



ENERGY EFFICIENCY: A UNIVERSAL CHALLENGE

Turbomachinery engineers design diverse systems for many industries – but they face the shared challenge of maximizing efficiency. ANSYS software supports them in developing next-generation solutions.

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Turbomachines power the world around us. “Turn or burn” systems play a central role in the cars we drive, the planes that transport us, and the electricity that powers our homes and offices every day. While the applications for turbomachinery are incredibly diverse, there is one challenge shared by turbomachinery engineers: the need to improve energy efficiency.

For commercial airlines, fuel accounts for 30 to 40 percent of overall operating costs. While lightweight materials, improved aerodynamics and other initiatives help to drive greater fuel economy, engine enhancements are still the primary source of efficiency gains. The improved fuel economy of the Boeing 787 Dreamliner and the Airbus A350 XWB are newsworthy examples. Furthermore, the airline industry is acutely aware of its responsibility to the environment. While airline traffic makes a relatively small contribution to environmental pollution, efficiency gains go hand in hand with environmental benefits.

In the global automotive industry, pressures to improve fuel economy come from many sources – including consumer cost concerns, tightening government regulations and increased awareness of climate change. Automotive engineering teams race to develop higher-compression engines; more-efficient turbocharger designs; and new composites, alloys and coatings that will dramatically improve fuel efficiency in cars and trucks.

The world’s power generation engineers also focus on efficiency innovations. The addition of renewables to the grid is forcing engineers to improve efficiency and durability to accommodate variable energy availability and loads. Improvements have yielded efficiencies of over 60 percent for gas and steam turbines operating in combined cycle mode – and at least one

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manufacturer has set the lofty target of 70 percent, which it plans to achieve by introducing a fuel cell to create a triple combined-cycle system.

ANSYS has worked relentlessly to develop powerful simulation software that helps turbomachinery engineers not only increase efficiency, but ensure that their systems deliver other critical benefits such as reliability, safety and low maintenance.

With its multiphysics, systems-level perspective, ANSYS software provides engineers with an in-depth view not only of individual components but also of how turbomachinery components interact as a sophisticated system. Engineers can feel confident that they are making the right trade-offs as they balance efficiency goals with other design criteria. With support for high-performance computing environments – including those residing in the cloud – ANSYS software can flexibly accommodate the large model size and complexity that turbomachinery simulations call for.

In addition to creating fast and accurate general simulation tools, ANSYS has developed highly specialized turbomachinery software. These tools help engineering teams model combustion and turbulence with much greater accuracy, explore the use of composites and other advanced materials, simulate blade row performance, and take analyses to a new level of speed and precision.

Unfortunately, there are no easy answers to the challenge of dramatically increasing energy efficiency for cars, planes, power plants and other engineered systems that rely on turbomachinery. These systems encompass a plethora of moving parts, fluid flows, mechanical stresses and control systems. Elevating performance means optimizing incredibly complex processes. Mastering efficiency in the face of such complexity, while also improving other performance aspects, requires sustained engineering focus and effort.

Despite the magnitude of this technical challenge, our customers continue to introduce turbomachinery innovations that raise the bar for efficiency and other critical aspects of performance. We are excited to share some of their success stories with you in this issue of *ANSYS Advantage*. Looking ahead, we believe we all benefit from sharing our customers’ results – and, of course, we support your efforts to make evolutionary gains that increase energy efficiency, while also protecting your other essential product promises. ▲