

Manufacturing efficiency



Getting the most from bulk chemical plants. By Terumi Okano, product engineering, **Aspentech**.

The industrial world is predicted to grow over the next decade and competition will intensify as global energy consumption increases to meet consumer demand across emerging regions. The bulk chemicals industry is expected to take a large portion of both consumption and growth, as well as capitalise on the increased supply of natural gas, hydrocarbon gas liquids and petrochemical feedstock. Whilst opportunities exist for companies in the market, many chemical manufacturers are focused on maximising yields, reducing energy costs and ensuring plants reliably perform to safety standards.

While some energy is used in the bulk chemical manufacturing process for heat and power, most energy in this industry is used as feedstocks or raw materials for the manufacture of chemicals. With high volume output and low margin return, operations are

capital intensive and continuous processes. Companies continually strive to achieve high asset utilisation while staying on target for production goals or KPIs. The use of cutting-edge software technology can dramatically improve equipment performance, validate plant bottlenecks, push production constraints and ensure safe, reliable operations.

ANSWERING THE BIG QUESTIONS

Identifying operational strategies to bypass bottlenecks and improve operating targets for key plant equipment is a crucial goal for chemical businesses today. Optimising trade-offs between production, yield and energy performance requires greater visibility of plant behaviour in order for stakeholders to make the necessary corrective actions to keep production on track and reach operational targets. Validating relief system design for new operating conditions and conducting operability analysis to address



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stability problems quickly will also mean that businesses can keep to schedule and deliver products on time.

Many leaders in the chemicals industry are constantly reviewing their strategies to keep their business lean and competitive. As part of the processes, key questions arise including 'How can we best utilise the capital we've invested and minimise operating costs?', 'Which pieces of equipment are preventing the smooth running of the plant and causing downtime?' and 'Is there a better way to speed up the production process whilst remaining safe?'

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It is not easy to balance the trade-off between making the most products without using an enormous amount of energy. Processes are energy intensive and a small difference in operations can make a huge impact to the bottom line. The combination of embedded automation devices, high-capacity networks and advanced software is now capable of capturing, collating and contextualising data into purposeful real-time information that improves day-to-day communications, supporting better operational decisions. Smart manufacturing is getting smarter and with the use of cloud computing, visual analytics and mobile platforms, technology can now intelligently aid an organisation's key stakeholders to better understand operational data from the plant. Today, responding quickly to operational issues can be performed anytime and anywhere with the right tools.

ADDRESSING TECHNOLOGY CHALLENGES

Companies seeking innovative ways to reduce capital and operating costs are turning to technology to help improve engineering efficiency, maximise plant performance and increase profitability. Successful manufacturers have implemented process simulation, optimisation and energy management systems to reduce energy usage. Cutting-edge tools help operators to continually monitor the dynamic behaviour of the operation and marketplace to determine the best operating policies that will allow them to control the facility and continually run their plants to the maximum capability whilst remaining within safety guidelines.

Operational excellence revolves around driving the optimum performance from all areas of the business on a second-by-second basis every day throughout the year. Organisational excellence leverages proven integrated technology that empowers staff and supports younger generations to make better decisions in order to collaborate more effectively and accelerate business performance.

Manufacturers must implement optimisation initiatives through the entire lifecycle of industry assets and address business challenges in a more comprehensive and holistic manner to unlock the value often tied up in departmental functions caused by silo practices. The combination of process simulation tools, manufacturing executions systems (MES) and effective planning and scheduling solutions is vital to optimising the asset. Companies using an advanced process simulator can model their

chemical processes to gain better insights and improve designs that will optimise production performance. Many companies have adopted AspenTech's Aspenone software suite, which contains innovative solutions to optimise process designs for energy use, capital costs, operating costs and product yields through the use of energy analyses, economic evaluations and detailed equipment design during the modelling process. From the Aspenone Engineering suite, Aspen Plus solves critical engineering and operational problems that arise throughout the lifecycle of a chemical process plant. The software tool predicts process behaviour using engineering relationships, such as mass and energy balances, phase and chemical equilibrium and reaction kinetics. With reliable physical properties, thermodynamic data, realistic operating conditions and rigorous equipment models, engineers are able to simulate actual plant behaviour.

Aspenone MES aggregates process, production and business information into a cohesive context with fast data discovery tools, automated workflow and order tracking, as well as extensive analytical, notification and visualisation capabilities. Covering all aspects of the ISA-S95 activity model, manufacturers are able to easily exchange real-time information between the shop floor and the rest of the enterprise to create actionable intelligence and optimise manufacturing excellence. The end result is lower operating costs, reduced process variability and improved asset utilisation that optimise bottom line profitability.

Manufacturers are under intense pressure to maintain high profit margins and be operationally agile while demonstrating both internal and external compliance to health, environmental and safety regulations. Aspenone MES delivers these capabilities by providing automated workflow and order tracking to facilitate improved operational consistency, better production tracking and reduced errors. Consistent, repeatable work processes maximise the efficiency of the production asset, assuring faster time-to-market. Collecting, storing, organising and communicating data is fundamental to effective analysis of plant performance. The use of a robust data historian captures real-time production information and visualises data in context to measure and discern production planning and tracking.

Complimentary to the MES functionality, advanced process control (APC) is used to reduce process variability, enabling



operators to push the production closer to safe operational limits. APC maintains tight control of operations, reducing quality variance (up to 50%), improving process yields (up to 3%), increasing capacity (average 4%), reducing energy costs (up to 10%) and increasing asset effectiveness. AspenTech's adaptive process control automates the process of building and maintaining APC controllers, dramatically reducing time and effort to implement advanced control solutions and achieve quicker benefits. By transforming process manufacturing with innovative technology, industry leaders are more competitively positioned to meet today's demands and also better prepared for the challenges of tomorrow.

IMPROVING MANUFACTURING PERFORMANCE

For bulk chemical companies today, it is a competitive necessity to achieve excellence in execution with consistent and predictable performance. Manufacturing requires the integration of all process and production information sources to allow engineers and operators to analyse vital data that can be tracked in real-time and used to quickly identify root causes of operational problems for immediate corrective actions. Successful chemical manufacturers are now implementing advanced integrated software solutions to help them maintain production margins, improve product quality and continue to meet regulatory compliance. The market today is more globally dynamic and competitive. Therefore, getting the most out of chemical plants requires innovative technology to optimise assets, which ultimately delivers greater profitability. ■

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