Specialty Chemicals Producer Reduces Off-Spec Product With Aspen ProMV®

"Aspen ProMV does in hours and days what other solutions would take weeks or months to accomplish during analysis and modeling."

Reduced impurity level to

historical low of 0.02%

CHALLENGE

Reduce the level of impurities that cause product quality issues in downstream production units.

SOLUTION

Aspen ProMV software enabled the producer to perform extensive analysis and modeling to discover the root cause of the issue, reduce impurities and improve efficiency.

VALUE CREATED

- Reduced level of impurity 1,1-DPE below the historical low, from 0.05% to 0.02%

- Improved product yield

- Increased production and minimized lost revenue from waste

- Reduced energy consumption

Overview: Product Impurities Slow Downstream Production

In early 2022, a leading global producer of catalyst solutions and specialty chemicals faced a significant challenge as a result of light impurities causing product quality issues in its downstream production units. These products are used across a wide range of industries, including pharmaceuticals, water treatment, agriculture, electronics, refining and paper.

The company's process engineering team decided to conduct a trial on two plants using Aspen ProMV, AspenTech's industry-leading process quality analytics solution. They selected Aspen ProMV for its fast time to value—specifically its ability to perform analysis and modeling in a matter of hours and days, compared to weeks and months for competing solutions. In addition, because the company had an existing implementation of AspenTech's Batch APC solution, Aspen ProMV aligned well, as they share a common product ecosystem.

Aspen ProMV Identifies Root Cause of High Contaminant Levels

The main challenge for the producer was the presence of unwanted levels of light impurities—like 1,1-Diphenylethylene (DPE)—which were affecting product yield and quality. Off-spec product was leading to increased waste and lower operating margins. To determine the root cause of the contaminant levels, the company created two models for detailed analysis of the production variables.

The first PLS model consisted of approximately 20 variables focused on the conditions around the reactor, including phase times, quality of feed/solvent, temperature, pressure and reactant charges. This initial offline model enabled the team to perform efficient multivariate analysis of historical data to identify critical factors for reactor performance.

A second PLS model was deployed online, tracking in real time approximately 75 variables related to column feed, temperature and pressure. With Aspen ProMV, the producer was able to quickly sort through nearly 100 variables in the production process and identify two that were predominantly responsible for degradation.

Analysis by Aspen ProMV indicated that, while the temperature of the solvent recovery column played a significant role in the high contaminant levels and degradation, the concentration of ethylbenzene in the recovered solvent being fed back to the reactor was the root cause of the issue and responsible for lower product yield and quality.

The producer discovered that ethylbenzene existed in the solvent recycle loop, and as more was being recycled to the reactor, the generation of impurity 1,1-DPE was increasing. This had not been previously considered or investigated until the correlation was identified. As a result of this additional finding enabled by Aspen ProMV, the company implemented two new best practices:

- Reduce the lower-limit temperature of the solvent recovery column to minimize the concentration of ethylbenzene overhead.

- Build online monitoring tools for the distillation train to detect higher concentrations of ethylbenzene and other impurities.

Goals Achieved, Positive Results From the AspenTech Trial

The bottom line: Aspen ProMV reduced the level of impurity 1,1-DPE below the historical low—from 0.05% to 0.02%—resulting in improved operational efficiency and greater accuracy in predicting impurities. This ultimately improved yield and minimized waste.

Future Aspen ProMV Deployments Being Considered

Looking ahead, the producer plans to use Aspen ProMV to develop inferential models for its bromine extraction and separation process. There is also an opportunity to leverage online model monitoring, so that the model will trigger an alert when column conditions indicate elevated ethylbenzene and 1,1-DPE concentration.

AspenTech's solutions and expertise are developing capabilities that will enable the specialty chemical leader to stay ahead of the competition and continue delivering value to customers.

About Aspen Technology

Aspen Technology, Inc. (NASDAQ: AZPN) 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 life-cycle. 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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