

Helping speciality chemicals companies build for a positive future – the key role of process optimisation

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

Today, with a tentative recovery underway, prospects for growth are looking more positive.

Enterprises appear to be adapting successfully to the new economic conditions and many are beginning to plan again for growth and new investments. In the future, significant cost cutting can be achieved by process modelling and optimising energy and natural resources usage.

Analyst house, Business Insights, recently forecast that the global market will grow at a CAGR of 2% during 2010-14 to reach a total value of approximately \$319 billion in 2014. However, significant challenges do remain across the sector. The specialty chemicals industry is characterised by an innovative culture that develops a broad range of high-value products and grades.

To succeed in this highly competitive arena, producers must keep pace with constantly shifting needs and expectations from their customers for innovative products and shorter lead times. In order to differentiate from the competition and achieve business advantage, it is critical that they develop products both quickly and to the highest possible quality standards.



Organisations across the sector are acutely conscious of the need to reduce their time to value – not only time taken in developing new ideas, but critically also in developing these ideas commercially.

Another major driver is compliance – both in terms of industry regulations – on CO₂ or other emissions for example, but also to best manufacturing practice and procedures. Sometimes, this is cross-sector in scope. Many specialty chemicals companies sell to pharmaceuticals businesses, for example, and so need to comply with industry regulations in this arena. Crucially, they will also need to be able to monitor and document procedural and regulatory compliance.

Finally, specialty chemicals companies must ensure that they exert tight control over their supply chain. Again the most important driver here is customer satisfaction. In other chemicals industry sectors like bulk chemicals, where sales are more commodity-based, the primary focus is on reducing cost not only of inventory,

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but also of the entire supply chain process.

This is also important in the specialty chemicals sector, although not to the same extent. Instead, organisations are more closely focused on meeting customer needs.

They are likely to ask themselves, ‘how can we use the supply chain to ensure that we do not run out of inventory?’

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.

Finding a solution

To tackle these complex challenges, organisations increasingly need integrated solution tools that give them enterprise-wide visibility and control over their

industrial operations from process development through pilot plant scale-up and technology transfer to full-scale supply. They need solutions that address the key operational areas, such as engineering, manufacturing and supply chain.

In terms of engineering, bulk chemicals companies primarily focus on how they can get the most from their process equipment.

In speciality chemicals, the focus is different.

Organisations want to ask solutions providers – what kinds of simulation tools can you provide that will enable us to bring a new product or process to market faster than the competition? The best tools offer speciality chemicals companies the opportunity to carry out the full spectrum of ‘what if’ analysis. These capabilities, in turn, help them to streamline workflows, reduce costs and reach faster and more informed decisions. The best solutions should also streamline the workflow of both people and processes not only between engineering and manufacturing units, but across a whole organisation from the R&D function, to the laboratory, then on to the pilot, and ultimately, the commercial plant. This will drive more effective communication and cooperation between departments and ultimately help organisations scale from pilot to commercial plants more quickly.



On the manufacturing side, the key priority of speciality chemicals companies is product quality and they are, above all, looking for technological solutions that address this priority.

AspenTech, for example, is addressing many of the issues outlined above through aspenONE for specialty chemicals, an integrated solution set that gives users enterprise-wide visibility and control over their industrial operations from process development, through pilot plant scale-up and technology transfer, to full scale manufacturing and supply.

The role of prediction modelling

Inferential measurements are needed in the specialty chemical industry to augment existing instrumentation, synthesising process data in the absence of physical instruments and eliminating or reducing reliance on infrequent laboratory analyses. Besides providing enhanced visibility to the operators of product properties, they are a prerequisite for implementing APC solutions as discussed in the next section.

The basic principle involves the development and use of a model for predicting future events that cannot be measured in the plant. Historical data is used, for example, to try to predict online the quality of a soon-to-be-developed product. Managers can then take faster decisions based on these predictions.

APC and PAC

In order to ensure product quality is consistently high, chosen solutions should ideally help companies to reduce variability in the process. Advanced Process Control (APC) is highly effective within automated environments. However, a further challenge, particular to the specialty chemicals sector, is the need to extensively manage manual processes. Whereas in the bulk chemicals sector, 95% of the manufacturing operation is automated, in the specialty chemicals arena this figure falls dramatically to around 50%.

Manufacturers need solutions that can manage these manual operations as efficiently as possible in order to ensure they achieve optimum product quality. To do this, they can use an approach known as Procedures Advanced Control (PAC), which is unique to the specialty chemicals sector.

This approach enforces the precise and accurate execution of manual manufacturing processes, helping to ensure that operators do not make mistakes. AspenTech provides a tool to help electronically document these procedures and then force the operator to execute them in a particular way. Checks can be made to ensure that the operator puts the right materials in the right places, for example.

Finally, in the supply chain, the

major requirement is for solutions that delivers flexibility. Unlike the bulk chemicals sector, speciality chemicals companies tend to have extensive and fast-changing product portfolios. They are often dependent on high-quality marketing campaigns and they need to optimise product production throughout. Solutions that enable them to easily group products together to support the smoothest possible workflow are therefore imperative.

Production scheduling

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 cleaning tasks, while taking into account inventory replenishment needs and inventory capacities.

Due to a sequence dependent on 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 support tools bring several key advantages:

- The ability to schedule under current operational constraints: equipment, capacity and customer order deadline;
- The ability to schedule and optimise technology constraints: minimal cleaning time, minimal setup time;
- Increased efficiency through increased capacity to evaluate multiple alternatives: quicker, more detailed, more scenario evaluation, more production alternatives screened;
- Increased flexibility: quick reaction to changes, to unplanned events;
- Save time allocated by Management and Scheduler into scheduling; and
- Shift Scheduler time from creating schedules to improving values of schedules.

Finding a way to a positive future

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 allowing these companies to provide services to all other sectors across the national economy.

Yet, if the potential within the speciality sector is to be fulfilled, then many challenges still need to be overcome as companies battle to streamline their workflows, develop high-quality products, drive shorter production times and deliver the highest possible levels of customer satisfaction.

As they battle to achieve competitive edge in this complex and difficult marketplace, leading edge technological solutions that help to drive business

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.

advantage and commercial success, such as software tools for process optimisation, will become an ever more critical requirement.