to run the plant in the most efficient manner, while still providing customers with high levels of service.

One measure the company uses to quantify increases in efficiency is decreased overtime. Over a period where the manufacturing department's activity level increased, Package Products decreased the use of overtime by 300% through better scheduling.

Package Products has used several measures to quantify increases in customer service. Again over a period of increased customer orders, TACTIC helped Package Products improve on time delivery by 32% and decrease back orders by 53%.

In addition, using data from TACTIC, the customer service department now averages 22 seconds to give customers updates on the status of their orders. Previously, these status updates could take overnight.

These quantifiable benefits have paid for the company's investment in TACTIC many times over. However, the software has benefited the company in ways that are harder to quantify, but are no less significant. Since implementing TACTIC, the company has reduced work in process inventory and cut spoilage. It also shortened lead times through better scheduling smaller runs and quicker changeovers. TACTIC has helped the staff work around capacity constraints, saving significant investment in equipment and inventory.

Last but not least, the software has greatly improved teamwork and communications. It has allowed the scheduler to pull together data that was spread around the organization, to understand and improve that data through interacting with it, to use the information to involve others in making better decisions, and to communicate those decisions throughout the company.

About the Author

Mr. Daniel T. Trail is the information technology manager for Package Products. He has over 15 years experience with Package Products.

More Information

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