

Refining & Petrochemicals Middle East delves below the corporate strategy to understand what really makes the industry's leaders tick

BRINGING THE POWER OF INDUSTRIAL ARTIFICIAL INTELLIGENCE TO THE CHEMICAL INDUSTRY



Many companies feel overwhelmed by the discussion of digital technologies, especially artificial intelligence

Leaders often wonder, where do we apply digital technologies to the challenges in our business? How can we chart our success? This uncertainty is understandable considering the technology's complexity and rapid evolution, but understanding and integrating artificial intelligence (AI) is increasingly critical to competitiveness in the chemical industry.

Aspen Technology is meeting this need by embedding AI capability throughout its asset optimisation portfolio. Incorporating AI into existing operating technology (OT) and information technology (IT) enables easier adoption, and when combined with domain expertise in the chemical industry, brings new levels of asset performance. Industrial AI is the term used to describe this application to industrial challenges, but considering Aspen Technology's four decades of domain expertise in chemicals and energy, we are uniquely qualified to deliver Industrial AI solutions.

Aspen Hybrid Models are at the centre of these capabilities, which combine AI with first-principle model design and domain expertise. Engineers can now build enriched process models faster using machine learning to leverage simulation, or plant data, integrating application knowledge including first principles and engineering constraints, without requiring deep process, or AI expertise. These hybrid models can be



Paige Morse, chemicals industry lead at Aspen Technology.

used to optimise operations, create soft sensors (such as colour, or viscosity), design new equipment, or integrate asset-wide processes such as crude-to-chemicals.

Many customers are working with these new technologies from Aspen Technology in a variety of chemical processes, from bulk to specialty chemicals, and for polymers. Hybrid models can also be applied to develop virtual sensors like colour, or stiffness that are key indicators of product quality but cannot be predicted from first principles.

A multinational energy and petrochemicals company has already implemented Aspen Hybrid Models to reduce the grade transition time in their plastics production. The customer created a reactor model to determine key performance properties (melt flow index and density) and was able to lower the time between low density polyethylene (LDPE) grade transitions by 50%. The company reduced waste and boosted productivity for an estimated annual savings above \$700,000.

Hybrid models can also be applied to challenging processes and equipment, including solvent extraction, membranes, and extruders. For all of these applications, better understanding how process conditions influence product quality can help engineers predict emissions and reduce waste – insight that can help companies progress to achieving sustainability targets.

AI can also enhance advanced process control (APC) technology, making it easier to use APC across a broader range of scenarios. Embedding AI gives operators in-context assistance, using large quantities of collected data to provide insight to better reflect actual operations and augment future operations. This capability allows companies to execute APC model tuning more quickly and with less expertise, reducing the engineering support required.

The diversity and complexity of chemical processes have limited the application of APC because of the effort required – AI assist lowers that barrier so more chemical manufacturing operations can take advantage of this valuable technology. For the first time, APC can now be employed on batch processes to enable closed-loop control to boost quality and productivity, while limiting the need for manual intervention.

When combined with the online monitoring capabilities of multi-variate analysis, Aspen Technology now provides a holistic platform to boost the profitability of specialty chemical producers with a range of technology solutions to be deployed based on customer preference and capability.

With these capabilities, we are enabling our customers to take their first step toward the self-optimising plant, progressing toward operations where human and autonomous decision-making work in tandem to achieve the most profitable and sustainability-focused outcome. Building in this capability will also enable companies to more effectively respond to market changes and reposition for new opportunities demanded by the circular economy.

This is a journey for all of us – one we must take as our markets evolve and stakeholders demand new approaches to address global environmental issues. [RPM](#)

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