Total Landed Should Cost for Specialty Chemicals in Oil & Gas Industry

By: Monica Medina and Sang Truong

Advisor: Dr. Debabrata Ghosh

ABSTRACT

Purchasing specialty chemicals at the right price can be a significant challenge within the oil and gas industry due to reasons such as a limited source of supply, unknown manufacturing cost, intellectual property constraints, and competition with other industries for raw materials. In this thesis, we develop a should cost model that estimates the total landed should cost for specialty chemicals despite these challenges. With additional data inputs, our model can be automated for prediction of cost for specialty chemicals that can be further leveraged for negotiation with suppliers.

Monica Medina received a BS in Microbiology at Javeriana University and an MBA at Escuela Europea de Negocios. She has 12 years of experience in Procurement and Sourcing.

Sang Truong holds a Bachelor of Science in Aerospace Engineering from the University of Texas at Austin. Prior to joining the MSCM program, he has over 10 years of experience in the oil and gas industry.

KEY INSIGHTS

1. We identify a method for accurately predicting raw material costs.
2. We identify a method for estimating different cost components using financial ratios.
3. We develop an effective model to predict the cost of specialty chemicals at the individual product level.

INTRODUCTION

Chemicals can be categorized as either bulk or specialty. While bulk chemicals can be treated as a commodity with accurate pricing readily available through historical data and or competitive bidding, specialty chemicals are unique products that introduce challenges that can be difficult to overcome for accurate pricing. These challenges include limited source of supply, intellectual property constraints, unknown manufacturing cost, and competition with other industries for raw materials.

The company considered in this study, spent over USD 1 Billion annually toward the purchasing of chemicals, with over 40% towards specialty chemicals. The company uses a cost model that estimates the cost components of specialty chemicals at a family level and lumps several cost components such as labor and warehousing into a single bucket of conversion cost. Furthermore, distribution and logistics costs are also combined into a single cost component. Aggregation of these costs does not allow the company to have visibility into a specific cost structure that can vary greatly from one region to another (i.e. labor cost in Southeast Asia vs Western Europe). We believe that a more accurate cost model can be developed to prevent precluding these costs from the total landed cost analysis.

Due to the main challenge that most of the specialty chemicals are sourced from either single or limited suppliers, obtaining an accurate cost can be difficult. Therefore, we develop a should cost model approach that looks into the manufacturing cost of a product and each component of the cost thereafter until its final destination to accurately estimate the total land should cost for a specialty chemical.

A should cost model allows the buyer an opportunity to investigate what the true cost of a product should be to minimize the risk of overpaying. With a single source of supply, as with a monopoly, the supplier can easily set a price without the fear of competition due to the demand for the product.

With the should cost model, a comprehensive approach is taken to includes all relevant cost components. By knowing the true cost upfront, future financial losses can be prevented due to inaccurate or incomplete cost analysis.

Our study aims to develop a should cost model for specialty chemicals that can be used to accurately predict what the right cost of the product should be at a product level taking into account different cost components and factors.

EXTANT KNOWLEDGE

One of the earliest literature on the adoption of the should cost model came from the U.S. Department of Defense (DOD) when the average cost of project overrun reached more than 50%. The DOD was able to leverage its governmental power to perform should cost analysis on major contracts such as engines for fighter aircraft. The total effort took 11 months to complete with 50 highly skilled personnel that resulted in a contract savings of approximately $100M (Williams, 1985)

Without the same resource and power, the private industry has to modify the should cost approach that can still yield significant savings. One of the most widely used versions of should cost is manufacturing should cost-approach, used for vendor selection, negotiation, and for guiding the procurement process (Moy, 1998). With manufacturing should cost, there are some commonly used models know as simple should cost (Young, 2012), the approach that is used for our model development. The challenge for our research is to extend the model to specialty chemicals, where previous research has shown to be ineffective (Mealer & Park, 2013).

RESEARCH APPROACH

The research approach for this thesis included both a qualitative and quantitative analysis.

The qualitative approach consisted of interviews with all relevant internal supply chain personnel within the sponsor company to fully understand the end to end supply chain of specialty chemicals. In addition, interviews were also conducted with senior management of a specialty chemical manufacturing company to gain insight into their process flow and methodologies.

From these interviews, data was gathered for input into our should cost model. With accurate estimates from the manufacturing plant, inputs were further refined using financial ratios from the same scale companies within a geographical region. Financial ratios from same scale companies were especially critical when the source of supply is a private company where public financial statements are unavailable. To derive raw material cost, which is often the largest single component in the manufacturing cost (Hart & Sommerfield, 1997), a breakdown of the chemical make-up was conducted. Finally, with feedback from Global Category Manager within the sponsor company, an effective should cost model was developed.

RESULTS

A key result from our research can be seen in figure 1 below. When all relevant cost components are analyzed at a product level, there are significant differences between what a should cost model generates versus the estimation model the sponsor company uses at a family level. The model over-estimates the component of raw material and underestimates the cost of actual distribution and logistics. These differences should impact where and how much focus is placed when conducting a plan to drive down costs. For instance, although raw material is a big component of cost, our results show that significant savings are available within the logistics portions of the supply chain where a purchasing company may have more options to drive down costs.

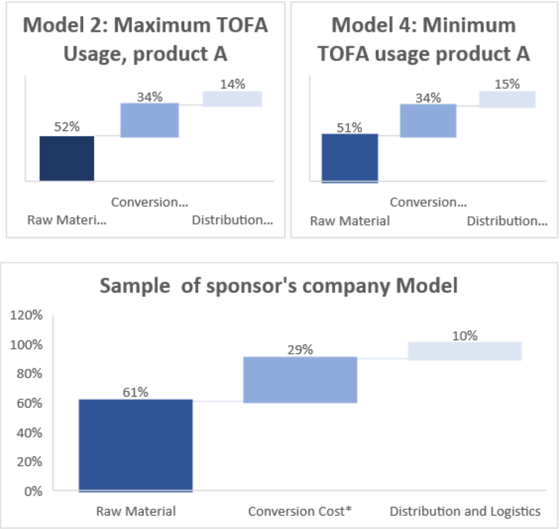

Figure 1 Should Cost Model VS Estimation Model

Another key result from our analysis can be seen in figure 2. Our multi-point analysis, displays differences between what our model predicts versus actual purchasing cost. A multi-point analysis was conducted to take into account the uncertainty of the actual composition of a specialty chemical product, where this information is a competitive advantage for the supplier. To account for this, the model was built by varying the largest component of the raw material, tall oil fatty acids (TOFA). Our results show that by maximizing TOFA in product A, the predicted total landed should is closer to the current purchase price, while for product B, a minimized TOFA composition is more accurate.

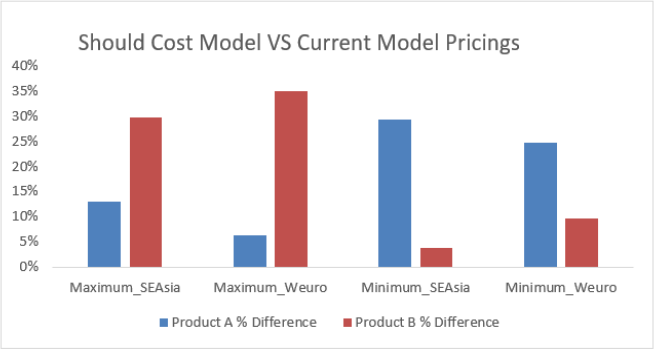

Figure 2 Pricing variances between TLSCM and Current Model

This result highlights the criticality of knowing as close as possible the composition make-up of the product. Despite this challenge, our model was able to break down each cost component from manufacturing to the final warehouse location with results being within -6% to +4% when compared to the current purchase price for the total landed should cost.

CONCLUSION

Our model was not only able to contribute to the existing literature review but also identify gaps within the current estimation model to further drive cost improvements.

We were able to build the model despite challenges on data availability for each component. For the sponsor company, the model provided a key tool to allow full visibility on costs for an end to end process.

Despite our positive results, some limitations do exist in our research. This includes the exact composition of the chemical being unknown, which was mitigated by doing a multi-point analysis model. Another limitation was the availability of financial information with regards to the supplier as it is a private company. This challenge was overcome by using data of public companies in the region and extrapolating it in our model. There were also geographical constraints due to the logistics flow and price variations of customs and transportation rates depending on entry and arrival ports. This was further mitigated by bidding out directly to multiple carriers to identify realistic rates.

Going forward, we have two recommendations for future research to further improve and expand on our results. We recommend further analysis into the chemical composition of specialty chemicals and have each component tied to existing market indexes to have real-time visibility on these costs. Furthermore, we recommend building a database to store all information internal to the sponsor company that can quickly be accessed through certain input requirements such as the source of supply and the final destination. By automating the process with up to date cost factors, better decisions making for strategic purchasing can be made.

REFERENCES

Hart, P., & Sommerfield, J. (1997). Cost Estimation of Specialty Chemicals from Laboratory-Scale Prices. *Journal of Cost Estimation*, 31-35.

Mealer, C., & Park, S. (2013). *A Simplified and Scalable Should-Cost Tool in the Oilfield Services Industry.* Cambridge: Massachusetts Institute of Technology.

Moy, E. (1998). *Design Tradeoffs For Advanced Manufacturing Using Cost Modeling.* Cambridge: Massachusettes Institute of Technology.

Williams, R. (1985). *A review of the "should cost" process and management issues of the process.* Monterey: Naval Post Graduate School.

Young, S. S. (2012). *Cost Estimation and Cost Management (4th ed.).* Bumhan Academy.