Abstract

The meat industry faces a unique planning challenge: how to achieve carcass balance in sales. Demand for finished products or “cuts” will never equate exactly to what is available from the carcass. A given amount of waste is an inevitable by-product of matching supply and demand. The key to profitability is in finding a good market for all of the cuts from a carcass and not merely the higher-value steaks and roasting joints. Each cut has its own profit margin and costs associated with the production process. Certain material surpluses created by the need to fulfill service obligations are inevitable.

The planning process and the extent to which it is able to react to market needs can make a difference of 1-2% on total cost of goods sold, equating to substantial savings over the course of a planning year. Most current planning solutions in the meat industry are based around people, spreadsheets, and conventional enterprise resource planning (ERP) or scheduling solutions. These offer little help to demand and supply planners with a complex matrix of options. The task of achieving service levels, driving supply chain cost reductions and efficiencies, and retaining a healthy profit margin is largely left in the hands of a few experienced planners, whose complex spreadsheets and knowledge have now become critical risk factors to the business.

The advent of meat-specific planning optimization software, which is increasingly affordable to medium-sized businesses, offers a step change in this planning process and the opportunity to significantly increase margins, improve service levels, and provide early visibility into opportunities for surplus meat. The reduction, and potential elimination, of the reliance on complex, suboptimal spreadsheets also reduces risk in the business.

This paper examines these issues in detail and explains how solutions from Infor™ have helped companies improve their planning processes and achieve improved profit margins.
Introduction

Matching consumer demand for individual cuts against supply is one of the most difficult planning tasks; it requires the planner to have intimate knowledge of all aspects of the business. The extent to which the planner is able to resolve the imbalance between supply and demand determines both the attainable level of service and the profitability of the business.

The problem lies in the design of the raw material itself.

Nature constrained meat processing to a finite number of disassembly options. Using lamb as an example, a whole carcass yields a primal front, middle, and back. From a front, we get two shoulders, a neck, and a fillet. From the shoulder, we can get a boneless shoulder or shoulder chops, but not both. In reality, many more cuts are available and the product has a short shelf life, serving only to exacerbate the problem.

Unlike many industries, the supply of raw materials is effectively fixed and to some extent known. A planner must make the key decision of how to handle the available supply, as something must be done with a carcass once an animal is slaughtered—you can’t stop the process because you don’t need the products.

This means the process is both “push” driven at the supply end and “pull” driven by market demand for individual cuts.

In the sections that follow, a number of the aspects that impact the process are discussed.

Customer demand

Predicting demand in the meat industry is extremely difficult and worthy of a paper in its own right. However, for brevity’s sake, let’s examine a few key aspects.

Short term

The problem is complicated by the difficulty of forecasting sales; e.g., consumer demand is affected by both weather and marketing activities such as promotions.

Special promotions create a particular challenge by generating high demand for one particular cut of meat. This results in a large surplus of other cuts requiring markets. Some might be frozen and held in storage, but this normally reduces their value.

Medium term

In the medium term, the problem shifts with the seasons. For instance, summer is the peak time for steaks and chops while winter is the peak for roasts and casseroles. Additionally, consumer lifestyle or economic impact may result in a reduction in eating out. As consumers migrate from restaurants to food retailers to butcher shops, the cuts and packaging are different.

Long term

Consumption trends are magnifying the problem as demand increases for the prime cuts of meat by comparison with the rest. Consumers are now more aware of organic and health-orientated products, so suppliers must align with changing market tastes and trends.
Unsalable or expired products
Pushing products with short shelf lives may result in unsalable products or excessive promotions to move inventory.

“Bull whip” effect
Demand amplification, commonly known as the bull whip effect, occurs when small changes in consumer demand are progressively amplified or exaggerated as orders are passed from one company to the next along a supply chain. This effect is present in meat chains and is a major cause of uncertainty, cost, and waste.

Product innovation
While demand for fresh product remains high, the greatest growth has been in value-added meals, namely, coated, filled, enrobed, and ready meals. These are also often associated with higher margin products.

The impact on producers in these sectors is that they must constantly strive to introduce new products into the market, increasing the range and numbers of products to manage.

Order cycle times, particularly for fresh cuts, are typically less than eight hours from order confirmation to shipment. While weekly forecasts are provided to producers from retailers and revised up to 24 hours beforehand, most producers still complain of demand variability on individual stock-keeping units (SKUs) measured in hundreds of percent differences.

The introduction of effective collaborative demand planning solutions has contributed significantly to management of the above and brought some structure to the front end of the planning process.

But the net result is that the industry is characterized by demand fluctuation, with an effective planning horizon measured in hours and days. In this environment, effective demand planning, although helpful, cannot solve the planning problem by itself.

Supply
With the exception of packaging materials, supply considerations revolve mainly around the carcass, although there are more options and constraints than might at first seem obvious.

Once an animal arrives at the abattoir, a producer can do little to accelerate or decelerate the process. It is a classic “push” process. However, supply considerations are not that simple.

Grade
Mother Nature is often described as a lousy supplier. Carcass quality varies greatly between breeding stock and between individual animals from the same farm.

Purchased meat
Most manufacturers supplement their own supply inventory with supply purchased from outside vendors, often in percentages extending up to 30%. This helps to balance supply and demand over the planning horizon.
However, purchased meat does bring its own constraints:

- Some customers are sensitive to the origin of meat
- Grade may be less predictable or consistent
- Fresh product—if available—has a reduced working shelf life, and frozen product brings its own constraints

**Frozen meat**

Frozen meat is another potential source of supply for some products. Where this is possible, meat may be purchased on the open market or existing frozen stocks may be utilized.

One obvious advantage of using frozen meat is extended shelf life, but that is generally frowned upon and limited to further processed product applications. Another advantage is the possibility of reserving excess meat for another planning period, when demand starts to outstrip supply.

However, the downside to this includes increased cost of storage—which significantly impacts the cost per weight—and the costs of handling and distribution. Planners are required to consider all these factors in coming to their decisions, and the optimal answers are not always obvious.

**The planning process**

As in most other businesses, the planning process attempts to balance demand (given some of the characteristics examined above) with supply (within the constraints discussed), to achieve the highest possible level of customer service. However, there are additional considerations—some of them common to other industry types, some of them unique to the meat sector.

**Capacity constraints**

The meat industry is still characterized by high manual dependencies in first processing.

Lines may be limited to specific cuts, and choices must be made regarding sequencing of product, use of labor, and use of other production assets (e.g. chillers, de-bone lines, vacuum sealers, butchers, etc.).

At the plant level, the planning process needs to consider high-level conversion capabilities and their associated costs; the latter takes on increasing importance later, when product-mix profitability considerations are made.

**Shelf life**

Particularly impacting fresh meat, the planning process must consider the shelf life of product and match it against shelf-life requirements, which often vary by retailer.
Service levels
The meat industry is an extremely competitive market. Service level attainment is a critical measure placed upon the supplier. Virtually all suppliers operate at 100% customer service for all customers, which makes the planning process more complex. The challenge is to maximize customer service most profitably while balancing supply and/or purchase options with customer demand, all within the capacity constraints of the plant.

Product-mix profitability
Most companies faced with balancing supply and demand against the constraints highlighted above—in the cycle time available—are challenged just to meet service level targets. And yet, the way in which service levels are reached—and the extent to which service compromises are made—is a significant determinant of profit.

This is referred to as product-mix-profitability and is a characteristic of the meat industry. Some of the options are examined below.

The cutting plan
The first priority—for anything other than whole carcass production—is to determine an optimized cutting plan, which matches portion demand against available supply.

Inevitably, the process results in some compromise of:

• Service level
• Meat surplus to demand—by cut
• Blending
• Meat shortages
• Profit—since the margins and costs are different on each

Service level
All companies want to fulfill the “perfect order” every time. But it comes at a cost if the net effect of fulfilling 100% “shoulder chops” demand is a surplus of necks and fillets.

Meat surplus
Several options are available to processors to manage the surplus meat supply. These include:

• Add to frozen meat stock. Considerations include the forward demand for products that can be sourced from frozen meat; existing stocks; shelf lives of those stocks; and the cost and availability of storage capacity.

• Sell on open market. Meat surpluses can be traded on the open market, often to other secondary processors. This requires consideration of a company’s own forward demand and supply plan and the option to add to frozen stocks, in addition to the relative margins of different sale opportunities.

• Sell as co-product. Very little meat product is ever truly wasted, and there are always markets for meat by-products, including pet food and other food products (e.g., soups, sauces, and ingredients). One of the keys to having a successful meat surplus policy is to have forward visibility of the surplus. This is where the combination of demand planning and optimization solutions will help bring a commercial advantage.
Blending
Margins can be improved by blending or processing of excess or lower-quality cuts.

Meat shortages
If a specific plan results in meat shortages, again, there are a number of options.

- **Purchase additional meat.** This can be achieved on the open market, with consideration for source of supply and the need to match against customer requirements. Further options include purchase of a whole carcass—which may ultimately add to meat surpluses of other cuts—or purchase of higher-cost cuts where available. The latter choice exposes the producer to less waste, which may prove less expensive overall.

- **Factored sales.** In some cases, it may be possible to supply directly from a third party. With this option, the company receives no value added, but can maintain high service levels for a strategically important customer.

- **“Short” the customer.** While never a popular choice, and sometimes not permissible, there may be times when this is the best option in terms of overall profitability. If the company chooses this option, it should have knowledge of the customer and the likely impact. Alternatively, if the company chooses to maintain service levels, it should know the cost of doing so. This knowledge may be useful when sitting down with the customer for future price discussions.

Profit
The final component that should be a consideration in the overall plan is the cost impact or profit impact of the plan ultimately selected.

Too often, this is not an active part of the forward decision-making process and is only reported historically—several weeks later, when the accounting department explores variances.

Considering the meat industry’s unique set of circumstances and variety of planning options, it is clear that no two planners, armed with spreadsheets, will come to the same decision. It is also clear that all of the options and compromises described above have a profit impact, which is conservatively estimated at 1-2% of total cost of goods sold.

Because of the cycle time within which companies must make decisions, alternative plans are rarely, if ever, considered. To be of assistance, a decision-making tool must be able to evaluate all the options, all the time, balancing supply, demand, capacity and profit, and achieving this quickly enough to be of value to the planning process.

Infor provides such a solution, dedicated to meeting the specific carcass balance problem faced by meat processors.

The following section briefly examines the Infor solutions in this area.
Infor Advanced Planning

Infor Advanced Planning assists companies in improving the efficiency and flow of their supply chains by applying advanced mathematics to provide “optimized” answers to difficult supply chain scenarios.

An optimized solution, in a supply chain context, uses modeling capabilities to evaluate countless permutations quickly, weighing each against a common basis—usually cost or margin—and recommending an optimized option that meets the given business requirements (minimum inventory or off-cuts, maximum service, etc.).

Supply chain optimization techniques are particularly suited to complex logistical problems, where there are many known options and outcomes, and a cost or margin basis can be established against each.

For the meat industry, Infor Advanced Planning is aimed at the complex carcass balance planning challenge, selecting the best option to maximize customer service most profitably while balancing supply and/or purchase options against customer demand. This is done within the capacity constraint of the plant and provides early visibility into excess meat cuts and the shelf-life window in which these must be sold.

The optimizing capability provides the heart of the solution. It stores all the relationships between supply and demand, including—but not limited—to:

- Demand—forecasts and/or orders
- De-bone specifications—inverted BOM with yielded cut options
- Retail or food service pack options
- Desired service levels—by customer
- Supply—production and/or purchasing
- Production capacities—by site/line
- Production options—overtime/outsource/routing options
- Process constraints—e.g. carcass must be chilled for a minimum of 24 hours before cut
- Blending
- Shelf life
- Inventory
- Costs or profit margins
The solution then establishes a model, uniquely by customer requirements, to balance supply and demand against any number of options. Typical scenarios include:

Maximising customer service—at any cost
- Maximizing profit—at any cost
- Maximizing service—at least cost
- Maximizing production
- Maximizing waste and/or off-cuts
- Maximizing inventory holdings

All the above can be modelled assuming limited or unlimited supply of live animals and options to purchase pre-cut meat.

Outputs from the model include:
- Supply recommendations—live animals
- Purchase recommendations—kill versus buy option
- Detailed daily de-bone (cut) plans
- Forward visibility of excess stock with shelf life
- Line/chiller capacity issues
- Potential overtime requirements to meet demand

In the meat industry, Infor sees the option of maximizing customer service at the least cost as being most appropriate to maximizing product-mix profitability.

The options are limitless and are determined only by users, in terms of how they choose to plan their supply chains. Since all planning is done off-line, users can test a number of permutations in a “what-if” environment and select the most appropriate plan. This same capability supports more strategic decision-making. For example:
- What would be the impact of outsourcing production at X cost/weight?
- What is the impact of currency fluctuations on imported meat?
- How do I manage that sudden demand spike?
- Is it feasible to meet the promotional demand from capacity, or do I need to build inventory in advance? If so, how much inventory? And will it have sufficient shelf life?
- How much overtime do I need, and what is its cost?
Infor Demand Planning

Infor Demand Planning combines traditional forecasting with statistical analysis to provide the most accurate forecasts possible—at individual SKU levels—based upon historic trends and adjusting for seasonality.

Forecasts can be:

- Developed at any level—SKU, product family, customer or channel, geography, etc.
- Expressed in any unit of measure—cases, weight, revenue
- Developed with flexible bucketing—daily, weekly, monthly

Users can incorporate the effect of promotions into the forecast through the solution’s extensive demand analytics capability, which permits detailed, graphical analysis of demand patterns and helps judge the success of promotional campaigns.

A particular strength of Infor Demand Planning—and of increasing importance in today’s trading environment—is its ability to support Collaborative Planning, Forecasting, and Replenishment (CPFR) techniques via the Internet. Effective use of collaborative business processes assists in smoothing out the bull whip effect. Closer collaboration reduces uncertainty in demand and amplification in demand throughout the supply chain.

Conclusions

Meat processes currently employ both people and spreadsheets to keep track of carcass balance and to find markets for “left over” parts of the animal.

Service level attainment is a critical measure placed upon the meat supplier. Virtually all suppliers operate at 100% customer service for all customers, which makes the planning process more complex. The challenge is to maximize customer service most profitably while balancing supply and/or purchase options with customer demand, all within the capacity constraints of the plant.

Considering the meat industry’s unique set of circumstances and variety of planning options, it is clear that no two planners, armed with spreadsheets, will come to the same decision. It is also clear that all of the options and compromises described in this paper have a profit impact, which is conservatively estimated at 1-2% of total cost of goods sold. Companies that are reliant on a few individuals run the risk of losing that knowledge should those employees leave the business. And because of the cycle time within which companies must make decisions, alternative plans are rarely, if ever, considered.

Infor Advanced Planning is a decision-making tool that evaluates all the options, all the time, balancing supply, demand, capacity and profit, and achieving this quickly enough to be of value to the planning process.
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