Optimising engineering processes

Aspen Technology (AspenTech) is a leading provider of software and services to the process industries. The company has more than 1,500 customers including 19 of the 20 largest chemical companies, all 20 of the largest petroleum companies, 17 of the 20 engineering and construction companies, and 15 of the 20 largest pharmaceutical companies.

Mr B V N Prasad.

By standardising on AspenTech solutions, these companies have been able to design and run more efficient plants, increase operational performance, operate more agile supply chains, and reduce energy consumption and the carbon footprint.

'The Singapore Engineer' finds out more about the company and its offerings, from Mr B V N Prasad, AspenTech's Senior Director - Services Sales, Asia Pacific.

Question: AspenTech's origin goes back to MIT and the development of a third-generation process simulation system called the ASPEN project. Could you briefly explain the various stages of development, leading to the successful commercialisation of the company's products?

Answer: It was a big challenge to convert a university research project on the simulation of a coal gasification process into commercial software for the industry. The key drivers for the development were:
• Efficient use of computing resources: Given the state of computing in the early 1980s, significant effort was needed into making the software code efficient, with low overheads. It was extremely important to get the program to run quickly and deliver the solution so that engineers would have the time to analyse different options.
• Generic simulation capabilities: The ability to address a wide variety of process simulation requirements in the industry was critical, in order to expand the target market, instead of focusing only on the coal gasification problem.
• Ease of use: From the beginning, AspenTech focused on making it easier for process industry companies to optimise their operations. In the 1980s, this focus helped to transform process simulation so that even entry level engineers could adopt it quickly and deliver value.

While the above aspects were important from a software development perspective, it was also important to develop the adjacent services required for clients to derive full value from the solution, like Training, Software Support, and Modelling Services, while building a world-class sales team to take the product to market.

Q: What are some of AspenTech's major software products?

A: AspenTech has two key product families, Engineering, and Manufacturing and Supply Chain, both released under the aspenONE brand.

aspenONE Engineering helps customers achieve the following best practices for engineering excellence:
• Using one, unified interface.
• Executing global projects 24x7.
• Reducing risk, improving plant performance.
• Reducing capital cost through faster and better analysis of process design options.
• Speeding up equipment design - lowering the time to market.
• Accelerating green initiatives.
• Handling any complex modelling job.
• Continuously improving product usage.

aspenONE Manufacturing and Supply Chain helps manufacturers overcome today's challenges by enabling them to:
• Convert plant data to meaningful information.
• Optimise plant and supply chain operations.
• Make better and faster decisions.
• Reduce cost of operations.
• Provide role-based access.
• Use software when and where needed.

Q: How does AspenTech optimise engineering, manufacturing, and supply chain processes for its customers in the chemical and petroleum industries?

A: In the chemical industry, aspenONE drives collaborative manufacturing by providing solutions for each phase of the business in an integrated environment, providing visibility, collaboration through sharing and re-use of data and process models. By integrating the overall business processes, companies achieve significant improvements in performance with payback in months instead of years. aspenONE for Chemicals maximises profitability by:
• Optimising feedstock selection and scheduling.
• Improving and accelerating process innovation.
• Optimising plant performance.
• Standardising manufacturing workflow.
• Improving capital efficiency.
• Reducing environmental risk.

AspenTech has focused solutions for the petroleum industry specifically addressing the upstream and downstream industry segments.

aspenONE for Exploration & Production addresses the upstream petroleum industry segment and helps to do the following:
• Shorten the time and reduce errors from the conceptual design stage to handover, to operations.
• Visualise equipment, platforms, and enterprise performance.
• Analyse production system performance using consistent models and real-time data.
• Optimise decision-making with industry-leading simulation and optimisation tools.

aspenONE for Refining & Marketing addresses the downstream petroleum industry segment and delivers an integrated foundation for reducing costs and increasing throughput,

while achieving safety and regulatory compliance.

aspenONE for Refining & Marketing enables standardised work processes and real-time decisions based on common data, models, and assumptions. By integrating the overall business processes, companies achieve significant improvements in performance with payback in months instead of years.

aspenONE for Refining & Marketing maximises profitability and drives operational excellence by:

• Expanding visibility across the entire petroleum supply chain, to reduce inventory carrying costs.

• Increasing speed and accuracy of response in decision-making, to enable higher refinery margins.

• Optimising selection and scheduling of feedstock, applying actual refinery constraints.

• Driving collaboration across engineering, refinery operations, and the entire petroleum supply chain.

• Optimising refinery performance, given the trade-offs between capacity, yield, and energy.

Q: What are the cost savings that can be achieved and what is the payback period on the investment in the software solutions?

A: The typical payback period varies widely based on the industry and solution being implemented, the quality and effectiveness of the client's current operations, and the client's current ability to quickly respond to market opportunities. The further removed the client's current operations are from global best practices, the more the opportunity to deliver significant benefits. In almost all cases, the payback is less than a year and in many cases the payback is just a few months. ᴛꜱᴇ

(More information on AspenTech may be obtained from www.aspentech.com)

Improving potential profits at refinery with real-time optimisation

Brazil's state-run oil company, Petrobras, operates the 250,000 barrel per day REVAP refinery in Sao Jose de Campos in southeastern Sao Paulo state. It produces approximately 15% of Brazil's oil derivatives after completing an upgrade as part of a refinery modernisation programme.

Petrobras identified Real Time Optimisation (RTO) as a strategic and 'highly sustainable' technology to improve business operations and profitability at the REVAP refinery. After a thorough and competitive evaluation, Petrobras selected AspenTech software and services to help implement an RTO solution for the refinery's distillation unit.

To ensure a more manageable adoption of this cutting-edge RTO technology, Petrobras chose to initially commission RTO in an open-loop format. An average of nine RTO runs were performed daily, including model adjustments for feed reconciliation and optimisation, which led to a potential daily increase in profit of up to US$ 13,000. Such a significant improvement convinced Petrobras to start deploying RTO as a closed-loop solution, and use this technology at other sites in the future.

Optimisation at REVAP Refinery
Early on in the modernisation

programme, Petrobras recognised the need to optimise the feed selection as a way to raise the heavy oil processing capacity of the refinery, while improving the quality and diversification of the product portfolio. The switch to heavier crudes allows the use of more affordable, nationally produced crudes, and reduces the dependency on lighter crudes that must be imported at a higher cost.

The optimisation accurately models operating conditions, as well as feed and product qualities, to support adjustments for feed reconciliation. The more that is known of the feed composition, the better the optimisation results. At REVAP, the initial feed composition for every RTO cycle is determined by understanding which tank is feeding the unit, and all crudes from the Petrobras Crude Assay Databank are integrated into the RTO system.

Modeling solution for optimisation
Petrobras worked closely with AspenTech to implement the project, using aspenONE and the Aspen Plus Optimizer as the primary tool due to its power, flexibility, and ability to enable Equation Oriented (EO) optimisation for complex integrated processes. The

RTO model comprises 38 independent variables, all of the constraints from the Advanced Control system, plus other critical constraints. EO-based technology delivers the performance required for proper feed reconciliation and optimisation. More importantly, the RTO system is indicating a potential increase of profitability by up to US $ 13,000 per day by adjusting the unit to process an adequate crude slate and meet all the flow and quality requirements for the products. Closing the loop in the next phase is expected to capture these benefits and also 'extend' them across the refinery.

RTO in Petrobras
This project confirmed the value of using EO technology in RTO applications, and supports Petrobras' strategy of leveraging RTO to improve operations and profitability. In addition to the results achieved in open loop optimisation, RTO also benefitted other areas, including variables and parameter monitoring, operational analysis and troubleshooting, and evaluation of crudes and scenarios. Furthermore, the use of models in refining operations enhances collaboration among Process Engineering, Planning, Automation, IT, Instrumentation, Laboratory, and Production, thereby improving overall efficiency at the REVAP refinery. ᴛꜱᴇ