How V&M Star Converts Family Forecasts Into Resource Requirements With Executive S&OP

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Preview. *Generating item-level forecasts can be complex, time consuming, and frustrating for forecasters, and can produce forecasts so inaccurate that they are not used in the planning process. In this case study of V&M Star, management uses Executive S&OP to refocus its forecasting process to family-level forecasts, which are then converted into resource requirements based on assumptions about product mix. This new approach has allowed V&M Star to gain bottom-line results of improved customer service with reduced inventories.*

INTRODUCTION

The previous S&OP column, "How Jarden Branded Consumables Made Forecasting Simpler & Better through Executive S&OP" (*Foresight*, Fall 2009), dealt with Demand Planning, Step #2 of the 5-Step Executive S&OP process illustrated by Figure 1. Executive S&OP is defined as the decision-making process that seeks to balance supply and demand at the family level, is fully integrated with financial planning, and is the forum for executive debate about strategy, policy, and risk alternatives.

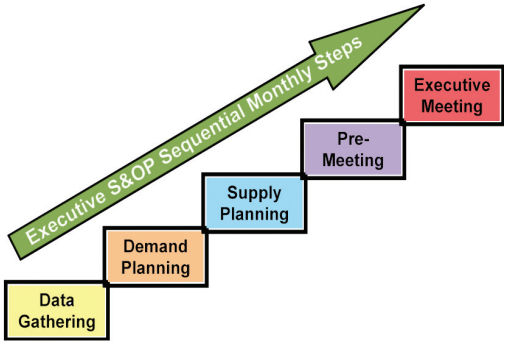

Figure 1. The Executive S&OP Process

This column now concentrates on Step #3 – Supply Planning. We will demonstrate how the conversion from family forecasts to resource requirements can be done effectively.

Jarden Branded Consumables is a consumer products company. The company in the present case study, V&M Star, manufactures industrial equipment. The principles of Executive S&OP apply to any type of company operating in any type of environment.

EMERGENCE OF EXECUTIVE S&OP AT V&M STAR

V&M Star, a division of Vallourec and Mannesmann Tubes, operates in the steel industry, manufacturing seamless oil country tubular goods (OCTG), line and standard pipe, and coupling stock for the oil and gas industries. They are headquartered in Houston, with production facilities there and in Youngstown, Ohio and Muskogee, Oklahoma. Finished goods are sold through a distribution network to end users at major energy companies, including ExxonMobil, Chesapeake, and Devon Energy.

The oil patch industry is one of the most volatile boom-or-bust marketplaces, making visibility about the future a critical component of success. Nevertheless, prior to the summer of 2005, V&M Star lacked a sufficiently robust way in which to anticipate and plan for the future. As a result, they suffered problems in customer service and inventory management. While they had known of S&OP, they neither understood nor practiced the executive part of the process.

That has all changed. Executive S&OP has become the way they run their business from the corner office. It has fully inte-

grated the communication and combined thinking of Sales, Marketing, Operations, and Finance into one company game plan. To quote their CEO, Roger Lindgren, "We now have our entire management team talking every month about what might happen six, 12, 18 months out into the future and validating or modifying our plan. Wow! Why didn't we always do it this way?"

V&M STAR'S ORDER-FULFILLMENT STRATEGY

On the supply side, the manufacturing of seamless pipe, as sequenced in Figure 2, takes approximately 45 days.

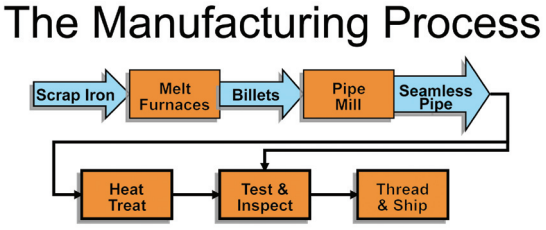

Figure 2. The Manufacturing Process at V&M Star

V&M Star's order-fulfillment strategy is Make-to-Order, building to precise customer requirements. Customer orders, however, are actually received from V&M Star's distributors. These orders are what drive V&M Star's Master Scheduling process to the 45-day horizon. Shipping is to distributors who maintain the finished-goods inventory, thus facilitating quick responses to customer requirements. The distributors ship to customers in the field.

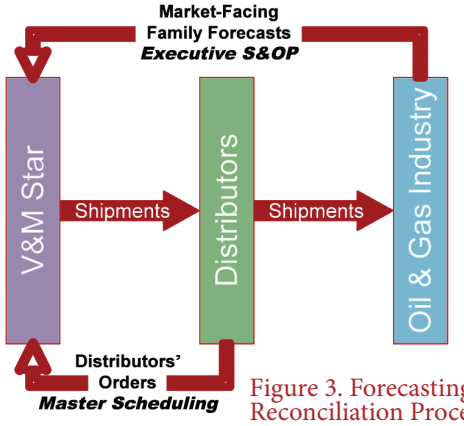

Figure 3. Forecasting Reconciliation Process

Key Points

- By redirecting the forecasting function from granular to family forecasts, a company can reap considerable benefits. There are challenges, however – namely, the conversion of family forecasts into specific resource requirements.
- The key to conversion is the analysis of historical data to establish simplifying assumptions about product mix within those families. V&M Star used traditional TQM Control Charts to analyze and track these data assumptions monthly.
- Once resource requirements are known well into the future, alternative solutions can be quickly and accurately analyzed, allowing implementation long before a crisis happens.

V&M Star forecasts over an 18-month horizon, well beyond the 45-day Master Scheduling customer-centric view. From this longer view, the company sets resource running rates and manning levels, and plans capital investments that have long lead times. Then, in the Executive S&OP process, they reconcile the 45-day detailed requirements from distributors with the family view for the extended horizon. Figure 3 portrays the reconciliation process.

Let's take a closer look at how this forecasting practice changed with the implementation of Executive S&OP.

V&M STAR'S FORECASTING PRACTICE

Prior to 2005, V&M Star attempted to generate very granular forecasts, by specification number (SKU) and by distributor, resulting in over 7,500 data points over the 18-month horizon. This task was time consuming, and results were inaccurate – the worst of two worlds.

In its Executive S&OP project, the company determined that it could better forecast across the extended horizon by focusing on seven families rather than upon indi-

vidual items. The families are:

- Standard Pipe
- Alloy Coupling Stock
- Alloy Castings
- Line Pipe
- Carbon Castings
- Structural Components
- Carbon Coupling Stock

Forecasting at the family level allowed leading extrinsic indicators to be identified, establishing the relationships between orders and these indicators through regression models. The leading indicators they use are USA rotary rig count, price of crude oil, Nymex natural-gas futures pricing, natural-gas working underground storage, footage drilled, OCTG domestic shipments and imports, and industry months of supply on hand.

Each month, Marketing reviews trends and patterns in the leading indicators as well as V&M Star's actual shipments. Then Sales factors in information about new products, changes in programs, and intelligence from customer input. A demand plan is agreed upon and distributed to the supply teams for identification of resource requirements.

Before continuing, let's consider one last issue – units of measure. For Executive S&OP, business activity metrics must be in three "languages" -- one for Sales/Marketing, one for Supply/Manufacturing, and one for Finance. For V&M Star, they are as follows:

Function	Focus	Unit of Measure
Sales/Marketing	Market-Facing Family	Metric Tons (Pounds)
Supply/Mfg.	Specific Resources	Hours/Pieces
Finance	Financial Performance	Dollars

One of the challenges in Executive S&OP is to keep these tightly tied together, converting from one to another without having full granular detail about mix. Here's how V&M Star accomplishes this.

SUPPLY PLANNING

When Operations receives the demand plan, which contains forecasts at the family level but lacks individual-item detail, it must make simplifying assumptions about product mix. These assumptions allow conversion of family forecasts into resource requirements. This task is illustrated in Figure 4.

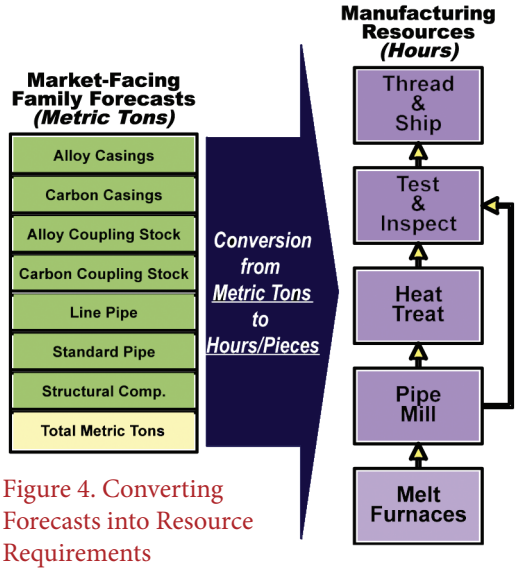

Figure 4. Converting Forecasts into Resource Requirements

One company objective is to hold the backlog of customer orders constant, so that deliveries to distributors were consistent with a 45-day lead time.

Simple arithmetic for a Make-to-Order company is as follows:

Beginning Backlog	+	Forecasted Sales	-	New Supply	=	End Backlog
(Constant)		(Given)		(Variable)		(Constant)

If the backlog is to be constant (45 days), Operations must match the family forecasts with the new supply. To do so, it must translate the forecasts expressed in metric tons into the resource-appropriate unit of measure (hours/pieces). This represents what they need to do, if they can, or alternatively indicates that they have to deal with other courses of action.

Take the pipe mill as an example. Since all families of product pass through the pipe mill, total metric tons needs to be converted to hours of time required. This in turn requires assumptions about the mix of product going through the pipe mill.

To this end, Operations examines a traditional Total Quality Management (TQM) Control Chart (Figure 5). It shows the monthly run rate in metric tons per hour for each month over the last year. While

there is some variability over time due to product mix, the run rate hovers close to the average of about 55 tons per hour.

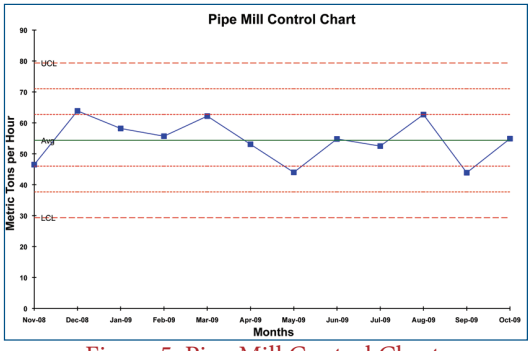

Figure 5. Pipe Mill Control Chart

With this data updated each month, a judgment is made that the current assumption about the run rate of 55 tons per hour remains valid or needs to be changed. Using this run rate, conversion from metric tons to hours is straightforward; for example, 1,000 metric tons divided by 55 tons per hour equals 18.2 hours. Similar calculations can be done from the upper and lower control limits (UCL/LCL) to account for the possible variability of the run rate.

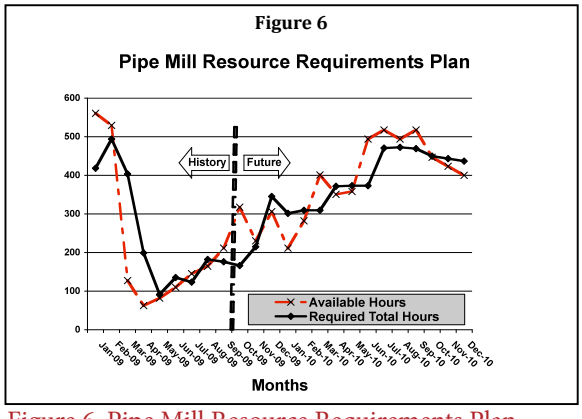

Figure 6. Pipe Mill Resource Requirements Plan

Once the resource requirements are projected, Operations compares "what do we need" versus "what we can do." This is called the Pipe Mill Resource Requirements Plan, which is shown in Figures 6 and 7.

Notice, in Figure 6, that from the spring of 2009 to the fall of 2010 there is a dramatic swing in projected volume in total hours. This is the boom-and-bust pattern of the marketplace. To see this coming is an imperative for companies in the industry.

To better handle wide swings, V&M Star has an arrangement to contract out certain functions (storeroom, security, shipping, etc.) as the upswings occur, shifting permanent employees to the more skilled, core-competency jobs. When a downturn follows, they bring functions back "in house." This helps dampen the impact of the boom-and-bust cycle of the oil and gas industries.

In the Pipe Mill case to the left, V&M Star is able to meet the resource requirements of the family forecast. If and when they can't, they would have to consider some alternatives, such as:

- Build and hold semi-finished inventory
- Outsource some volume
- Add capital equipment
- Constrain demand (say no to some customers)

Similar conversions must be made for each of the critical resources. But not all families pass through every resource. For example, the only family that requires Threading is the Alloy Casing family. To convert metric tons into hours of threading, Operations needs to make three data assumptions:

1. What percentage of the Alloy Casing forecasted volume (metric tons) requires threading?
2. For that portion, how many pieces per metric ton need to be threaded?
3. How much threading time per piece is required?

Figure 7. Shift Schedule

	Q-1 2009		Q-2 2009		Q-3 2009		Q-4 2009		Q-1 2010		Q-2 2010		Q-3 2010		Q-4 2010	
Resource	Crew	Hours	Crew	Hours	Crew	Hours	Crew	Hours	Crew	Hours	Crew	Hours	Crew	Hours	Crew	Hours
Pipe Mill	4/2	40/24	1	24	1	36	2	40	2	40/48	3	40	3	40	3	40

Figure 8 shows one of the data-assumption Control Charts; Figure 9 is the Resource Requirements Plan for Threading. You can see that the capacity swings in Threading are similar to those of the Pipe Mill.

The use of these techniques makes it simple to test various scenarios, such as:

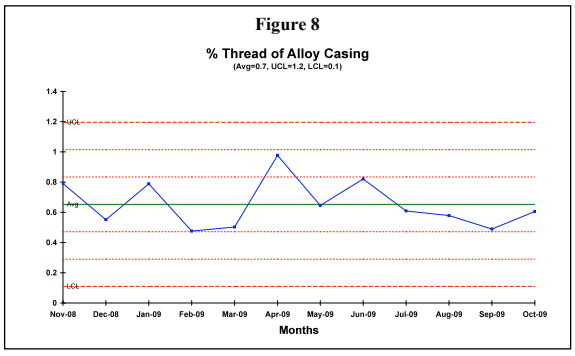

Figure 8.

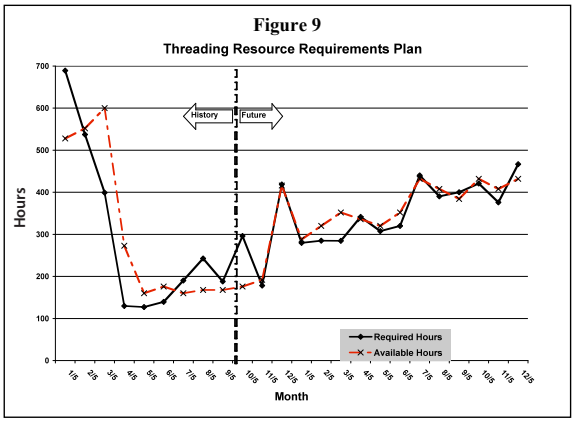

Figure 9.

- What if the forecast comes in at the upper limit or lower limit? What's the consequence?
- What if mix changes based on a new product release? What and where is the impact?
- If there is a problem with capacity downtime, what's the result?

And many more.

COPING WITH DISRUPTIONS

For a moment, imagine you're the president of a company where Executive S&OP is operating successfully. You and your staff are meeting monthly to authorize sales and operations plans that will harmonize demand and supply and to integrate those plans with the attainment of financial results.

In the executive meeting, your Operations person informs you that a much-needed capital-equipment upgrade has been approved and is scheduled for 12 months from now. It also means that the rolling-mill operation will have to be idle for an entire month.

This very circumstance happened at V&M Star during a peak demand cycle. Here's how they dealt with the problem.

The obvious questions were:

1. What are the alternative, viable scenarios that would enable V&M Star to sustain customer-order fulfillment during the shutdown?
2. What are the financial consequences of each scenario?

In the very next Executive S&OP cycle, using the tools described above, V&M Star tested various resource plans to deal with their dilemma.

These plans centered on building a semi-finished inventory of "green" pipe that would allow finishing operations to continue to supply customers without interruption. This inventory would equal 75% of the volume for standard products needed during the shutdown period. Additionally, V&M Star would plan available capacity in the month prior to the shutdown to allow the production of nonstandard products needed during shutdown.

It was determined from their Resource Requirements Plans that the additional demand for all of this exceeded their internal capacity: they had to find additional outside sources for green pipe. Sales staff also contributed to the solution by assuring that distributors did not place "just in case" hedge orders that would tie up capacity, instead creating confidence among distributors in the plan and its viability.

These specific plans were put through the "financial simulation" part of the Executive S&OP toolbox to assure that the cash-flow requirements and financial performance consequences were understood and acceptable. They reviewed their progress in each monthly Executive S&OP cycle, making revisions as things changed.

The result? Downtime for the equipment upgrade was successful and customers never missed a beat; in their eyes, it was another month of business as usual. Prior to V&M Star incorporating the Executive S&OP process, this would have been unthinkable.

BENEFITS

Companies doing a first-rate job with Executive S&OP cite benefits in two main

categories. The first is hard benefits – those that can be readily measured with numbers – such as:

- Higher customer service
- Lower finished-goods inventories
- Smaller customer-order backlogs
- Shorter lead times
- Stabilized production rates
- Decreased unplanned overtime
- Higher productivity
- More controlled intro of new products

These benefits usually come in quantum measures, far greater than the expectation. They do not come directly, however… they are the consequence of the soft benefits that are not so easily quantified but are still very real. The effects of soft benefits are seen on the faces of the people doing the work and felt in the tone of discussions that take place throughout the company.

Common characteristics in companies that successfully use Executive S&OP include:

- The atmosphere tends to be informal, comfortable, and relaxed, in spite of the serious decisions being made.
- All departments understand that disagreement is not merely OK, but necessary for good decision making, one party openly explaining why they disagree while others listen with attention and with open minds.
- As such, conflict resolution creates positive, not negative, energy. People have learned how to disagree without being disagreeable.
- Because of the defined and disciplined cross-functional practice within Executive S&OP, people begin to see the business through the eyes of others, helping them to understand the value of real teamwork.
- As a result, when action is taken, assignments are clearly defined and readily accepted. The organization is as concerned with maintaining the quality of the cross-functional process as it is with the outcome, routinely evaluating process performance for improvement.

CFO, Adam Szczepanski, following implementation, put it this way: "Addressing long-term issues was always ad hoc, based on someone analyzing an issue and being able to get it on a management meeting agenda. Now [with Executive S&OP] we have a comprehensive scan of our demand-and-production future to 18 months out, which every month captures critical issues before they're a crisis…." Roger Lindgren, V&M Star's CEO, observed: "Improvement is a journey, not a destination. The Executive S&OP process provides a framework, and a map for that journey."

Thanks for listening . . . see you in the next issue of *Foresight*.

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