Using Capacity Planning to Predict the Impact of Projected Future Demand on Distribution Infrastructure

Challenge

A leading transport fuel supplier and convenience retailer was faced with shifting demand for fuel products due to increased uptake of biofuels, changes in customer preferences and transportation costs and refinery closures. The company wanted to analyze the impact of projected future demand patterns for fuels on its distribution terminal infrastructure.

Traditionally, the company employed a yearly planning process to forecast demand, product mix changes and supply scenarios. However, using spreadsheets to accomplish this task was laborious and not suited to repeatable use. It was difficult to keep the data fresh and the spreadsheets lacked true optimization technology and the vital ability to conduct in-depth sensitivity analysis of alternate potential network structures and policies.

By using LLamasoft modeling technology, the company hoped to build a 10-year demand and supply plan across the terminal network, specifically:

- Identify gaps in capacity for serving key customers and product markets
- Understand the tipping point for capital investment requirements
- Identify and define storage tank requirements and loading rack configuration at terminals and refineries
- Model sourcing changes and identify impact on capacities of these increased importation changes
- Determine optimal safety stock levels to minimize cost while maintaining service levels

Solution

In order to visualize the current distribution network and capacities, the company built a baseline model capturing current terminal locations and capacities and 10-year demand and supply plan across its terminal network.

Positioning more inventory at the terminals rather than the refinery generated significant working capital savings without impacting service
With an agreed-upon baseline as the foundation, the team was then able to examine a variety of what-if scenarios representing a number of potential future demand and regulatory scenarios. This process allowed the company to understand the implications of shifting capacity from one facility to another, either partially or completely, in the event of a refinery closure. They were also able to analyze the network’s sensitivity to changes in fuel cost and the impacts of demand shifts.

Five long-range capacity planning scenarios, with corresponding variations, were developed and compared. Inventory optimization was performed on a refinery and its associated terminals in order to understand the savings associated with planning inventory in a multi-echelon fashion. LLamasoft’s scenario management capability enabled designers to select the correct demand for each scenario run, and easily compare results across all scenarios.

Results

Having built a living model of the end-to-end distribution network, the company had the ability to analyze future scenarios quickly and accurately as part of its regular planning process, as well as adjust its network for unplanned market changes and testing new strategic proposals.

Safety stock optimization applied known safety stock formulations at each node based on lead time, lead time variability, service requirement, demand, demand variability and order size, and now also utilizes a multi-echelon algorithm to further optimize service times to lower safety stock. Potential inventory savings identified were in the millions.