Supplement Chain Network Optimization: Low Volume Industrial Chemical Product

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Abstract

The chemical industry is a highly competitive and low margin industry. Chemical transportation faces stringent safety regulations meaning that Cost-To-Serve (C2S), costs associated with products net flow from manufacturers to customers, consists of a big percentage of the delivered product cost. Supply chain practitioners in this industry need to make key logistics decisions to minimize C2S for profitability and business sustainability. In this thesis, we present a network optimization model to minimize the total C2S for SKU-1, a low volume and low margin industrial chemical with a customer base spread across North and South America. We use a mathematical linear program to investigate the effects on total C2S when available production capacities and sources are shifted. We develop the model as a minimum cost flow problem, and more specifically, as a production and transportation problem (PTP). We analyze the total C2S under three scenarios. In the baseline scenario there are three manufacturing facilities in the Midwest, South East, and Europe. In the second scenario, where the Midwest supplier is excluded from the network, the C2S increases by 3%. In the third scenario, where both the Midwest and South East facilities are excluded, the C2S increases by 13%. Under each scenario we calculate the C2S for each individual customer and identify the customers most impacted by the change in supply. Our results provide insight regarding the changes expected to the supply network under capacity constraints and how those changes may affect the profitability of individual customers.

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