



CUSTOMER CASE STUDY

Covestro makes polymer production more sustainable using flexible process simulation tools

Covestro - www.covestro.com
Industry - Chemicals

Challenges

- Achieve net-zero scope 1 & 2 emissions by 2035 by creating less energy-intensive processes, using climate-neutral steam, and enabling recycling.
- Engineer, test, commercialize, and scale recycled or bio-based polymers.
- Model complex, evolving thermodynamic and solid processes to determine the technical and economic feasibility of circular polymers.

Solution

- By leveraging its existing AVEVA™ Process Simulation solution and bank of process models, Covestro can rapidly build and iterate models to assess the commercial and technical viability of new process candidates.

Results

- Simulating processes to move swiftly from concept to trial phase in green polymer production.
- Establishing a viable approach to sustainable polymer production.
- Enabling a cost-effective way to test many different scenarios.
- Creating less energy-intensive chemical processes.
- Saving time, reducing errors, and decreasing engineering effort thanks to an intuitive user interface and open architecture.

Found in everything from Silly Putty to plumbing sealants to spray foam insulation, polymers have become integral to modern life, though we may not always realize it. We depend on these synthetic materials to ensure our homes stay warm, our cars stay safe, and our appliances run as efficiently as possible. For Covestro, a global leader in polymers, the question of energy efficiency—both in terms of polymer production and application—looms large.

After all, Covestro's polymers contribute to the energy efficiency of everyday products and processes. Covestro's flagship Cold Chain polymer, for example, better insulates food in transit, thereby hardening critical supply chains and decreasing the energy burden that refrigerating food in transit incurs. But Covestro's commitment to sustainability does not end with the products it supplies.

The multinational has adopted a set of ambitious goals. Covestro has pledged to achieve Scope 1 & 2 net-zero emissions by 2035—a bold target that positions the polymers producer as a sustainability leader in the industry.

To meet this goal, Covestro has worked to innovate new, efficient ways to close energy and material cycles in polymer production. It is working to reinvent and redesign chemical processes towards circularity, to enable materials recycling and reduce energy consumption and emissions. Moreover, Covestro is designing revolutionary green polymers using renewable, biology-based raw materials.



While many industrial companies have looked to mitigate their environmental footprint, what Covestro has undertaken is a taller order still. Short of simply tracking and reducing its CO2 emissions, Covestro's goal of creating new, sustainable processes requires rigorous modeling to determine the economic and technical feasibility of its end product.

"Our goal is to find more sustainable processes for more sustainable products. The challenge we're facing is we have a lot of ideas and possibilities that can move us toward these goals. We need a tool to quickly and efficiently assess how real the impact of a new process will be, economically, technically, and in terms of environmental impact."

-

Franz Kirchhoff

Head of Process Modeling and Conceptual Design, Covestro

Simulating processes for sustainable engineering

As Covestro works to participate fully in the burgeoning circular economy, its experienced team of engineers has no shortage of hurdles to clear. Not only do they need to find less energy-intensive processes—undertaken at lower temperatures and pressures than historically possible—for polymer production, but they also need to expand their scope to include recyclable materials and bioprocesses.

Advanced and new processes like these are notoriously difficult to model, as they require aggregating complex and evolving thermodynamics and solid processing steps.

Covestro already uses AVEVA Process Simulation for its established processes. The solution's flexibility allows Covestro's teams to reuse existing sub-models and knowledge to create the new models they need.

In its quest to innovate a circular, sustainable polymer, for example, Covestro's engineers are often working with the same molecules and materials they use in their existing processes. AVEVA Process Simulation allows them to migrate their existing knowledge of thermodynamic properties into the solution.

Owing to the solution's easy-to-customize tools, Covestro's engineers can quickly model new processes without having to build a model from scratch, giving them a valuable edge in the race for rapid development and deployment.

“An extremely valuable feature of AVEVA Process Simulation is the ability to add flow-sheet equations easily. This allows us to model our process in a very flexible and customizable way.”

-
Jannik Burre
Process Simulation Expert, Covestro



Open architecture enables rapid optioneering

Covestro's teams especially like the built-in Python scripting, as it enables them to quickly do grid searches on parameter spaces, like temperature and pressure, as well as connect data from other corporate systems to the inputs and results.

By leveraging AVEVA Process Simulation's open architecture, Covestro's teams easily complete sensitivity analyses for each new variant. With Microsoft Excel and Python scripting integrations, they can easily export the results from their models and generate the mass and energy balances they need for each stage of the project, and, because all three tools are connected, it's easy to update these outputs.

This integrated approach eliminates the errors and effort that Covestro's teams would otherwise spend on copying and pasting values and manual data entry, which saves valuable time in the company's race to market.

“Thanks to the Excel and Python interfaces in AVEVA Process Simulation, it's quite easy to generate mass and energy balances documents for our circular economy projects, and it's straightforward to update them to different scales when needed.”

-
Maria Sofia Palagonia
Process Simulation Expert, Covestro

Rapid innovation and scaling in the circular economy

As the circular economy continues to develop at breakneck speed, enterprises in the chemicals, oil and gas, and related industries are looking to gain market share quickly. The flexibility, agility, and scalability that process simulation tools can deliver are often key to gaining an early competitive edge.

For Covestro, the task is not simply to determine if its new green polymer meets the desired specifications. The project's success hinges on Covestro's ability to produce the polymer at scale. AVEVA Process Simulation allows Covestro to model and predict the new polymer's production feasibility from environmental, technological, and economic standpoints.

“We have a really close development partnership with AVEVA. This relationship is integral to our mission. Unlike some other solutions that are cold and static, together, we make AVEVA Process Simulation a living software that evolves as new needs arise.”

-
Stefanie Gerlich
Process Simulation Expert, Covestro



Looking forward

Covestro continues to fine-tune its novel processes, with an eye toward product development in the near future. To date, the chemicals leader has achieved admirable progress toward its goal. Powered by simulations Covestro performed using AVEVA Process Simulation, it has successfully established several laboratory and pilot-scale testing facilities to validate its predictions. Covestro's testing plant has successfully run the different steps of the process, from reaction and phase separation through to distillation, demonstrating the technical feasibility of the new polymer production processes.

For more information about AVEVA, please visit: [aveva.com](https://www.aveva.com)