DUPONT

DuPont Uses AI-Driven Aspen Hybrid Models™ to Improve Polymer Quality by 10%

aspentech | Case Study

"Aspen Hybrid Models is a powerful tool for quickly developing a model using plant data; once deployed, the models can be used with little to no Aspen Plus® experience."

– Zafir Zaman, PhD, Process & Simulation Consultant, DuPont Electronics & Industrial

CHALLENGE

DuPont's operators lacked reliable inline viscosity measurements and had no systematic way to account for raw material variability, resulting in frequent reactive adjustments and difficulty maintaining product quality within target conditions.

SOLUTION

Design engineers used Aspen Hybrid Models and Aspen Plus to combine first-principles simulation with plant data and AI-driven modeling, developing an inferential viscosity sensor and a raw-material variability model that delivers real-time quality estimates and proactive operating guidance.

VALUE CREATED

- Real-time visibility and predictive guidance for viscosity control
- Improved product consistency with a 10% reduction in viscosity deviation from target

Tackling Process Variability and Measurement Issues

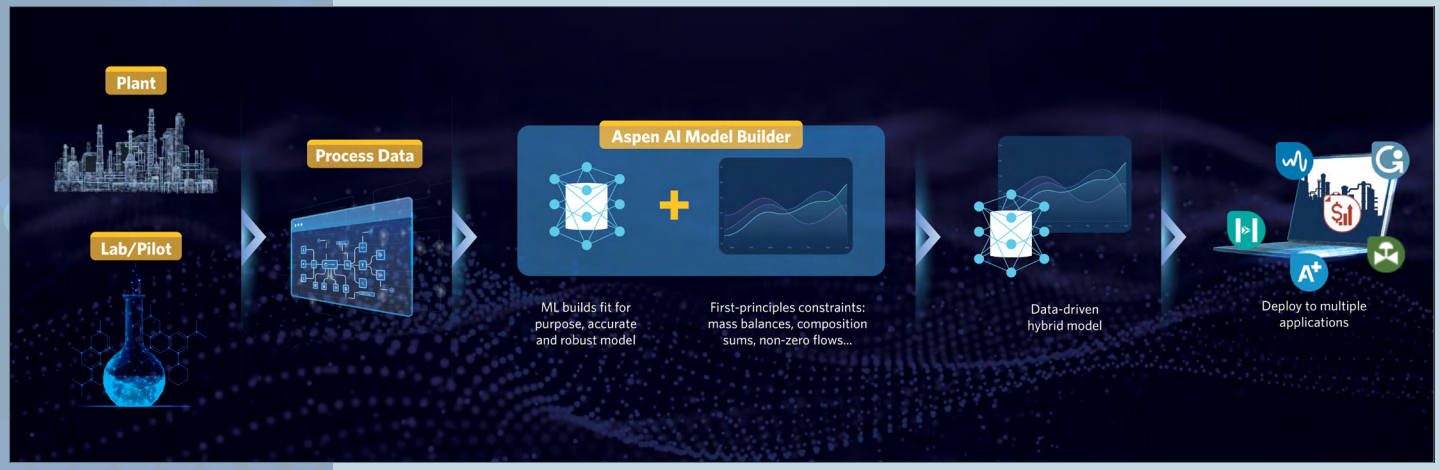
DuPont, a global leader in advanced materials and high-performance polymers, has long served industries such as automotive, electronics and healthcare. A polymer production facility in **DuPont's Electronics & Industrial business**, now part of Qnity Electronics Inc., faced recurring quality challenges that required frequent, unplanned process adjustments to meet key performance indicators (KPIs). To address this, the production team implemented a proactive strategy to reduce variability and deliver more consistent product quality.

Process engineers identified two core issues impacting product quality:

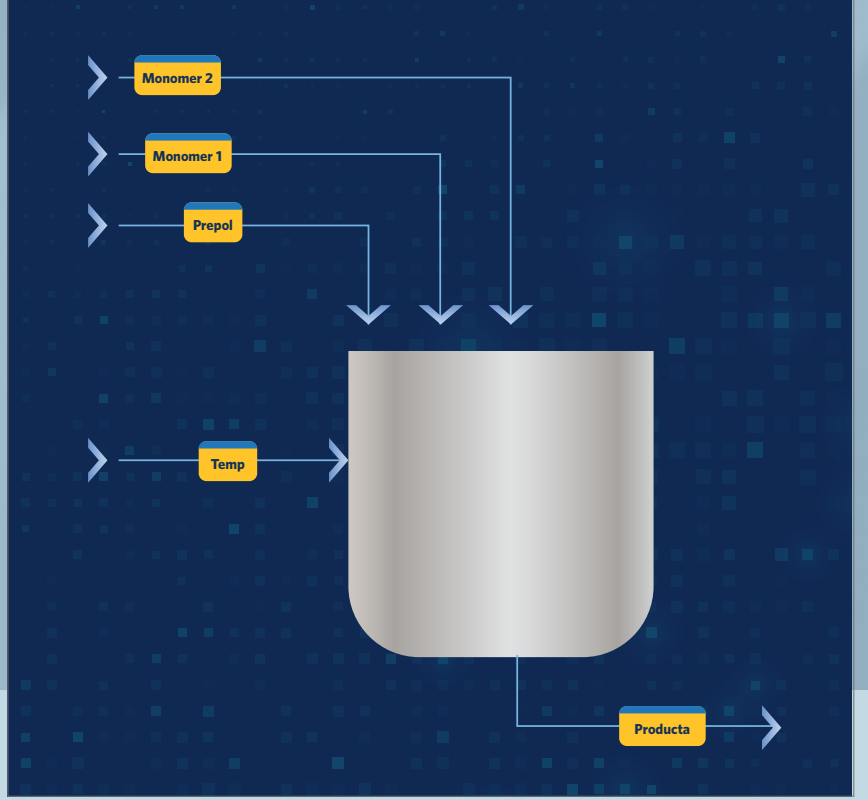
- **Unreliable inline viscosity measurements**, creating viscosity control challenges and occasionally triggering false excursions
- **Raw material variability**, with no systematic method for determining how to adjust the process when feed properties shifted

To overcome these challenges, DuPont turned to hybrid modeling—a combination of first-principles simulation, Industrial AI and plant data. This approach enabled rapid development of rigorous models, providing operators with actionable, real-time guidance to make timely, data-driven process decisions.

Building Models from Plant Data Using Industrial AI



AI-driven hybrid models leverage plant data and machine learning to accelerate model development for complex processes.
Source: AspenTech.



Batch model developed with Aspen Plus to enhance understanding of raw material impact on polymer quality. Source: DuPont.

Using Hybrid Models to Enhance Batch Process Control

Creating a soft sensor for timely insights

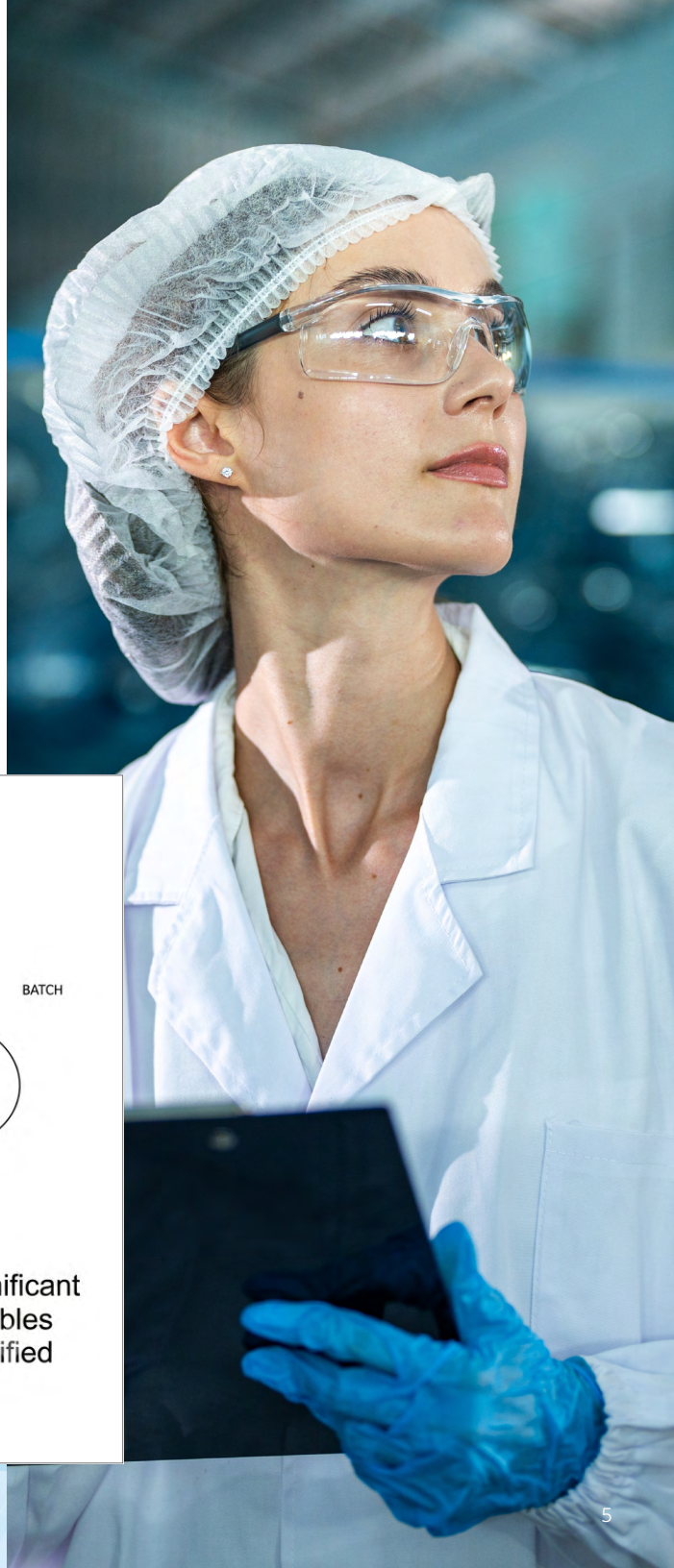
DuPont's engineering team developed an inferential viscosity sensor for a continuously stirred tank reactor (CSTR) using plant data and Aspen Hybrid Models. Conventional viscosity measurements were unreliable or required significant lab time, making the soft sensor essential for providing operators with timely, dependable insight into product quality during production. Using **Aspen AI Model Builder**™, the team imported nine historical datasets, including operating variables such as flow rates and reactor temperatures.

The software helped identify the variables with the greatest influence on viscosity and guided data conditioning, enabling efficient development and evaluation of multiple hybrid model candidates. The model that provided the best balance of accuracy and usability was selected, allowing operators to apply it confidently without requiring deep Aspen Plus expertise.

Modeling raw material variability

To assess the impact of raw material variability, the team developed a hybrid model using historical plant data, including flow rate, pH and UV absorbance. The model captured seven input streams and one output stream for the CSTR. Aspen AI Model Builder screened twenty-five candidate parameters and identified the ten most influential variables affecting the three polymer KPIs: pH, viscosity and absorbance.

The team incorporated an optimization block to evaluate multiple operating variables at once, allowing engineers to quickly test feasible adjustments and identify conditions that would best maintain product quality. After validation against laboratory data, the model was deployed in Aspen Plus, where it now provides proactive recommendations for process adjustments and supports corrective actions when raw material properties trend off-spec.



Model Reduction to Significant Variables and Export Model to Aspen Plus

Variable importance plots indicating ten significant raw materials' properties driving polymer quality. Source: DuPont.

Expanding Hybrid Model Use in Production

DuPont found Aspen Hybrid Models to be an effective way to rapidly develop models that support routine production decisions. The inferential sensor model has already delivered value by identifying instrumentation drift, improving confidence in viscosity measurements and reducing false alarms. The engineering team is preparing to integrate this model into the Distributed Control System (DCS), where it can contribute to advanced control logic and automated adjustments.

Understanding Raw Material Impact on Polymer Quality

The raw materials hybrid model has delivered measurable improvement by eliminating a 10% deviation between actual and target viscosity, and providing operators with clear recommendations when feed properties change. These capabilities reduce reactive interventions and contribute to more stable, predictable operation.

Looking ahead, DuPont plans to extend the use of hybrid models across additional polymer lines. Together, these models give the plant a practical, data driven method for applying AI in production environments—improving operational control, reducing off spec waste and lowering production costs.

About Aspen Technology

Aspen Technology, now part of Emerson, is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in asset-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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