Process modeling tool for steady-state simulation, design, performance monitoring, optimization and business planning for oil & gas production, gas processing and petroleum refining industries.

The Challenge: Optimum Process Designs
The oil & gas production, gas processing and petroleum refining industries are faced with the need to optimize the design of processes and achieve more reliable and stable operations. The process industries must identify optimum designs quickly with minimum risk of rework while they remain competitive and maximize the business performance. Process engineers are challenged with making timely business decisions while meeting the business objectives of designing and operating efficient, safer and profitable process plants.

The Opportunity: Linking Business Objectives and Process Design
Process modeling is a powerful technology that enables managers and engineers link critical business objectives to process design, thus enabling true Process Lifecycle Management™ (PLM). The major business benefits of process modeling include:

• Usage of ‘what-if’ scenarios and sensitivity analyses to identify the optimal design based on operating and business targets
• Ensuring that process equipment is properly specified to deliver desired product throughput and specifications
• Evaluation of the effect of feed changes, upsets, and equipment downtime on process safety, reliability, and profitability
• Monitoring of equipment performance against expectations
• Assessment of equipment deficiencies such as heat exchanger fouling and column flooding by evaluating the equipment employed in different services or evaluating the consequences of a design basis change

The Solution: HYSYS
HYSYS is built upon proven technologies, with more than 25 years experience supplying process simulation tools to the oil & gas and refining industries. It provides an intuitive and interactive process modeling solution that enables engineers to create steady-state models for plant design, performance monitoring, troubleshooting, operational improvement, business planning and asset management.
Benefits Offered by HYSYS

HYSYS helps process industries improve productivity and profitability throughout the plant lifecycle. The powerful simulation and analysis tools, real-time applications and the integrated approach to the engineering solutions in HYSYS enables the companies to improve designs, optimize production and enhance decision-making. Some of the key business benefits offered by HYSYS are listed below:

Improved Process Designs

*Engineers can rapidly evaluate the most profitable, reliable and safest design*

It is estimated that on-site design changes made during commissioning constitute 7% of the capital cost of a project. HYSYS enables engineers to evaluate the impact of their design decisions earlier in the project. For new designs, HYSYS enables users to create models quickly to evaluate many scenarios. The interactive environment allows for easy ‘what-if’ studies and sensitivity analysis. The top candidates can be used to create high fidelity models, in which additional equipment and process details are included.

Equipment Performance Monitoring

*Ensure optimal equipment performance*

HYSYS allows users to determine rapidly whether equipment is performing below specification. For example, engineers troubleshooting or improving plant operations use HYSYS to assess equipment deficiencies such as heat exchanger fouling, column flooding, compressor and separation efficiencies. Engineers engaged in retrofit work can quickly evaluate equipment employed in different services or evaluate the consequences of a design basis change.

Reduced Engineering Costs

*Avoid manual and error-prone data re-entry*

Simulating with HYSYS Process reduces engineering costs by creating models that can be leveraged throughout the plant lifecycle – from conceptual design to detailed design, rating, training, and optimization providing a work environment that ensures work is completed quickly and effectively. This avoids the time consuming and error-prone manual process of transferring, formatting and analyzing production and process data that can account for up to 30% of engineering man-hours.

HYSYS Features

In order to operate with maximum effectiveness and provide the necessary insights and knowledge, a steady-state modeling tool must combine ease-of-use with robust engineering power. HYSYS is built upon proven technologies, with more than 25 years experience supplying steady-state simulation tools to the oil & gas and refining industries, and provides the following features:

- **Easy-to-Use Windows Environment.** PFDs provide a clear and concise graphical representation of the process flowsheet. Including productivity features such as cut, copy, paste, auto connection, and organizing large cases into sub-flowsheets.

- **Comprehensive Thermodynamics Foundation.** Ensures accurate calculation of physical properties, transport properties, and phase behavior for the oil & gas and refining industries. Contains an extensive component database and the ability to add user components.

- **Active X (OLE Automation) Compliance.** Permits the integration of user-created unit operations, proprietary reaction kinetic expressions, and specialized property packages. Interfaces easily with programs such as Microsoft Excel and Visual Basic.
• **Comprehensive Unit Operations.** Includes distillation, reactions, heat transfer operations, rotating equipment, and logical operations in the steady-state and dynamics environment. Proven to deliver quality realistic results and handle various situations such as vessel emptying or overflowing and reverse flow.

• **Detailed Heat Exchanger Design and Rating.** Users may optionally link to rigorous heat exchanger design and rating tools, such as TASC™ (shell and tube exchangers), MUSE™ (multi-pass exchangers) and ACOL™ (air coolers). This provides users with more rigour when needed without leaving the HYSYS environment.

• **Economic evaluation of process designs.** HYSYS simulation models can be exported to Aspen Icarus Process Evaluator™ or Aspen Icarus Project Manager™ for economic evaluation and project management of process designs. Aspen Icarus™ technology is used to perform unit operation and site-wide costing of processing equipment and facilities.

• **Front-end engineering work.** HYSYS simulation models can be exported to Aspen Zyqad™ in order to streamline the front-end engineering work process. Using Aspen Zyqad throughout this process results in increased engineering efficiency, quality and reduced project cycle time.

**HYSYS Options**

HYSYS provides maximum flexibility and power to users by using an open architecture which enables industry-specific capabilities to be easily added by AspenTech or third-party vendors. The following options are available for HYSYS to help ensure client needs are met and enhance Process Lifecycle Management (PLM).

• **ACM Model Export™ Option** enables user models created and compiled in Aspen Customer Modeler® (ACM) to be utilized within a HYSYS steady-state or dynamic simulation.

• **Aspen OnLine™ Option** allows HYSYS 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 WebModels™ Option** enables companies to publish secure, pre-configured HYSYS models via the Web. This allows plant managers, operations engineers, and financial analysts to use rigorous models to optimize operating parameters and make better business decisions.

• **HYSYS Amines™ Option** simulates and optimizes gas and liquid sweetening processes involving single, blended, or activated amines. Its tray-by-tray approach models hydrogen sulfide and carbon dioxide absorption and reaction in various industrial solvents with outstanding precision. An advanced thermodynamic Li-Mather electrolyte model achieves more reliable results than empirical models, especially for blended amines. The technology is based on the AMSIM engine from the Oilphase-DBR division of alliance partner Schlumberger.

• **HYSYS Crude Module™ Option** enables the simulation of crude oil assays and crude columns. It characterizes the hydrocarbon fluid by determining the hypothetical components that make up the oil and predicts their thermophysical and transport properties.

• **HYSYS Data Rec™ Option** enables the reconciliation of live plant data with HYSYS for on-line performance monitoring and optimization applications.
• **HYSYS Dynamics™ Option** provides a dynamic simulation capability fully integrated with the HYSYS environment, a steady-state model can be leveraged into a dynamic model which offers rigorous and high-fidelity results with a very fine level of equipment geometry and performance detail.

• **HYSYS Neural Net™ Option** enables specialized processes or operations that are difficult to simulate using first-principle models to be incorporated into HYSYS by ‘training’ them using actual plant data. Additionally, a neural net can be trained using data from a model from a HYSYS flowsheet. This closely approximates the first-principle model results, but can significantly increase the calculation speed for the simulation.

• **HYSYS OLGAS™ Option** incorporates industry-standard multiphase pipeline flow correlations within HYSYS to calculate pressure gradients, liquid holdups, and flow regimes.

• **HYSYS OLI Interface™ Option** is based on the technology developed by OLI Systems Inc., experts in aqueous chemistry. It enables analysis within HYSYS complex aqueous electrolyte systems by combining the HYSYS simulation power with the extensive OLI databank and thermophysical properties for more than 3,000 organic and inorganic electrolytic species.

• **HYSYS Optimizer™ Option** is an advanced algorithm for optimization based on sequential quadratic program (SQP) technology. It provides a tool for both design optimization and online/offline performance monitoring and optimization applications within the plant.

• **HYSYS PIPESYS™ Option** enables the accurate modeling of single and multiphase flows to design, debottleneck, and optimize pipeline systems. It can account for pipeline elevation profiles, inline equipment, pipe composition and roughness, and fluid properties.

• **HYSYS Upstream™ Option** provides industry standard methods and techniques for handling petroleum fluids and brings together the disciplines of petroleum and process engineering. Production field data can be input in an easy to use environment to create an asset wide model from the reservoir to the back end of the facility.

• **HYSYS Tacite™ Option** provides a tool for multiphase flow modeling for onshore, offshore and deep offshore environments. TACITE is a multiphase flow correlation from IFP that is validated by experimental databanks. It consists of steady-state prediction methods for pressure gradient, liquid hold-up and flow regime.
The Goal: Efficient and Profitable Process Plants

HYSYS brings steady-state simulation to the engineering desktop and superior modeling power and ease-of-use to the oil & gas and refining industries – enabling companies to design and operate more efficient, safer and more profitable process plants.

AspenTech: A Tradition of Innovation

Aspen Technology Inc.’s proven, integrated software and rapid implementation services enhance the efficiency and profitability of process companies. AspenTech’s engineering software optimizes process designs to maximize lifecycle returns. 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.