



TRANSFORMING A COMPANY'S MANUFACTURING FLEXIBILITY FOR COMPETITIVE ADVANTAGE

Smart businesses are on the hunt to continually evaluate and transform how they use their assets. All too often, transformation becomes necessary to maximize resources in response to changing circumstances. In the case of a client of Quadrillion Partners, that change came in the form of a plant closure that forced production volumes to different locations—and threatened increased delivery times to critical customers.

Dallas-based consulting firm Quadrillion helped their client, a global middle market high tech manufacturer, develop a new strategic planning process to make quick, informed decisions when consolidating manufacturing sites or pooling volumes globally. To help with the project, Quadrillion worked with FlexSim to develop a global simulation model that would aid in this critical decision making. The goal? Determine options for pooling product family volumes across different plants globally—balanced against constraints like costs and customer delivery cycle times—to answer questions like: **What products should be produced where? What are the costs and benefits of sourcing products from different regions? What bottlenecks or capacity issues can arise?**

Managing Complexity

Quadrillion's client has built a complex and productive global manufacturing ecosystem: six factories producing and shipping more than 75,000 SKUs from over 20 product families. To meet the 600,000 global orders per year, these factories relied on more than 1,000 pieces of equipment, dozens of continuous flow manufacturing lines, and in some cases different product "recipes" for similar products at different locations. This is all before taking into account those all-important customer delivery commitments. For the end client, the FlexSim model needed to imitate every facet of the system to be useful—so that realistic scenarios on volume pooling could be run.

This meant planning a single simulation model that would link orders, customer locations, plants, costs, and current capabilities. Everything from machine speeds to staffing needs to customer logistic routes to the nuances of imports and exports would be considered. Qua-





drillion gathered and prepared a staggering amount of operational data on the system; this data, contained in 22 spreadsheets, can be updated regularly for future simulations and then quickly pulled in and processed by FlexSim's robust Excel import capabilities.

CLIENT
QUADRILLION PARTNERS

LOCATION
Dallas, TX

TYPE
Management Advisory / Private
Equity Investments

WEB SITE
www.quadrillionpartners.com

The Simulation Solution

The simulation model made extensive use of FlexSim's *Process Flow* tool, which allows system characteristics to be modeled with easy-to-use process steps. This method of modeling makes it easier to understand and expand complex models without sacrificing the ability to create a 3D visual representation of the system. It also adds an element of flexibility and responsiveness to data updates when considering different simulation scenarios.

An example of this is when the client wants to evaluate the effects of equipment expansion, a "wish list" item for the simulation model. By adding a number machines to an Excel file, the model logic will automatically update to add the desired number of machines.

This allows for rapid scenario evaluation for time-sensitive decision making.

Since customer delivery cycle time was a key metric in this project, the model was fed geo-location data developed by Quadrillion that linked every customer ship-to site with every plant globally by postal code. The geolocation data was then used to calculate average delivery times in days for each product being shipped to each customer globally. This data was a critical excel input for the FlexSim model so that as volumes were pooled, the Quadrillion team could examine the impact on customer delivery times at both the customer order level and in a histogram by product family. The model also showed the trade-off in how quickly products can be delivered to an account versus where that order is made.

Analysis and Results

The simulation model examined a variety of scenarios including volume pooling within regions, options to consolidate plants, and the changes resulting from new labor laws with variable staffing over the course of days. All the critical metrics were present in the model output: order demand by customer and product, capacity in and out of the plant, change over times, cycle times, customer delivery times, etc.

But the model also showed when equipment maxed out in a simulation run (known in manufacturing as a 'bottleneck' or congestion or blockage)—something that can only be discovered in a simulation model that considers the variability and interdependencies of real life operations. Once identified in the model, bottlenecks could be resolved with improvements in equipment speed, rebalancing demand across different sites, or replacing pieces of equipment.

Several immediate outcomes of the model were a decision to increase the pooling of volumes across the Asia region, a decision to consolidate from six factories to five, and an initiative to expand lower cost imports into higher cost regions for certain product families.

The existence of a credible cross-functional model that is updated routinely has helped operations and finance make better decisions with a deeper understanding of their manufacturing process. The model is already slated to be expanded in the future, adding more capabilities for faster strategic planning decision making and to consider additional manufacturing challenges.