

Process modeling tool for steady-state simulation, design, performance monitoring, optimization and business planning for chemicals, specialty chemicals, petrochemicals and metallurgy industries.

The Challenge: Understanding and Predicting Process Behavior

The chemical process industries are faced with an increasingly competitive environment, ever-changing market conditions, and government regulations; yet they still must increase productivity and profitability. Bottom line performance can be adversely affected by many factors, such as production economies and product quality. Many of these factors are extremely complex and subject to varying degrees of unpredictability.

Process engineers routinely address these difficult issues. They are faced with challenges that range from the designing new processes to evaluating and improving performance of existing plants while they address these business objectives. Experience alone is not always sufficient to answer the questions that continually arise – and ‘trial and error’ efforts to provide meaningful insight are costly and potentially dangerous. To avoid production delays, downtime or off-spec product, process manufacturers require cost-effective tools that help identify and ‘correct’ anticipated problems before they occur.

The Opportunity: Maximizing Plant Performance and Enhancing Profitability

Fundamental to improving performance of the plant or enterprise, or even the extended supply chain, is an accurate representation of the basic processes. Companies need a product that will enable them to develop that information and then build the models required to optimize enterprise performance. Steady-state simulation is a powerful process engineering tool that enables engineers to simulate plant behavior and analyze their results rapidly – exploiting the latest software and engineering technology to optimize plant performance and profitability.

The Solution: Aspen Plus

Aspen Plus solves the critical engineering and operating problems that arise throughout the lifecycle of a chemical process, such as designing a new process, troubleshooting a process unit or optimizing operations of a full process like an Acrylic Acid plant. The process simulation capabilities of Aspen Plus enables engineers to predict the behavior of a process using basic engineering relationships such as mass and energy balances, phase and chemical equilibrium, and reaction kinetics. With reliable thermodynamic data, realistic operating conditions and the rigorous Aspen Plus equipment models, they can simulate actual plant behavior.



Benefits Offered by Aspen Plus

Aspen Plus has a proven track record of providing the chemical process industries with substantial economic benefits throughout the manufacturing lifecycle of a process, from R&D through engineering and into production. It brings the power of steady-state process simulation to the engineering desktop, and delivers both modeling power and ease of use. With Aspen Plus, companies can design, simulate, troubleshoot and manage profitable process plants. For example:

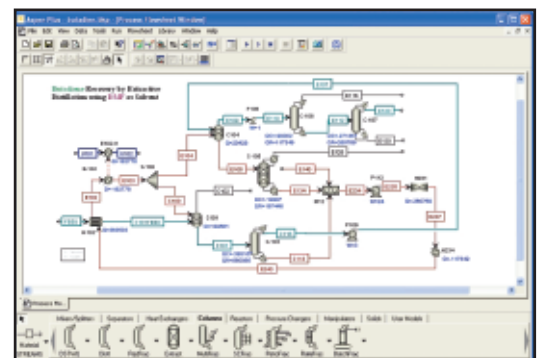
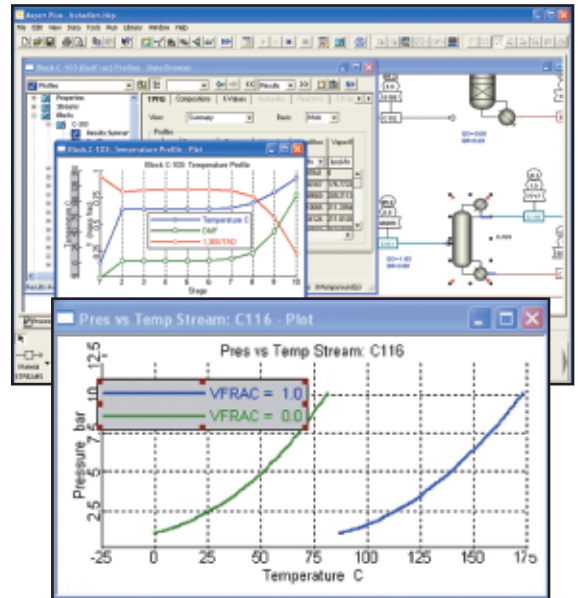
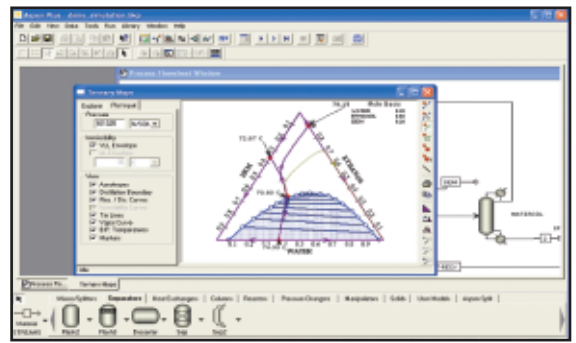
- The R&D group has come up with a new process for manufacturing a commodity chemical. They have detailed physical and thermodynamic property data and have had successful pilot plant operations. **How do you evaluate the commercial feasibility of using this process?**
- The main process line has recently come up after a turnaround during which several de-bottlenecking operations were performed. However, the results are falling short of design. **How do you explore the impact of key operating variables upon operation of the process line to see what can be done to improve performance?**

Aspen Plus Features

Aspen Plus is a component of the Aspen Engineering Suite™ (AES), an integrated set of products designed specifically to promote best engineering practices and to optimize and automate the entire innovation and engineering workflow process throughout your plant and across your enterprise. Automatically integrate process models with your engineering knowledge databases, investment analyses, production optimization and numerous other business processes.

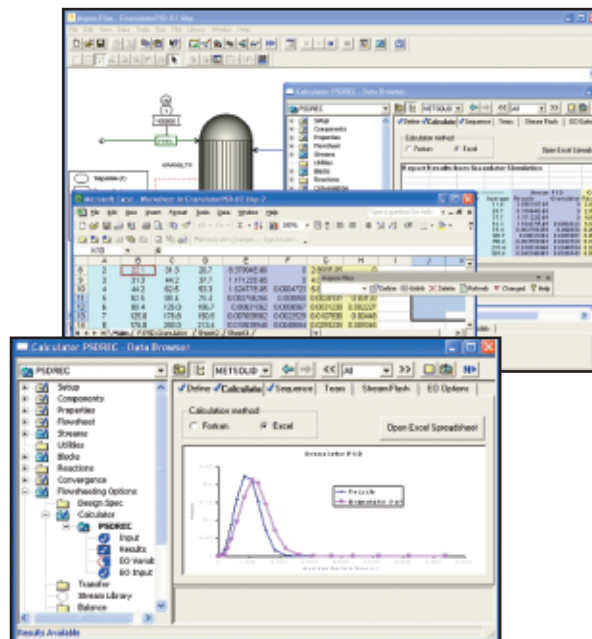
Aspen Plus contains data, physical properties, unit operation models, built-in defaults, reports and other features and capabilities developed for specific industrial applications, such as electrolyte simulation. Key Aspen Plus features are listed below:

- **Windows® Interoperability.** Interface contains a process flowsheet view for graphical layout, data browser view for entering data, the patented Next expert guidance system to guide the user through a complete and consistent definition of the process flowsheet.
- **Plot Wizard.** Enables the user to easily create plots of simulation results.
- **Flowsheet Hierarchy and Templates.** Collaborative engineering is supported through hierarchy blocks that allow sub-flowsheets of greater detail to be encapsulated in a single high-level block. These hierarchy blocks can be saved as flowsheet templates in libraries.
- **Equation-Oriented Modeling.** Advanced specification management for equation-oriented model configuration and sensitivity analysis of the whole simulation or specific parts of it. The unique combination of Sequential Modular and Equation Oriented solution technology allows the user to simulate highly nested processes encountered typically in the chemical industry. Even smaller problems such as divided sump simulation of a column can be solved in a faster and more accurate manner.
- **ActiveX (OLE Automation).** Interfaces easily with programs such as Microsoft Excel® and Visual Basic®. Supports OLE features such as copy, paste or link.
- **Comprehensive Unit Operations.** Includes vapor/liquid, vapor/liquid/liquid, solid systems and user models.
- **ACM Model Export™ Option** enables user models created and compiled in Aspen Custom Modeler® (ACM) to be utilized within an Aspen Plus steady-state simulation in either Sequential Modular or Equation Oriented solution mode.
- **Thermophysical Properties.** Physical property models and data are key to generating accurate simulation results that can be used with confidence. Aspen Plus uses the extensive and proven physical property models, data and estimation methods available in Aspen Properties™, which covers a wide range of processes from simple ideal behavior to strongly non-ideal mixtures and electrolytes. The built-in database contains parameters for more than 8,500 components, covering organic, inorganic, aqueous, and



salt species and more than 37,000 sets of binary interaction parameters for 4,000 binary mixtures. The binary interaction parameters were determined using data obtained from the Dortmund Databank, licensed from DECHEMA.

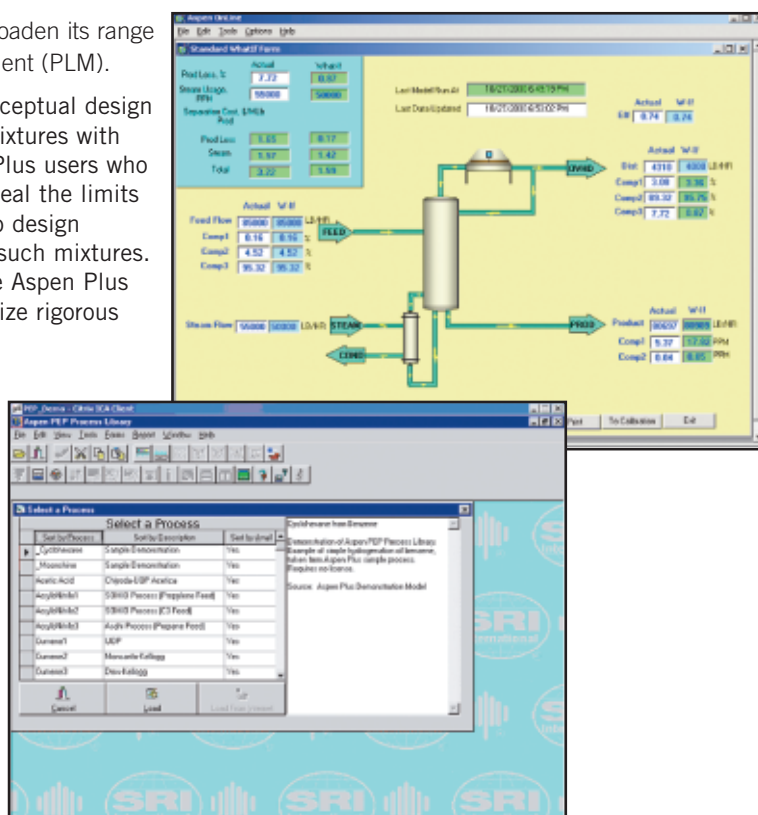
- **Convergence Analysis** to automatically analyze and suggest optimal tear streams, flowsheet convergence method and solution sequence for even the largest flowsheets with multiple stream and information recycles.
- **Calculator Models** including in-line FORTRAN and Microsoft Excel model interface for ad-hoc calculations.
- **Sensitivity Analysis** to conveniently generate tables and plots showing how process performance varies with changes to selected equipment specifications and operating conditions.
- **Case Study Feature** to run multiple simulations with different input for comparison and analysis.
- **Design Specification** capabilities to automatically calculate operating conditions or equipment parameters to meet specified performance targets.
- **Data-Fit** to fit process model to actual plant data and ensure an accurate, validated representation of the actual plant.
- **Determine Plant Operating Conditions** that will maximize any objective function specified, including process yields, energy usage, stream purities and process economics.
- **Open environment** to easily incorporate proprietary in-house or third-party technology. These may be created using Microsoft Excel®, FORTRAN or Aspen Custom Modeler®. Aspen Plus supports industry standards, such as CAPE-OPEN and IK-CAPE. AspenTech is an Associate Member of the CAPE-OPEN Laboratories Network (CO-LaN).
- **Detailed Heat Exchanger Design and Rating**
HeatX enables Aspen Plus to interface to:
 - TASC™/Aspen Hetran™ the Aspen B-JAC™ and HTFS thermal design programs for shell & tube, multitude, and double pipe heat exchangers.
 - ACOL™/Aspen Aerotran™ the Aspen B-JAC and HTFS thermal design programs for air cooled heat exchangers.



Aspen Plus Options

The following options are available with Aspen Plus to broaden its range of applications and enhance Process Lifecycle Management (PLM).

- **Aspen Split™ Option** is AspenTech's tool for the conceptual design of distillation schemes for separation of chemical mixtures with non-ideal vapor liquid equilibrium behavior. Aspen Plus users who have licenses for Aspen Split can use the tool to reveal the limits of feasible separations for individual columns and to design advanced distillation schemes for the separation of such mixtures. The Split Conceptual Design tool can be used in the Aspen Plus flowsheeting environment and can seamlessly initialize rigorous column simulations with its design results.
- **Aspen OLI Interface™** enables Aspen Plus their simulation power with the extensive OLI databank and thermophysical properties for more than 3,000 organic and inorganic electrolytic species.
- **Aspen OnLine® Option** allows Aspen Plus models to be connected to, and driven by, real plant data. It enables users to leverage engineering knowledge gained from process models into the plant operations environment.
- **Aspen PEP Process Library™ Option** provides pre-built models representing various process technologies used for a particular chemical or polymer product. These models are based upon SRIC's Process Economics Program (PEP) process descriptions and flowsheets.



- **Aspen Plus HTRI Interface™** enables Aspen Plus to interface to the Heat Transfer Research Institute (HTRI) family of heat exchange products.
- **Aspen Plus Optimizer™ Option** automatically creates profit and process optimization and data reconciliation of large-scale Aspen Plus models based on weighted, user-defined objectives. It provides robust convergence for real-time solutions with models complex enough to address true unit economics and supports Web delivery, so plant engineers can maximize profits through continuous process optimization.
- **Aspen Plus SPYRO Equation Oriented Interface™** enables Aspen Plus to use the SPYRO Ethylene cracking model from Technip. The equation-oriented capabilities of Aspen Plus and the ethylene cracking expertise of Technip enables engineers to create highly accurate ethylene plant models that are suited for real-time optimization, resulting in increased operating margins.
- **Aspen Plus TSWEET Interface™** provides Aspen Plus access to the physical property models in TSWEET® from Bryan Research and Engineering (BR&E).

The Goal: Optimal Process Designs

Aspen Plus, as the de facto standard in the chemical industry, has a proven track record of providing substantial economic benefits throughout the chemical processing lifecycle, from R&D through engineering and into production. It brings the power of steady-state process simulation to the engineering desktop, and delivers a powerful combination of modeling power and ease of use. With Aspen Plus, companies can design, simulate, troubleshoot and manage profitable process plants - enabling them to optimize plant performance and profitability.

AspenTech: A Tradition of Innovation

AspenTech's proven, integrated software and rapid implementation services enhance the efficiency and profitability of process companies. Our engineering software optimizes process designs to maximize lifecycle returns, and our manufacturing/supply chain software harmonizes production, inventory, demand, and delivery to improve operating margins. Together, these offerings create an integrated solution – enterprise operations management (EOM) – that transforms enterprise-wide operating performance.



[world wide web] www.aspentech.com

worldwide headquarters

Aspen Technology, Inc.

Ten Canal Park
Cambridge, MA 02141-2201 USA

[phone] +1 617 949 1000
[fax] +1 617 949 1030
[e-mail] info@aspentech.com

houston office

Aspen Technology, Inc.

1293 Eldridge Parkway
Houston, TX 77077 USA

[phone] +1 281 584 1000
[fax] +1 281 584 4329
[e-mail] info@aspentech.com

europa/middle east/africa headquarters

AspenTech Europe SA/NV

Avenue Reine Astrid 92
1310 La Hulpe BELGIUM

[phone] +32 2 701 94 50
[fax] +32 2 701 95 00
[e-mail] ATE_info@aspentech.com

asia headquarters

AspenTech, Inc.

371 Beach Road
#23-00 KeyPoint
Singapore 199597

[phone] +65 395 3900
[fax] +65 395 3950
[e-mail] info@aspentech.com

japan headquarters

AspenTech Japan Co., Ltd.

Kojimachi Crystal City 10F
4-8 Kojimachi, Chiyoda-ku
Tokyo 102-0083 JAPAN

[phone] +81 (0) 3 3262 1710
[fax] +81 (0) 3 3262 1765
[e-mail] info@aspentech.co.jp

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