Scheduling optimisation – How software solutions achieve success for specialty chemicals manufacturers

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The specialty chemicals sector has proven to be more resilient than most process industries to the negative effects of the economic downturn.

Today, the recovery is underway and growth prospects are looking ever more positive for the industry. Analyst house, Business Insights, recently forecast that the global market will grow at a CAGR of 2% during 2010 to 2014 to reach a total value of approximately $319-bn in 2014.

Barriers to success

Significant issues do remain across the sector if growth is to be sustained.

Specialty chemicals make up a complex and highly demanding marketplace. The industry is characterised by the need to deliver high-quality products quickly, while taking into account constantly shifting needs and expectations from customers for innovative products and shorter lead times. Added to these challenges are issues around escalating raw material costs, intense global competition driving prices down and conflicting production strategies (make-to-stock versus make-to-order). In addition, companies have to deal with a dynamic manufacturing environment where they need to optimise trade-offs between inventory levels, customer service and manufacturing costs and to manage variable demand across a broad portfolio of products.

Perhaps most significantly of all, the industry has to tackle complex manufacturing processes involving tightly coupled multi-step batch processing with mixing and blending operations.

Planning and scheduling

In the specialty chemicals sector, the key to addressing these challenges successfully is the ability to optimally plan and schedule production processes while taking into account continuously shifting customer demands and operating constraints previously referenced.

The traditional approach used to plan and manage the production of a suite of products at geographically distributed production sites, for geographically distributed customers, relies on a two step process involving long range (12 months) production planning across all assets and short term (1 week to 1 month) local production scheduling.

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 is to determine the timing of and the material produced by each batch run on a reactor, as well as clean-

About the company

AspenTech – software supplier for process optimisation

AspenTech [www.aspentech.com] is a leading supplier of software that optimizes process manufacturing – including energy, chemicals, pharmaceuticals, engineering & construction, and other industries that manufacture and produce products from a chemical process.

With integrated aspenONE solutions, process manufacturers can implement best practices for optimizing their engineering, manufacturing and supply chain operations. As a result, AspenTech customers are better able to increase capacity, improve margins, reduce costs and become more energy efficient.

ing 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 specialty chemicals production process.

The importance of scheduling optimisation

Effective scheduling is absolutely critical to achieving sustained success in this sector.

Specialty chemicals solutions can typically perform critical operational functions that are beyond any planning system. On account of sequence dependent product change-over costs, the short term product schedule for a given asset can have a significant impact on its capacity and, therefore, the long range production plan. However, the production plan does not directly account for change-over costs, but instead uses discounted capacities for each asset. Likewise the production plan does not consider inventory constraints.

Scheduling decision software tools bring process industry manufacturers several key advantages over and above what a planning solution could deliver.

These include the ability to schedule under current operational constraints, taking into account equipment, capacity and customer order deadline issues. Equally, these solutions deliver the ability to schedule to optimised technology constraints, including minimal cleaning and set-up time.

The best of these can provide greater efficiency through increased capacity to evaluate multiple alternatives and the ability to achieve quicker, more detailed evaluation of more production scenarios. The best scheduling tools also potentially deliver increased flexibility, including the ability to react quickly to unplanned events. They should be able to save time allocated by management and the scheduling team for scheduling and shift the focus of the schedulers from creating schedules to improving the value of the schedules they produce.

Delivering value

The potential benefits specialty chemicals manufacturers could achieve from process industry software scheduling solutions are clear. The scale and urgency of requirement is dependent on a range of other factors, such as complexity. Highly complex speciality chemical plants, where there is less visibility into the workings of the plant, typically have a higher need for scheduling than plants with less complexity. It is certainly true that most plants with large numbers of products and operational constraints would benefit from a plant scheduling system. It is also broadly true that the more dynamic the manufacturing environment, the more urgent the need for scheduling solutions.

As one customer commented recently to AspenTech, a leading global provider of mission-critical process optimisation software solutions, "the ability to react is what keeps us in the game."

In the most fluid, fast-changing environments, typical in the specialty chemicals sector, operators urgently need the agility to react quickly to disruptions or operational upsets. In the most dynamic scenarios, operators typically require on-time order fulfilment while keeping inventory at acceptable levels and they often need to be able to analyse complex trade-offs to minimise the impact on the schedule. At the same time, in dynamic environments, operators will need to frequently synchronise schedule updates with the enterprise resource planning (ERP) system and obtain rapid visibility into the schedule and the real-time performance of the plant.

The third issue driving urgent implementation of scheduling solutions is ease-of-use. Companies with fewer resources or a more inexperienced user base will typically require easy-to-use scheduling tools with intuitive user interfaces to help bridge the skills gap.

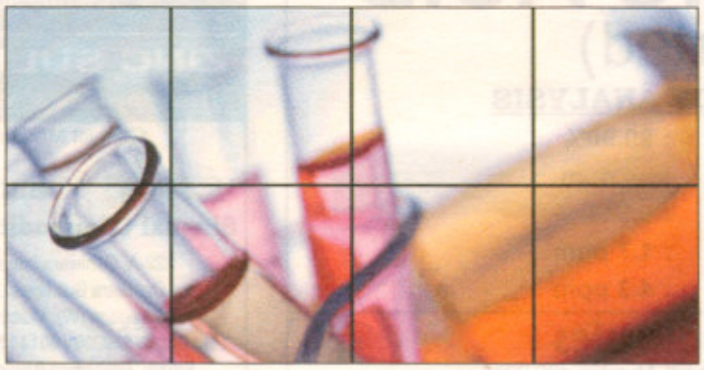
In commenting about scheduling systems, one AspenTech customer recently said: "The user interface is the single, most important piece of the overall solution."

Finding an answer

How can specialty chemicals manufacturers choose scheduling solutions that best address these urgent drivers?

In order to address the need for complexity effectively, they need a solution that models complex processes with enough fidelity to accurately evaluate alter-

natives. They also need to be able to time multi-stage operations that simultaneously consider all manufacturing constraints and provide optimal sequencing of setups and transitions to minimise off-spec production and enhance asset utilisation.



To effectively support a dynamic manufacturing environment, they should look for process industry software to enable business responsiveness and agility required to satisfy increasingly demanding customers. These tools provide 'what-if' analysis to simulate and understand the impact of schedule changes and supply forward visibility of inventory positions. Also, to provide the necessary ease-of use, manufacturers should be looking for solutions that deliver automation of the data gathering task to allow schedulers to focus on analysis rather than data management, standard interfaces and workflows and scalability of standard scheduling solutions to fit simple or complex plants.

One solution that addresses all of these issues and is already being widely deployed across the speciality chemicals sector is Aspen Plant Scheduler, a three-tiered family of plant scheduling products. These software tools help manufacturers to realise significant benefits in the areas of increased throughput, reduced inventory and expediting costs, as well as improve customer service.

Other benefits provided by the tools include basic finite capacity production scheduling with rapid implementation. Schedulers are able to effectively simulate production capacity and evaluate production scenarios for meeting total demand.

Additionally, the ability to link multi-stage production activities and customer orders provides real-time visibility of demand and manufacturing levels.

IN CONCLUSION

The health of the speciality chemicals sector is vital to the health of the chemicals sector generally. Specialty 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 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 specialty chemicals companies today. Tackling such complexity is vital. These tools will help to achieve best practices, optimise the scheduling process and enable manufacturers to see significant value across the asset lifecycle to gain a competitive advantage in the marketplace.

About the Author

Sunil Chaudhari heads up the South Asia Business of Aspen Technology as Country Manager with responsibility for strategic business operations & growth.

Based out of Pune he leads the company's Core Sector businesses in Engineering & Construction, Energy (Upstream, Midstream & Downstream) & Chemicals. In addition, his charter includes ensuring visibility for AspenTech as the leading software solution provider for process industry in the region, creating optimal value for its customers.

Mr. Chaudhari has had more than two decades of industry experience in Asia Pacific & global markets. His experience and expertise in automation, software and Industrial IT is well documented and acknowledged by his peers. He held various leadership roles during his long stints with global multinationals like Siemens, Honeywell & a brief one at Tata Consultancy Services.

His spread of experience includes leading business units, operations, project management, consultancy, business development and early days of plant automation commissioning.