Championing **Simulation**

NAFEMS champions CAE awareness, delivers education and sets simulation standards.

Tim Morris, Chief Executive of NAFEMS

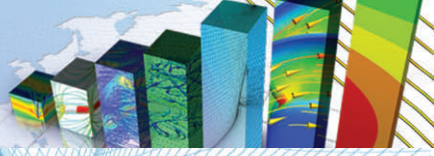
NAFEMS, founded more than a quarter-century ago, is an impartial best-practice champion of computer-aided engineering (CAE) standards. A non-profit organization headquartered in the United Kingdom, NAFEMS provides information to secure the best returns on investment in CAE software, to develop and enhance simulation capabilities, and to ensure the safest and most effective use of the software. About 940 companies around the world, from large multinational corporations to small engineering consultancy firms, are members of NAFEMS, and this number is growing. Although the largest proportion of members is involved in finite element analysis, the computational fluid dynamics (CFD) group is expanding rapidly. Members belong to almost every industry sector.

ANSYS Advantage staff interviewed Tim Morris, chief executive of NAFEMS, on his viewpoint about trends in CAE and the value of engineering simulation.

Is the manufacturing industry taking full advantage of engineering simulation technology?

The power and scope of simulation technology has increased dramatically in the past 10 years. Simulation should now be at the heart of the design process, driving it, not merely validating it in the latter stages. To do this requires change in how simulation technology is deployed in many organizations. Simulation engineers need to be better integrated as a fully involved part of the product development strategy from the very beginning. They also need to understand the commercial imperatives driving development. Product development managers need to better understand what engineering simulation can offer, in areas such as shaping external design appearance, instead of leaving this to marketing designers. By embedding engineering simulation in the product development strategy, technical products that meet all market needs can be realized, and engineering simulation can deliver best value by increasingly compressing development processes in order to reduce time to market.

Engineering simulation is a strategic weapon inside companies today, especially for nimble organizations that have a philosophy of core adoption and deployment



because it leads to competitive advantage. Financial and commercial pressures from an ever-more competitive market have led to companies' increasing reliance on engineering simulation to cut costs and reduce design and development cycles.

How important is a multiphysics approach to the development of engineering simulation?

By relying on engineering simulation as the primary tool to develop new products or processes, engineers and designers often want to simulate as near to the real world as possible. A multiphysics approach is inevitably going to be more accurate at simulating the real world than one that uses only CFD or FEA, for example. As high-performance computing (HPC) continues to improve, we will see more and more realistic multiphysics simulations in engineering. As engineering simulation becomes more powerful and additional companies come to rely on simulation to develop products and processes, being able to employ multiphysics will become more and more critical.

What are the current challenges facing NAFEMS?

As an organization, our broad challenge is to continue to sharpen our focus on the commercial application of engineering simulation. For example, we are actively seeking ways to bring about the kind of mutual understanding between simulation engineers, product development and business teams that is necessary to put engineering simulation at the very heart of product development strategies. Another example is to address the lack of CAE standards.

In college education, we need to establish a set of learning outcomes for simulation engineers, and knowledge capture from more-experienced engineers is essential for best practices.

Although bigger companies usually have rigorous engineering simulation processes, small and medium enterprise companies may not. NAFEMS would like engineers to understand the reliability of their CAE analyses. We aspire to establish grades of competencies for good simulation based on experience for these engineers.

What is the significance of CAE in the current economic climate?

Simulation ultimately helps companies to save money. It is all about making the design process more effective and efficient. Simulation empowers engineers and designers to envision and develop better designs — in which better might mean lighter, cheaper or stronger. While companies might need to cut back on manufacturing in these times of recession, the smarter companies will not cut back too much on design or research but, rather, will use the opportunity to improve both products and design processes.

Continued investment in simulation will continue to bring rewards in terms of making companies more competitive and should allow these businesses to emerge from the recession in a stronger state, and quite probably with fewer competitors. What we do know, from independent research that we have been involved with, is that the best-in-class companies are often those that make the greatest use of simulation.

Where is engineering simulation heading in the next 10 to 20 years?

The developments that HPC makes possible are very exciting and could transform the complexity of physics that can be simulated to the point that it may be possible to simulate right down to the molecular level. One day, ambient intelligent environments, ultra-high-bandwidth networks, pervasive wireless communications, knowledge-based engineering, networked immersive virtual environments and powerful games engines will transform multiphysics CAE for product design, creation, validation and manufacturing.

In the future, mesh-insensitive iso-geometric preprocessing techniques will become more common. We will see the gaming industry and Hollywood-style post-processing and visualization being pulled into CAE more and more. More stochastic simulation as opposed to deterministic predictions will be performed because, as more computing power becomes available, it will be possible to study a range of analyses rather than worst-case/best-case simulations that are the trend today.

Simulation data management is an up-and-coming issue in our industry. Good standards are required with petabyte-sized files that may soon become common. Security of data and information is crucial with enterprise-wide projects and collaborations across the world.

FEA, CFD and other related technologies are still very much in their infancy. Engineers in the future may look back and be amused at how crude and unreliable the methods of today are when compared with the technology that is yet to come. The technology itself continues to be developed at an ever-increasing rate, but the complexity of the applications that industry would like to tackle continues to exceed the available capabilities. ■