White Paper

Better Planning Sweetens the Food Manufacturing Mix

The recipe for excellence calls for a specific blend of supply chain ingredients

Executive Summary

Food manufacturers face all the usual supply chain challenges, from lead times to demand uncertainty, from excess inventory to manufacturing constraints—each given a unique twist due to factors like perishability, short shelf lives, and volatile commodity price fluctuations. To meet business goals and stay competitive, food manufacturers have implemented key strategies to synchronize demand and supply.

Now more than ever, service levels and costs are dependent on planning processes that provide:

1. **Long-term visibility to uncertain demand**
2. **Efficient capital equipment utilization**
3. **Optimized production given real-world manufacturing constraints**

To minimize inventory cost and maximize equipment utilization, the long-term demand forecast must establish the best mix and quantities of products to be produced. Then production planning and scheduling must minimize the impact of finite equipment capacity, supply seasonality, and production line changeovers related to preparation, cooking, filling, labeling, etc. Fresh-pack manufacturing and off-season processing must be planned carefully and sufficient capacity must be allocated to pre-processing of ingredients to meet the material requirements for off-season manufacturing.

This paper highlights how advanced planning and optimization solutions provide the forecasting acumen, capacity planning efficiency, and right-sized inventory levels needed to meet service level goals while remaining "lean and green."

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Leading food manufacturers have reached beyond manual methods to optimize their demand planning accuracy and manufacturing efficiency.

The Stage is Set for a Food Manufacturing Technology Boost

For food manufacturers, today is the perfect moment to increase competitive advantage by deploying supply chain planning and optimization solutions. Data-driven demand planning aligned with analytics-driven production planning and scientific inventory optimization can mitigate the impact of wild commodity price swings, market variability, seasonality, promotional events, and the like. The advantages that supply chain optimization solutions bring to the food industry include:

- Increasing demand predictability within an acceptable envelope of uncertainty
- Obtaining ingredients and raw materials in the most advantageous manner and timing
- Running production lines with maximum efficiency while maintain flexibility and responsiveness
- Minimizing excess inventory from rail car to production line to delivery vehicle

All of these benefits can be achieved while maintaining or improving outstanding customer service levels.

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Spreadsheets and manual systems are slow and inaccurate, tending to amplify human biases and over-emotional responses to real-world events. Decisions based on data, not emotion, help stakeholders concentrate on building highly efficient supply chains, enhancing throughput and operational flexibility with confidence that supply chain modeling and analytics are minimizing the impact of human error.

Leading food manufacturers like Kraft, Nestle and others have reached beyond manual methods by deploying powerful planning solutions that add value to operational tools such as Enterprise Resource Planning [ERP] and Materials Requirements Planning [MRP] systems. Supply chain optimization delivers the forward-looking demand planning and manufacturing efficiency required to succeed using leaner operations.

In addition, by treating inventory as an input to achieving the business plan, not as an output of the manufacturing process, food companies can maintain sufficient inventories to meet customer service mandates without holding excess inventory.

Supply Chain Optimization for Demand, Production and Inventory

There are several important ingredients in planning for demand, supply and production constraints that can lift a food manufacturer from standard service levels to higher efficiency, profitability and competitive advantage. Food manufacturing teams should ask themselves these questions to ensure they are taking vital steps to achieve the company's business goals:

Does our Demand Forecasting See all the Possibilities?

The goal of every supply chain team is to increase predictability. With accurate predictability, everything runs more smoothly at less cost. A time-phased finished goods demand forecast allows the company's planners and other departments to work from one "shared version of the truth," and be more confident of exactly how much the system needs to produce, and when.

For food manufacturers, the foresight must extend at least 18 months out in order to project future requirements from season to season. Since off-season products are produced out of phase with fresh-pack products, an 18 to 36 month forecast is best.

In addition to covering seasonal, cyclical demand patterns well, the food manufacturing demand plan must do a great job of accounting for demand uncertainty and the full impact of promotional events. Price promotions dramatically affect consumer behavior, and competitive promotions can easily cause swings in demand of 300%-500%.

The human tendency to overreact to real-time variations in market demand is almost impossible to "correct," except through a good demand planning system that works from historical demand data and sales histories to detect the real impact of promotional events on volume over time. To maintain desired service levels and hit cost goals requires a solid, time-phased road map of the optimal demand pattern the manufacturing organization must be prepared to meet.

Accommodating promotional programs and events must be an intrinsic capability of the demand planning process. Predicting and preparing for lifts in demand generated by "demand shaping" efforts and optimizing inventory investments given short shelf-life constraints is vital.

The Details: ERP systems do not offer the powerful analysis-over-time perspective that a powerful demand planning system does. Its ability to factor in uncertainty in future demand allows teams to confidently meet service levels while minimizing the tendency to over- and under-shoot the true demand curve. Demand planning should employ multiple forecasting models, switching between them according to the level of demand history available, type of product and phase of the product life cycle.

Are We Accurately Modeling our Manufacturing Lines?

Because every plant has its own distinct characteristics and operating requirements, perhaps the single most important ingredient to success is the ability to model production with a wide variety of constraints and configurations. The question is, does your manufacturing planning system adequately consider real-world constraints and adapt to the characteristics of the specific line or plant?

An advanced manufacturing planning system will model capacity across multiple plants, not just a single location or line. By accurately modeling the capacities and constraints of all production equipment, including set-up and changeover periods, production scheduling can flex to handle changes and even disruptions to supply or demand. The system reschedules all the resources in the production environment to maintain maximum efficiency and utilization, aligned with your demand plan. In addition, food manufacturers typically run a lot of shared equipment in the process of preparing, cooking, filling, labeling and so on. A manufacturing planning solution must manage shared equipment to avoid double-booking a resource for two or more processing lines at the same time.

More importantly, a good production planning system lets managers work through extensive "what-if" scenarios, especially regarding long-term capacity needs. "What-if" analyses can be used both to compare alternative day-to-day production strategies as well as to evaluate how to handle potential changes or disruptions in demand or supply. This allows the team to prepare—such as anticipating the possible need for additional co-packer resources—to respond effectively when conditions deviate from the expected. ERP and MRP systems lack "what-if" capabilities that are an essential part of advanced demand planning, manufacturing planning, and inventory optimization solutions.

The Details: Exception-based manufacturing planning delivers alerts on high utilization of limited resources such as labor or tools, and shortages in raw materials. The system must support expiration and effective dates, as well as rate-variable semi-continuous operations and co/by-products from multi-yield equipment. Seasonality of both demand and supply must be handled.

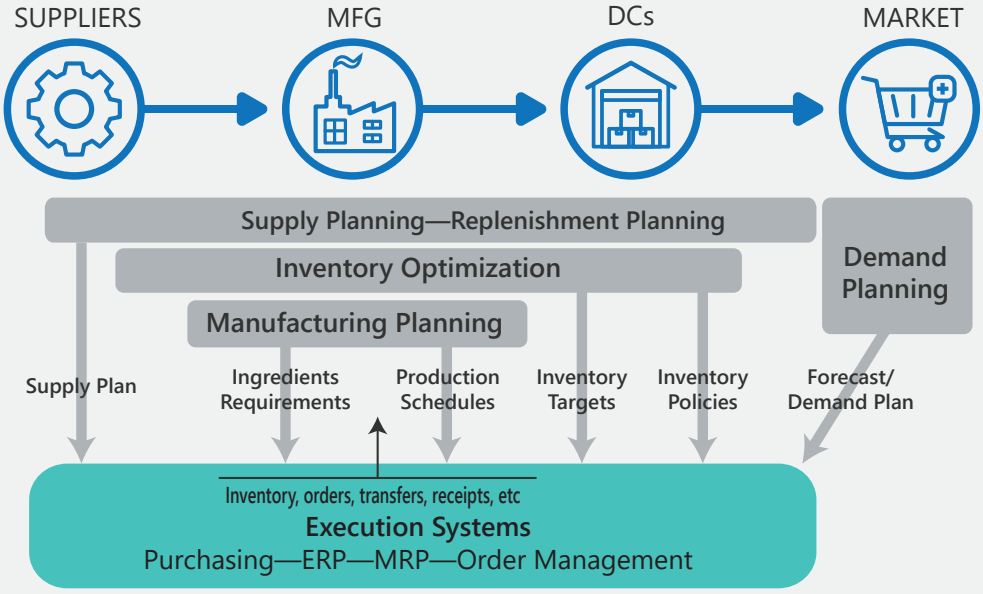
Are We Capable of Profiling Every Type of Changeover and its Impact?

As food manufacturers become more demand-driven, market requirements must be balanced with the traditional desire for maximum production efficiency [rated purely by uptime, throughput, etc.]. As companies become more in tune with market demand and focus more on inventory velocity, there is often a shift toward more frequent changes in production runs. This puts pressure on manufacturing teams to be more agile in scheduling changeovers, thereby minimizing lost production time and capacity—but changeovers are among the hardest constraints to optimize.

Changes due to activities such as allergen cleans and packaging configuration changes [driven by different product types, containers, caps and labels] can be minimized by optimizing the sequence of products through the manufacturing line. Defining a standardized product wheel establishes a pre-defined preferred sequence to be followed, but while the product wheel is predictable, it is not always the optimal choice.

If changeovers vary considerably depending on the product mix, it may be more efficient to use an optimized sequence that can vary depending on the set of products being manufactured in a given campaign. Efficient capacity utilization depends on an advanced manufacturing planning system's ability to represent changeovers easily and to prescribe the optimal production sequence that delivers the required output with minimal changeover downtime. The system must plan and optimize sequence-dependent changeovers with scheduling granularity of hours and minutes, not daily buckets.

Inputs from supply chain optimization solutions to execution systems



The Details: ERP systems offer limited scheduling functionality. They typically don't offer a daily level of detail and can't optimize dynamic lead times, which are driven by time spent in queue, set-up, run, wait, and move stages.

Do We Plan from the Start to Maximize Shelf-life for the Consumer?

Managing fresh ingredients with a limited shelf-life makes it necessary to project the expiration of on-hand material prior to processing in order to minimize ingredient loss and the corresponding increased cost. A more accurate demand plan coupled with optimization of inventory buffers and smart postponement strategies can dramatically increase product velocity so that more of the product's useful lifespan is spent at the retail and consumer level.

Speeding up time-to-market for short-shelf-life products can increase service level performance most dramatically, but higher velocity also improves the bottom line for bulk processed ingredients with a longer shelf-life, such as frozen products. Preparation, cooking and packaging lines may be shared by fresh-pack and off-season products, with equipment dedicated to fresh-pack during peak times. In this case, planning and scheduling should take into account both perishable ingredients and shelf-life differences between fresh-pack and off-season products in order to maximize their profitable finished goods lifespan.

The Details: Time-to-market is most improved by starting with a more reliable forecast, optimizing production scheduling using detailed changeover profiles and capacity constraints, and minimizing inventory buffers across multiple stages of the supply chain.

Can We do Better Pre-building the Correct Amounts of Off-season Products?

Because food manufacturers face supply gaps introduced by seasonal availability of key ingredients, the planning system must support pre-building to bridge them. Off-season products behave similarly to a pre-build in advance of a plant shutdown. The goal is to accurately ramp up production to cover anticipated demand between now and next season. A perfect pre-build covers demand without creating waste, monopolizing production resources needed for other products, or overcommitting storage space for unnecessary safety stock. What's at stake is falling short of finished goods before the next fresh supply, thereby missing orders or creating extra unwanted production runs to fill gaps.

An accurate, time-phased demand plan is the starting point for better pre-build decisions. More efficient use of existing manufacturing capacity lowers the impact of pre-building on fresh pack products and other operations.

The Details: "Infinite capacity" ERP logic is of little use here—only a powerful manufacturing planning system can effectively smooth out production of pre-built items by taking into account variables regarding when ingredients become available, and how much stock is required to cover time-phased demand uncertainty.

Are We Using ABC Classifications Effectively to Make Production Trade-offs?

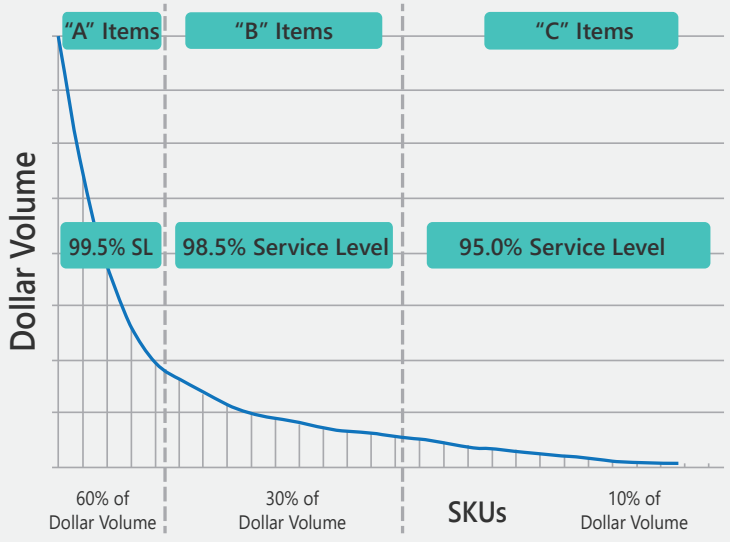
The ABC classification of finished goods is a useful mechanism for determining which products to build when, for instance, there is a supply constraint on a key ingredient. ABC prioritization can provide guidance as to which products to produce when a fresh supply is early or exceeds the expected quantity.

A demand planning system identifies category A products because they are fast-sellers [high-velocity products], highly profitable, destined for key customers, or important parts of other downstream products—generating perhaps 60% or more of company revenue—and assigns the maximum service level to them. Category B, which holds perhaps 30%-40% of total SKUs, is made up of products for which a more moderate service level is sufficient. C-level products may run more often in batch production… perhaps just once per season. As noted, the challenge is to create enough safety stock without excess, in order to meet service levels without stealing manufacturing resources and working capital from category A products.

Inventory optimization helps planners set inventory policies that ensure adequate availability of A products, which must achieve the highest service levels, while minimizing cost and waste associated with less profitable products [characterized by low or lumpy demand signals] that are often overbuilt and overstocked throughout the supply chain.

Different product families that have different ABC classifications may also have longer or shorter, perhaps overlapping seasons. Manufacturing planning systems can allocate capacity in blocks by product family, or in blocks by priority [profitability, end customer, etc.], while also taking into account that families with short seasons may have to take precedence over those with longer, more flexible manufacturing windows.

Better forecasting, inventory optimization and manufacturing planning can reduce capital trapped in "C" inventory



The Details: Products can be sequenced through the production line by blocking cycles for each family. The manufacturing planning system should accommodate products with shorter seasons, exploiting the ability to split up blocks for longer-season products into pre and post blocks that bridge the gap needed to produce the short season products.

Do Our Safety Stock Calculations Optimize our Inventory Cost and Service Level?

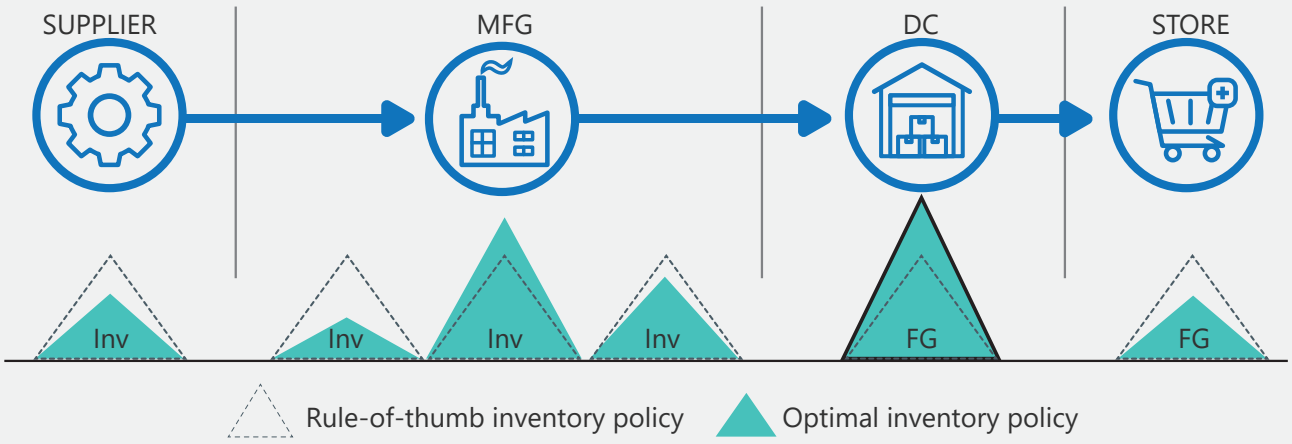
As in other industries, food manufacturers accrue large amounts of buffered inventory throughout the multi-echelon ["multi-stage"] supply chain. The main culprit in trapping working capital unnecessarily within the supply chain: safety stock. ERP and MRP systems lack the ability to optimize inventory, especially excess inventory that results from non-holistic decisions made by silo'd managers at separate sites.

Food manufacturers, functioning within a demanding environment of perishable materials and limited product shelf lives, must focus on improving inventory velocity. To do this, advanced inventory optimization solutions model the entire food supply chain, understand the interdependencies between stages, and assign a cost value to every component as it progresses from raw material to finished good.

Postponement strategies can be implemented to time differentiation [mixing, labeling, packaging, etc.] steps for maximum production flexibility and to pool products for more efficient distribution to multiple regions or customers. Overall inventory can often be reduced by 10%-30% or more while at the same time better meeting shifting market demand.

Time-phased safety stock changes month to month. The manufacturing planning system factors in seasonality to create the most efficient production runs while minimizing safety stock levels. Good manufacturing planning helps avoid overshooting the demand curve and creating excess inventory.

Overall inventory levels reduced through multi-echelon inventory optimization



The Details: Greater inventory control comes from the ability to accurately forecast demand and plan manufacturing to meet specific customer service goals while minimizing inventory. Better synchronizing of demand with supply lets companies achieve greater inventory turns while ensuring high service levels.

Case Study:

Transforming the Planning Mix at a Major Bakery Producer

A major producer of dry bakery mix products such as pancake and dessert mixes, breading and batters for both leading brands and premium licensed brands found itself ill-equipped to deal with increasing complexity created by new SKUs and new customers. Each division forecasted at a different level, but planning tools consisted of large spreadsheets without much science behind them.

By implementing flexible planning solutions for demand, supply, manufacturing, and inventory, the company began to "quantify the business" and understand how varying conditions change the manufacturing landscape. Demand planning transformed the forecasting process from administration-heavy to a streamlined statistical process that required far less manual "number-crunching". Planners gained the ability to see manufacturing capacity graphically at the touch of a button, making it simpler to identify bottlenecks and understand their causes. Now four divisions each manage their business in their own way, while still maintaining a single hierarchical structure that rolls up to a comprehensive corporate view.

Through streamlined production planning, improved capacity planning and dynamic safety stock calculations, the company has been able to maximize inventory investments and free up production capacity. As a result:

- Inventory turns have improved by 20%.
- Resource efficiency has increased in the forecasting process.
- Forecast error in one division dropped by almost 50%.
- Downtime for changeovers and cleaning has been reduced.
- Allergen strategy is better managed across facilities.
- Production sequencing has improved.
- Service level has improved to an unprecedented 99.48%.
- Data accuracy and visibility have improved throughout the business.

Conclusion

Demand planning, manufacturing planning and inventory optimization are disciplines that can transform the operations of food manufacturers, letting them achieve higher service levels at dramatically lower inventory cost with maximum equipment utilization.

Software planning technologies provide visibility, automation and analytic advantages that simple spreadsheets and manual methods cannot. In addition, these advanced tools perform granular modeling, end-to-end optimization, and sophisticated "what-if" scenarios that ERP and MRP systems lack. Some key elements that food manufacturers can address through software planning technologies include:

- Accurate demand forecasting with an 18 to 36 month horizon
- Manufacturing modeling of capacity and constraints, including detailed set-up and changeover profiles, across all production equipment and multiple plants
- Ingredients requirements informed by manufacturing constraints
- Pre-building correct amounts of off-season products
- Using ABC classifications to drive smart production priorities
- Profiling every type of changeover and its impact
- Planning with shelf-life constraints in mind
- Optimizing cost and service levels

Excelling at these aspects of demand planning, inventory optimization and manufacturing planning creates a recipe for profitable operations and a competitive advantage for any food manufacturing company.

About Logility

Accelerating the sustainable digital supply chain, Logility helps companies seize new opportunities, sense and respond to changing market dynamics and more profitably manage their complex global businesses. The Logility® Digital Supply Chain Platform leverages an innovative blend of artificial intelligence [AI] and advanced analytics to automate planning, accelerate cycle times, increase precision, improve operating performance, break down business silos and deliver greater visibility. Logility is a wholly owned subsidiary of American Software, Inc. [NASDAQ: AMSWA].

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