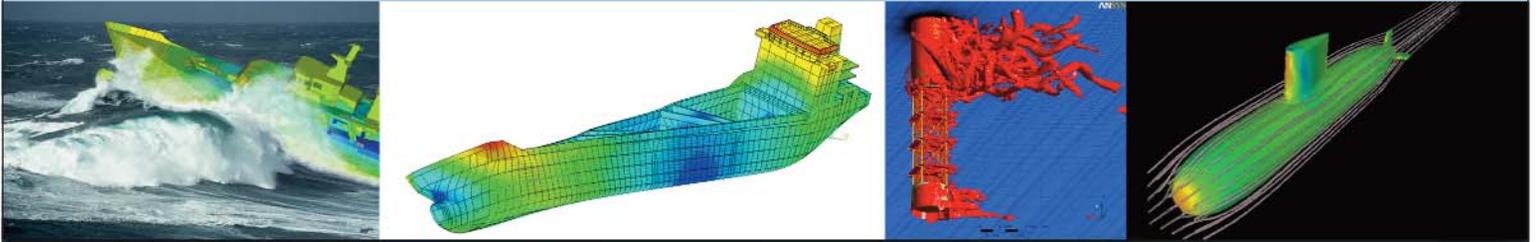


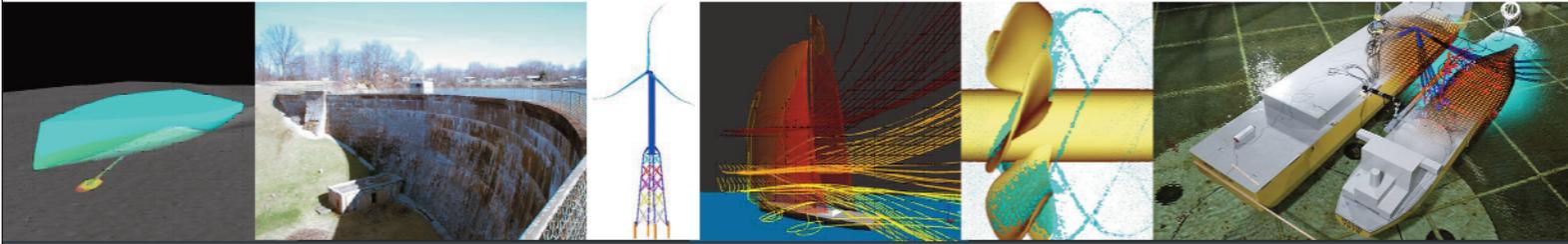


Engineering Simulation Solutions for the
marine Industry





With the unequalled depth and unparalleled breadth of our engineering simulation solutions from ANSYS, companies in the marine and shipbuilding industries 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 the industry leader — for the best in engineering simulation.



Challenges and Solutions

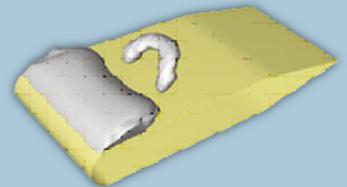
The marine industry is challenged to develop and produce new designs at an accelerating pace. To remain competitive, companies must also improve quality and minimize post-production modifications. In the face of intense global pricing pressures, companies turn to technological innovation to establish a niche and stay ahead. These challenges can be overcome by partnering with ANSYS and adopting its Simulation Driven Product Development™ (SDPD) process.

Faster Development

Simulation enables shipbuilders to shorten their engineering development cycle by troubleshooting designs using virtual prototypes. Simulations of virtual prototypes provide not only gross performance parameters, but also detailed phenomenological data and the insight needed to make design decisions quickly, with confidence and authority. For example: the impact of appendage placement on a hull can be quickly assessed to determine the optimal location; sail designs can be easily optimized; stress concentrations in structural members can be efficiently identified and reduced; and electromagnetic interference can be determined and mitigated.

Lower Cost and Higher Quality

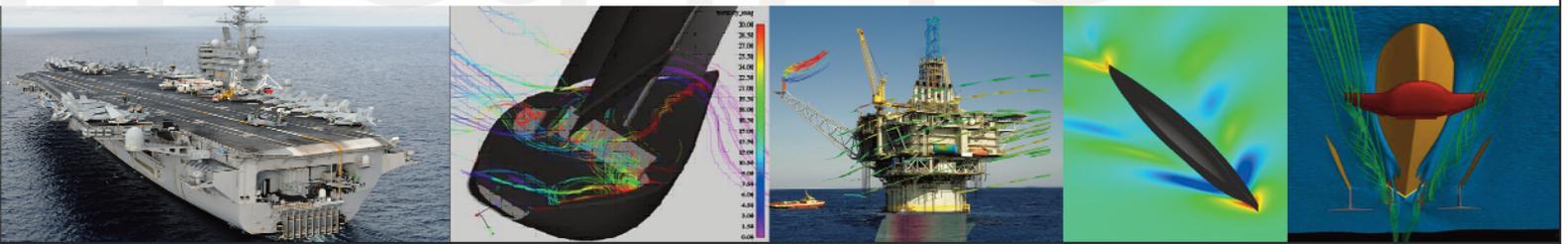
Identifying problems with virtual prototypes not only saves time, it also reduces development costs and improves quality, safety and reliability. Parts and systems work as expected, with fewer surprises. The effect of different operating conditions and environments — such as different flow profiles entering the propulsion system — can be readily assessed. Thicknesses and fiber orientations in composite structures can be quickly determined. Vibrations and fatigue can be minimized, and explosions and safety hazards mitigated.



Innovative Design

Innovative designs often require innovative engineering solutions. For example, the design of cargo space with fewer pillars requires a novel structural solution to support the applied loads. A longer cargo room requires a shorter engine compartment and a novel hull form. Using simulation, innovations in materials can be exploited with greater confidence. Such innovations need to be modified extensively to realize practical designs. Simulation guides these modifications and steers the solution to an optimal design.

marine



“The ANSYS Workbench platform lets us streamline the development process by eliminating the need to manually transfer simulation files and translate analysis results from one program to another. ANSYS Workbench associativity with the CAD system was a big time saver, and the ability to perform so many fast iterations guided us toward an optimal hull shape that was not intuitively obvious. When you dive to these depths, there is no room for error. That’s why we rely confidently on simulation technology from ANSYS in the development of these next-generation winged submersibles. ANSYS CFX helped develop the overall streamlined shape of the external fairing.”

Adam Wright,
Senior Mechanical Engineer,
Hawkes Ocean Technologies

Capabilities

- ▶ **Pre-Processing Solutions:** *Modeling:* CAD import and export, Lines Plan import; 3-D parametric modeling; bidirectional CAD connectivity; geometry creation and editing; *Meshing:* surface; structured; unstructured; polyhedra; wrapping; scripts; component specific.

Key Products: ANSYS® ICEM CFD™, GAMBIT®, TGrid™, ANSYS® DesignModeler™, ANSYS ICEM CFD Hexa for CAA V5, ANSYS® BladeModeler™, ANSYS® TurboGrid™, ANSYS® Mesh Mopher™, ANSYS® AQWA™.

- ▶ **CFD and Hydrodynamics Solutions:** Application-specific, CAD-embedded, and easy-to-use general interfaces; moving and deforming geometry; LES/DES/SAS; noise; conjugate heat transfer; dispersed and mixed phases; rotating machinery; customizable physics and user interfaces; ship motions; seakeeping; mooring systems; hydrodynamic interaction.

Key Products: ANSYS® FLUENT®, ANSYS® CFX®, ANSYS AQWA, ANSYS® AutoReaGas™, FLUENT® for CATIA® V5, ANSYS® CFX-Flo, FloWizard®, ANSYS® TAST™

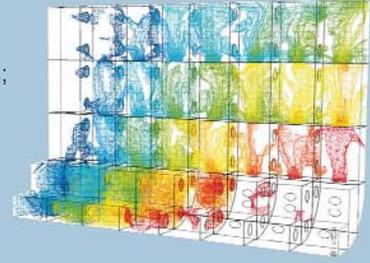
- ▶ **Mechanical Solutions:** Static, modal, and harmonic; transient and spectral; coupled wave-structure interaction; buckling and fatigue; contact; composites; deformable geometry; linear and nonlinear materials; component mode synthesis; rigid and flexible multi-body dynamics; rotordynamics; explicit dynamics; topological optimization; sensitivities; full suite of multiphysics element technology.

Key Products: ANSYS® ASAS™, ANSYS® Multiphysics™, ANSYS® Rigid Dynamics, ANSYS® AUTODYN®, ANSYS® LS-DYNA®

Capabilities (continued)

- ▶ **Electromagnetic Solutions:** Magnetostatic and quasi-static eddy currents; electrostatics; steady-state current conduction; low- and high-frequency electromagnetics; isotropic and anisotropic materials; excitation sources

Key Products: ANSYS Multiphysics, ANSYS Iceboard®, ANSYS Icechip®, ANSYS Icemax®, ANSYS Icepak®, ANSYS Icepro™



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mooring global performance • breakwaters • mast design •
single and multi-hull structural integrity • composites •
fluid structure interaction • sloshing • limit load analysis •
ballast water exchange • safety • fatigue • **marine**
air wakes • HVAC • acoustics • green engineering • floatover
and heavy lift analysis • wave loading • sails • propulsion and
power • cavitation • inland hydraulics • electric motors •
optimization • electronics cooling • generators • EMI/EMC •
keel design • antenna • rigid and flexible body dynamics •

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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