

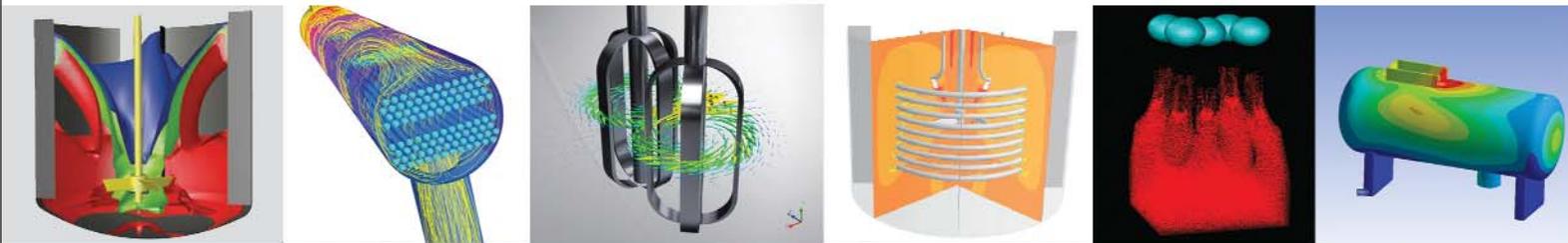


Engineering Simulation Solutions for the **chemical** Industry





With the unequalled depth and unparalleled breadth of engineering simulation solutions from ANSYS, companies in the chemical processing industry are transforming their leading-edge design concepts into innovative products and processes that work. Today, 97 of the top 100 industrial companies on the "FORTUNE Global 500" invest in engineering simulation as a key strategy to win in a globally competitive environment. They choose ANSYS as their simulation partner, deploying the world's most comprehensive multiphysics solutions to solve their complex engineering challenges. The engineered scalability of our solutions delivers the flexibility customers need, within an architecture that is adaptable to the processes and design systems of their choice. No wonder the world's most successful companies turn to ANSYS — with a track record of almost 40 years as an industry leader — for the best in engineering simulation.

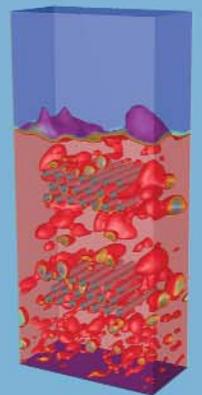


Challenges and Solutions

For more than a decade, chemical processing companies have faced high costs of raw materials, over capacity and stringent regulatory requirements. Many have responded by developing high-value products, improving efficiency and optimizing processes. Improvements and innovation have been made possible through the use of experimentation and process expertise, process engineering software and, increasingly, engineering simulation for high-fidelity and detailed understanding of process equipment and unit operations. The urgency for sustainability, green engineering, innovative new materials, plant and product safety, product quality and new process development has created great opportunities for designers and process engineers to help transform the chemical process industry to meet the challenges of the 21st century.

Virtual Prototyping *Gaining Insight*

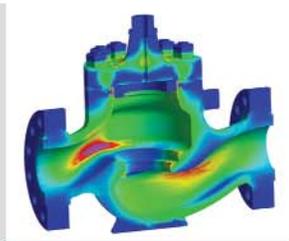
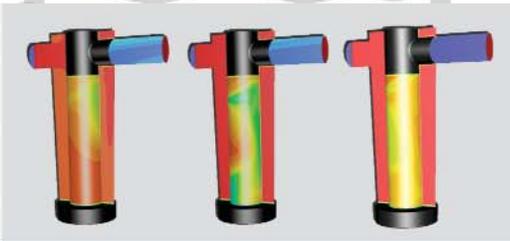
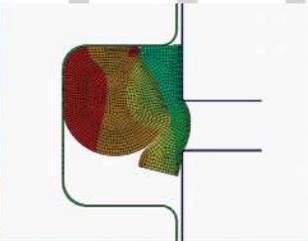
Whether developing new materials or designing new equipment, the ability to understand the performance of the equipment and optimize the process in the context of the entire plant operation is at the heart of process engineering. The ability to design unit processes and equipment to mix, separate, heat, distill, combust, react, store, package, pump or control significantly impacts the quality, process yield and business viability of the final product. ANSYS offers integrated engineering design and analysis solutions for process engineers and equipment designers who need to model and understand mechanical, structural, thermal, fluid dynamic and electromagnetic behavior, as well as multiphysics interactions such as thermal-mechanical, fluid-structural or electro-mechanical. Simulation-driven product and process development from ANSYS enables engineers to gain insight with a higher degree of fidelity for designing new products, reducing downtime, troubleshooting, increasing capacity and improving process efficiency.



Upfront Engineering *Gaining Efficiency*

Improvements and changes to the operation of process equipment can be costly. Upfront engineering enables chemical and process equipment manufacturing companies to evaluate product performance. For example, for off-design conditions, engineers can understand the process impact and evaluate return on investment (ROI) earlier in the design process with a higher degree of confidence. It is also possible to expand the life of equipment, examine the fit for service, reduce maintenance costs and delay shut downs by better understanding vibration, heat, erosion, fatigue and structural performance-related effects. To gain equipment efficiency, innovative companies use simulation engineering tools from ANSYS for upfront engineering. The applications cover a broad range of engineering design and operation cycles including initial equipment design, repairs or improvements, throughput increases, scale up or scale down, maintenance and/or retrofits, fitness-to-serve evaluation and assistance with meeting regulatory requirements.

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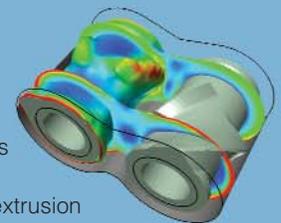
“At Bayer, we are dealing with many different kinds of fluid flows: gases, liquids, highly viscous and non-Newtonian polymers, and multiphase and chemically reacting flows. Computational fluid dynamics helps greatly in understanding and optimizing all of these states.

Depending on the nature of the task and the media, we decide which product is best suited. While POLYFLOW is the superior code for viscoelastic polymers and their flow in twin screw extruders, FLUENT is our all-purpose tool for the whole range of Reynolds numbers from highly viscous flows of shear-thinning fluids up to fully developed turbulent flows.”

Dr.-Ing. T. Ehret
Bayer AG, Germany

Advanced Technology *Simulate with Confidence*

Process and chemical industry applications cover a broad range of applications involving complex geometries and physics. ANSYS fluid dynamics, structural mechanics and electromagnetics technologies combined with customized tools for mixing and polymer processing cover a broad spectrum of applications involving composites, seals, rotating equipment, extrusion and single-phase and multiphase flows with heat transfer and reactions. For equipment and reactor design, ANSYS fluid dynamics tools offer solutions for mixing, liquid phase reaction, combustion, surface reaction, multispecies flows, heat transfer, particulate and population balance, and other processes. For more than 20 years, ANSYS has continually committed to and made investments in process industry-related features and capabilities. You can be confident that solutions from ANSYS have the most advanced capabilities and are supported by experienced technical staff that understands chemical and process industry-related issues.

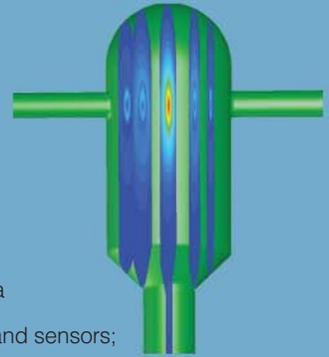


Energy and Environmental Efficiency *Evaluating New Technologies*

Chemical companies take environmental impact and energy concerns seriously. Concepts for improving combustion systems, reducing steam and energy usage greenhouse gases, and pollutant separation are capital-intensive investments. With the global emphasis on emissions and energy efficiency, engineering simulation solutions from ANSYS have proven to be valuable tools in evaluating various retrofit and pollution reduction scenarios, waste-heat treatment strategies and upfront cost estimations for decision making. For example, simulations add value by enabling detailed modeling; that can provide insight into combustion systems; equipment design to prevent leaks; ways to control and avoid spills; and plant safety, including fire, and gas and pollutant dispersion.

Capabilities

- ▶ **Structural Tools:** static; dynamic; explicit; vibration; deflection; buckling; thermal; contact; rotor dynamics; creep
- ▶ **Fluid Simulation Features:** thermal and fluid flow; single and multiphase flows with chemical reactions; multi-fluid interaction; solid-fluid interaction; phase change; viscoelasticity; population balance
- ▶ **Fluid Structure Interaction:** analyzes changes in fluid behavior affecting a structure and vice versa
- ▶ **Electronic and Electromagnetic Capabilities:** electromechanical systems; monitoring equipment and sensors; control electronics, motors, generators and instrumentation
- ▶ **Multiphysics:** fully integrated coupling of thermal, fluid, structural and electromagnetic physics
- ▶ **Specialized Tools:** ANSYS® POLYFLOW® for analysis of polymer processing, glass forming and other materials processing applications; ANSYS® BladeModeler™ for the rapid 3-D design of rotating machinery components



burners • combustion • conveyors and elevators • crystallizers •
dust collection • evaporators • extruders • fans and compressors •
filtration • furnaces • gas dispersion • **chemical** •
hazard assessment • materials processing • mist elimination •
mixers and blenders • polymer processing • pumps • scrubbers •
seals • sedimentation devices • static mixers • structured packing
• tanks and storage • water treatment

About ANSYS, Inc.

ANSYS, Inc., founded in 1970, develops and globally markets engineering simulation software and technologies widely used by engineers and designers across a broad spectrum of industries. The Company focuses on the development of open and flexible solutions that enable users to analyze designs directly on the desktop, providing a common platform for fast, efficient and cost-effective product development, from design concept to final-stage testing, validation and production. The Company and its global network of channel partners provide sales, support and training for customers. Headquartered in Canonsburg, Pennsylvania, U.S.A., with more than 60 strategic sales locations throughout the world, ANSYS, Inc. and its subsidiaries employ approximately 1,700 people and distribute ANSYS products through a network of channel partners in over 40 countries.

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