

Data Driven Supply Chain Optimization a Case Study

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Abstract

Logistics and the supply chain performance is very important in the HAZMAT industry. The end customer of hazardous materials is a wide range of industries from aerospace, automotive, craftsmen, healthcare, food and beverage, pharma and energy. Effectiveness of logistics is crucial to the performance of the supply chain. Logistic costs in the chemical industry can be as high as 20% of the purchase costs due to the complexity and risks involved. Therefore, cost-effective supply chain decisions and policies are essential to a profitable business. The company under study is an industry leader in HAZMAT products, it produces and distributes them. The organization has three main business lines: wholesale, bulk and retail. The corporation has presence in more than 90 countries. The research will be focused on the operations in North America and in the bulk business line. The bulk business line consists in tanks installed in different spots (customers) across the country and based on product consumption and telemetry readings the tanks are refilled by trucks. The tanks inventory is managed by the vendor under a VMI supply agreement. The logistics process consists in the following: [1] Each tank has a telemetry system that records the tank levels every hour and this information is available online. [2] The logistics planner checks tank levels and decides which customers need refill and plans routes for the next day. [3] The first step in all trips is to refill the truck with product. [4] Then, the product is in route to the customers. On average a trip has 2-3 deliveries and last about 2 days on average. [5] The driver closes each delivery through an app and the amount delivered is sent to the ERP for invoicing. It is important to take advantage of the wide range of existing degrees of freedom due to the nature of a VMI system, since the company decides when to deliver to the customer based on the level of inventory in the tank, how much product to deliver and how to combine the different customers to generate the route plan. For this research, three main areas were explored: reorder point, fleet sizing and routing. Currently all delivery points are set on a standard reorder point without taking into account the lead time and demand for each customer. So, an inventory policy with continuous review is proposed. Second, the company hires a third-party carrier and is able to set the number of base and spot vehicles rented per month. All base units have a certain number of kilometers as a take-or-pay, spot units pay only the kilometers driven. As the second solution, we present a formula to estimate fleet size based on the forecasted demand, round trip time and tanker capacity. Finally, all routing plans are done manually by the logistic planners. So, a simulation was done using a routing optimization model to minimize the total travel cost for a month worth of deliveries.

Keywords

HAZMAT, VMI, supply chain, cost reduction, fleet sizing.

Biographies

Sandra N. Garza Almazán is a Magna Cum Laude graduate with an Industrial Engineering degree and Cum Laude graduate from Master in Engineering Management, both degrees at Universidad de Monterrey. With 5 years of work experience in various industries such as oil & gas, retail, education, healthcare, industrial gases and business process services. Held positions in continuous improvement, import / export operations, scheduler, warehouse operations, project engineer, business analyst and business intelligence. Volunteer and part of the core team in Mexico for the non-profit Women in AI. Internal auditor certified in ISO 9001: 2015.

Edgar M.A. Granda Gutiérrez is the director of engineering and technology graduate programs of the Universidad de Monterrey. He holds a PhD in Industrial Engineering from ITESM. He has 18 years of professional experience in logistics, operations and supply chain in several Mexican companies. He has taught for 5 years courses on industrial engineering and logistics in the Universidad de Monterrey, ITESM, UMIN and Universidad Autónoma de Nuevo León. As a consultant, he has carried out projects on logistics and supply chain for different companies in México.