

Managing supply chain complexities in speciality chemicals industry

Speciality chemicals are used to create products that touch all aspects of our lives. They are vital components of the material world and are also integral to creating true added value for the chemical processing industry. Produced in lower volume than bulk chemicals, they can be found in numerous forms ranging from adhesives, additives, antioxidants, corrosion inhibitors, cutting fluids, dyes, lubricants, paints, pigments and much more.

The nature of the market is highly fragmented and growth initiatives tend to come from acquisition, mergers and product differentiation. Many players now maintain broad product portfolios to safeguard against fluctuations in demand. Companies tend towards consolidation to boost sales and have geographically diversified operations. Moreover, countries in Europe are witnessing shrinking demand trends. Operators in this sector are highly specialised and create enormous value characterised by their innovation. Products are sold on the basis of their per-

formance or function, rather than just for their composition.

The industry has to tackle complex manufacturing processes involving tightly coupled multi-step batch processing with mixing and blending operations. The key to addressing these challenges successfully is the ability to optimally plan and schedule production processes while engaging with the continuously shifting customer demands and operating constraints. It is the role of the planner and scheduler that drives priorities, plans support for uninterrupted production and minimises impact to the operation.

The added value ingredient

Complexity is the primary characteristic that drives the need for planning and scheduling solutions for speciality chemicals companies. Complexity comes in two main forms: complexity of the actual manufacturing process and complexity associated with the degrees of freedom in the supply chain network, such as available transportation options

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and dynamic sourcing decisions. The more complexity in the supply chain, the greater the need for planning and scheduling technology to guide companies to make the most profitable decisions.

Integration between planning and



scheduling provides even greater value. The goal of the production plan is to assign production quantities for each asset while taking into account asset capacities, recipe unit ratios, raw material and transportation costs and product prices. The goal of the production schedule, however, is to determine the timing of and the material produced by each batch run on a reactor, as well as cleaning tasks, while taking into account inventory replenishment needs and inventory capacities. Ideally, the two should work together to deliver operational efficiencies and achieve optimisation across the production process.

Leading by example

A recent project carried out by AspenTech, a leading global provider of process optimisation software solutions, highlights how speciality chemicals manufacturers can benefit from using planning models to better manage their business unit supply chains.

AspenTech's role in the project was to work with the planner whose interest was to understand the overall planned production volumes at numerous production sites. The planner needed to communicate which products would be produced in the upcoming month to his corporate and manufacturing colleagues. AspenTech configured the model to show the demand sourcing on a site basis and created an exception report, which indicated when production was being shipped out from non-standard source locations.

This particular speciality chemicals manufacturer has multiple manufacturing phases and transports materials from one site to another between phases. That means that it may produce an intermediate in one region and then ship it to another region, so it incurs significant stock transfer costs. AspenTech configured the planning model to consider shipment costs and transportation restrictions as part of the optimisation. In related plant scheduling applications deployed at each manufacturing site, schedulers can view net planned shipments as a forecast in their model and have the option of including it as demand, so that they can anticipate upcoming production requirements. Inter-plant purchase orders and purchase requisitions in SAP are also imported into the scheduling model and can be viewed and tracked on the planning board.

AspenTech also implemented a central headquarters scheduling solution that allows the client to view and understand the consequences of supply chain decisions across all interrelated sites.

Business-specific planning model considerations

The planner was not only interested in the overall volume of product that needs to be purchased, but also the composition and the associated price of the relative composition/concentration in the raw materials. This is a significant cost driver for the customer

and makes an enormous difference in their total purchasing costs. AspenTech configured the planning application, so the planner now has visibility into these raw material compositional aspects. It is important to note that this does not apply to all speciality chemicals producers.

Using the planning model

The speciality chemicals customer now has some inherent flexibility related to the locations where they decide to make products. The model considers their system-wide supply chain costs and constraints when generating an optimal plan. Sometimes, the model has returned an answer that the planner did not expect. Assuming that the underlying data inputs are right, that means that the model is helping to find better ways of doing things than in the past. The model has helped them to challenge traditional "rules of thumb" and established best practices. This is where value is established.

In another instance, the company was looking at bringing a new plant online and the expectation was that the production line at the new plant would be the best place to manufacture a significant amount of product. However, the model results were not in line with expectations – the capacity at the new site was not being utilised as planned. After some analysis, AspenTech demonstrated that the company's costs were not set up appropriately. It was





using costs from its SAP system – accounting costs that include a fixed-cost component allocated evenly across products made at a given facility. From an optimisation perspective, fixed costs are not considerations. The plant is now up and running, therefore, only the marginal production costs should be considered. This discovery made a tremendous difference in how the customer managed its business.

Recommendations for planning

Data availability and quality are crucial, especially the cost-related data. Prospective customers need to understand that their enterprise resource planning (ERP) system is not set up for optimisation purposes, but rather financial accounting purposes. A significant portion of the implementation process will be spent with consultants discussing data requirements, systems where that data is currently stored and the appropriateness of that data for planning optimisation purposes.

For this customer, there were instances where transportation costs and constraints were not adequately represented for optimisation purposes in its SAP system. AspenTech's planning model uncovered these data issues

when it recommended multiple stops for a product move, which is clearly not as cost effective as shipping the product direct. The software tool helped to quickly identify errors in the data that had to be fixed, leading to better and more profitable decisions. 'Aspen Supply Chain Planner' is very flexible. This means the inclusion of most, if not all, of the client-specific characteristics, business policies and constraints. By taking away the flexibility and configurability that is possible in AspenTech's planning tool, you take away a customer's source of competitive advantage. It was clear from the planning project that the application helped to quickly identify errors in the data that had to be fixed, leading to better and more profitable decisions.

So, the potential benefits speciality chemicals manufacturers could achieve from process industry software planning solutions are clear. The scale and urgency of requirement is dependent on a range of other factors. One of these is complexity. There is enormous value in having software models that realistically represent the production environment and associated constraints with enough fidelity to make profitable decisions and

accurately evaluate alternatives. Additionally, supply chain planning models that capture all of the degrees of freedom in the supply chain instead of relying on "rule of thumb" business policies have the potential to reap significant financial savings.

CONCLUSION

The health of the speciality chemicals sector is vital to the health of the chemicals sector generally. Speciality chemicals have the potential to deliver rapid product upgrading and high added value in the sector, as well as all areas of the national economy. Yet, if the potential within the sector is to be fulfilled, manufacturers will need to deploy efficient planning and scheduling across their operations to address their most urgent challenges. The fast changing environment, high demand and the need for greater operational visibility are just a few points of concern. Fortunately, innovative process industry software solutions are now available and delivering good return on investment for companies. These tools will help to achieve best practices, optimise the planning supply chain process and enable manufacturers to see significant value across the asset lifecycle to gain a competitive advantage in the marketplace.