

Maximising profit through real-time performance management

Managing a business in the chemicals and batch process industry today is complex. With increasing pressures to meet customer demand, reduce operation costs and improve manufacturing performance, relying on traditional silo business methods is no longer viable to remain competitive. The game has changed. Companies need to be more agile and responsive to fluctuations within the market and react more quickly to disruptions within their own operations. Get the business model right and you achieve targets and make significant profit – get it wrong and you lose money and miss the opportunity to maximise commercial potential.

The number of speciality chemical products has grown significantly over recent years. So there is an increased need to improve responsiveness of manufacturing plants to accommodate this change. The market has become even more demand-driven and pull-based. There is also growing need to reduce overall maintenance costs (i.e. heat exchanger fouling, utilities production costs, meeting regulatory constraints, managing different operator shift behaviour). Above all, there is the growing need to satisfy the highest customer quality standards.

So, from weeks to hours, minutes and seconds, there are continuous changes to companies' plants on an ongoing basis. Consequently, there is a danger of operations losing significant money and suffering a drop off in performance by not reacting quickly to such changes.

Industry leaders must view the situation holistically – from planning over

the yearly cycle through to daily and minute-by-minute scheduling on the plant floor dynamically connected to the shop floor. The strategy for success lies in comprehensive production planning, integrated execution, effective control and related performance monitoring that will drive the organisation



towards full optimisation. In short, the key to success is to view each of these areas not as individual silos, but as integral components of one larger 'decision-support' picture.

Reacting to changes in real-time

Reacting better to the changes in the market and being able to respond accordingly is the key to maximising profits from the operation. The primary change is meeting the demand from customers – the indirect changes that can also affect margins are the competing issues, including set-up times, product related issues and energy consumption, which all have a negative effect on profit.

So, how do you optimally balance customer satisfaction with inventory costs and production flexibility and not

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lose money in the process whilst maximising production in the process? The answer is to plan, execute and respond

About the author

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About the company

AspenTech [www.aspentech.com] supplies of software that optimises 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.

to change immediately on all time horizons. A truly optimised company-wide production plan is crucial here. With the wrong plan not accommodating all factors then the business will never proceed with optimal effect. If you know the optimal plan to make more products with all constraints then you will be better placed to maximise profits.

At the corporate planning level, simultaneous decisions have to be taken considering demand satisfaction, feedstock procurement, production and distribution capabilities, energy usage and other constraints.

The importance of organisational integration

Planning and scheduling often fail because they are not described very well in the company's plant business models. Energy usage, for example, is sometimes not considered in the planning model, causing enormous losses in costs and time. Planning and scheduling are often owned by different departments, which do not necessarily have the appropriate skills or expertise to truly address the regular challenges a plant may face.

This silo approach to business is one reason why companies fail to optimise operations. The energy consumption per product, per grade is not modelled against a tariff structure and production is only performed by planning against materials, capacities & production capabilities and there is a failure to take into account the energy component. Across many chemical companies this is a cultural or political issue. Executive decision-makers, therefore, need to address this organisational problem or the business structure will never be capable of performing optimally. The key



to the whole game is the integration of the right skills mapped to the relevant areas of the business.

If you know the challenges and the limits of the operation, then chemical companies will be well-placed to optimise their processes. When one looks into the actual performance against the plan, the differential can be huge. By understanding your challenges to meet the demand, you will improve your ability to know what to produce per plant – per region. Plan versus actual reconciled gap could mean chemical companies could achieve a higher end profit. For a successful operation, innovative process industry software makes it possible to seamlessly model and manage manufacturing workflow, easily connecting various systems and applications, defining analytics and relevant information in real-time enabling intelligent decision-making across the network of operations. By taking this approach, companies will significantly improve manufacturing operations.

Activities like planning and scheduling give a dynamic and predictive understanding of the plant. All of these forward looking decision-support areas need an effective model to run future scenarios and calculate outcomes. Operators, therefore, need to have sufficient understanding of their process and a method of describing it at planning, scheduling and order management stages to control and achieve good results in line with the model. Each stage of the

process will have targets and should be monitored and measured. Activities and solutions determine targets within the DCS.

Software technology plays a key role at this stage in the process. The next step is the feedback from execution into the

performance management solution or process data repository. This collects the data generated from the plant, aggregates it and compares the information to targets. The performance management solution reacts quickly if there is a delta between the actual plant performance and the targets by performing this closed loop business role and monitoring a significant driving down of costs from days, to hours and minutes. Better plans and execution and being able to react to change will deliver improved returns from the assets. Each individual step of the process needs to be assessed.

Effective execution management

Execution management relates to industry specific solutions (e.g. polymer sequencing, pharma batch and fine chemical, procedural automation such as S88) and the necessary adjustment to the customers operating procedures. Real-time optimisation for continuous processes, include areas such as steam crackers.

Therefore, effective production drives operational excellence and reduces operating costs through real-time performance management of manufacturing operations, enabling better and faster decisions. Today, software technology helps companies meet the business challenges of profitability in a low-cost commodity production environment by improving operational performance, reducing operating costs and enabling consistency of perfor-

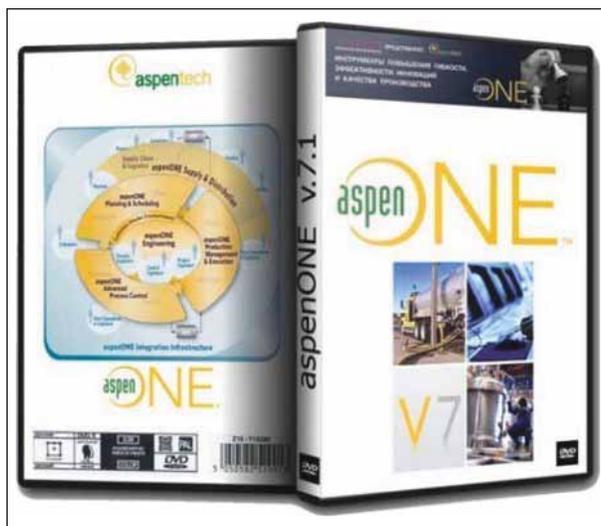
mance across all assets. It enables decision-makers to analyse, understand and improve the performance of the operations at an enterprise level by providing real-time access and visibility to process information. For example, 'aspenONE' MES is a comprehensive manufacturing execution system that incorporates the industry accepted ISA-95 framework to speed decisions, disseminate best practices and coordinate work activities. It enables companies to analyse, understand and improve the performance

of operations, providing real-time access and visibility to production information, faster product transitions and comparison of performance across the asset base. This technology brings order and control to the "execution gap" that exists between ERP systems and the many data sources and control systems throughout a production facility. Companies deploying such software can achieve positive return on investment within months.

The value of implementing better control

Real-time optimisation addresses the steady-state of the plant's behaviour on an hourly basis looking at how defined areas should be running and taking into consideration all constraints of the entire plant. On the other hand, Advanced Process Control (APC) controls the dynamic behaviour of the plant by having a more detailed an empirical dynamic model of it.

APC can assist significantly with a disturbance in the plant in a dynamic way with set-point changes defined by an optimiser. While a DCS controller only looks at one variable based on the model, APC looks at all the variables at the same time to get the necessary change under optimal control. In addition,



tion, the DCS controller does not know the future (i.e. predictive capability), whereas APC does know the future behaviour of all variables it controls.

Of course, APC is a closed loop technology that helps to control the quality of products produced every minute by manipulating the related variables, such as temperature and flows, while respecting economics. Traditionally, APC was used in large continuous plants to control the dynamic behaviour around steady state operations by using a linear APC controller. Today, APC can be used to control product transitions from one steady state to another using non-linear control techniques. In the future, APC will be used to control batch-based plants using a time-based model.

Significantly, this helps improve the financial performance of the plant where companies have experienced benefits ranging from 3-5% increase in capacity and 3-5% energy reduction. Technology applied to these types of systems includes programmable logic controllers, closed loop advanced process control systems and a variety of intelligent instrumentation solutions.

Many leading companies have

adopted this technology using 'aspenONE' Advanced Process Control software. The software enables process manufacturers to operate units close to peak performance while simultaneously generating closed loop data suitable for calibrating APC models and delivers ground-breaking new functionality. This breakthrough in the field of control technology eliminates aggressive step-testing while preserving the economic benefits of software applications and improves the synergy between multivariable predictive control, intelligent

data selection and closed loop model identification. This makes it easier to maintain highly accurate models as plants change over time.

Performance monitoring

An important step in the process is having the most comprehensive performance management and analysis solution to be able to optimise manufacturing and improve profitability. Manufacturing plants generate enormous data and it is essential that software tools are installed to aggregate process, production and business information into a cohesive context for a better understanding of the plant's operation and to help improve performance. These software tools form a powerful application environment and information management system for unlocking knowledge. The real-time manufacturing processes are the foundation for integrating solutions and connecting plant control systems from the shop floor with business systems.

Manufacturers have adopted software process optimisation solutions to help manage and track their data from the plant floor right through to executive level. Many have turned to AspenTech's 'aspenONE' manufacturing suite. The 'Aspen InfoPlus.21 Family',

for example, helps manufacturers drive operational excellence through improved monitoring, control and analysis of their manufacturing operations, enabling better and faster decisions across the enterprise. 'Aspen InfoPlus.21' specifically collects and stores large volumes of process data for real-time and historical analysis and reporting. This



process data repository forms the core of a plant and enterprise-level manufacturing integration platform, uniting data across process control, manufacturing operations and business systems.

Aggregation and validation

Aggregating real-time data through to commercial data is essential. This, along with validation and reconciliation, is essential for decision-makers across the operation to compare the data accrued and to ensure that it maps to the planned performance of the plant. Aggregated data across an operation leads to best practice and better understanding of the operation. The adoption of process industry software solutions enables manufacturers to harmonise their processes and to deliver more effective decision-making power. By thinking more holistically, VPs of operations and IT directors can make better real-time performance decisions and evaluate what is happening across the entire network.

Good understanding of information will help companies make timely, better informed decisions about production performance, which will ultimately have a positive impact on the bottom line. Again, the right business model and plan combined with the right process industry software tools will help to achieve this goal.

With all the relevant data put into

context, real-time performance management will have meaning (i.e. temperature/energy data belonging or linked to a particular batch – contextualising the measurements to business scenario). Without this, performance management will not make sense. Each database needs to be contextualised to give a true picture of what is happening in the plant. Isolated data is meaningless. The constantly growing volume of data that is generated across the process plant makes the task of deciphering data difficult. Consolidating data from multiple sources across the enterprise is a significant challenge. Gaining visibility and transparency is of paramount importance to making crucial decisions affecting the operation.

Conclusion: Optimisation and profit

With the right business model and thinking holistically, production will be optimised and commercial true targets can be reached. Therefore, better planning, better scheduling, reacting to changes quickly with better execution and monitoring in real-time is crucial. Contextualising and integrating accurate data to give meaningful real-time performance management and then aggregating to higher business targets will achieve successful step-by-step comprehensive target planning. Data needs to be made available to all stakeholders within a plant and in real-time to facilitate optimum decision-making and appropriate action. The staff working

on the plant floor is pressured to respond quickly and report accurately when issues occur. At the mid-tier management level, monitoring the technical performance of the plant and interpreting the data is vital to making the right decisions. At higher management levels, executives will receive more accurate reports to make relevant

operational and commercial decisions. Software solutions incorporate product applications that significantly help to monitor real-time performance against business goals and provide a common view of all critical business and operational data from disparate sources throughout the enterprise. When something happens, you know exactly why it happened and are able to respond to unexpected demands in an intelligent and timely manner.

The use of such models for strategic decision-making processes yields substantial benefits not only in economic terms but also in an improved understanding of the interactions between the various components of the business. Real-time monitoring of internal performance enables the company to react rapidly to significant developments. Using real-time information to drive actions empowers decision-makers at the time of greatest impact to see the big picture and work towards the vision. Having a good and accurate target supported by the model that describes the plant's process against real-time actuals significantly helps the business to stay in control. It also defines the importance of integrating the operation using real-time business performance management: plan, execute, monitor and respond to change immediately on all time horizons. The significance is avoiding an operational loss and achieving profit maximisation!