STRATEGIC ISSUES AND TRENDS

July 2008

Virtual Engineering: Creating a New Future for Mechanical Engineers

Published bi-monthly by
ASME Strategic Issues,
Opportunities
and Knowledge Committee

ASME
1828 L Street, N.W.
Suite 906
Washington, DC 20036
Phone: 202-785-7382
Fax: 202-429-9417
E-mail: pratta@asme.org

Over the next ten years, advances in simulation technology will merge with advances in computer aided design (CAD) systems and virtual worlds to create robust tools for virtual engineering. Virtual engineering will create a new future for Mechanical Engineers that reduce the cost and time for innovation, emphasize global teaming and create more demand for engineers with broad technical skills and the ability to integrate complex systems.

Mechanical Engineers will have powerful simulation tools that will allow them to build robust virtual prototypes, share them with colleagues worldwide and test them in a variety of simulated environments. Cost and time to market for complex technologies will be reduced and the global marketplace will demand mechanical engineers with the skills to make the most of these new simulations.

Computing power and broadband speed are growing at exponential rates. Improved network speeds coupled with increased power and memory have transformed CAD systems, making it easier for mechanical engineers to design system components and share designs with colleagues. As CAD systems improve they will move closer and closer to modeling the true physics and functionality of products, enabling computer simulations that match real life experiments.

Better simulations will permit engineers to identify problems early, experiment with novel design concepts and reduce the time and cost of the final product. Mechanical engineers will be able to test stress on materials, aerodynamics, assembly and disassembly of parts, among other attributes, early in the design process. Nanotechnology will enable the use of advanced materials with new properties for designs. Simulations will be vital for mechanical engineers to test these materials in diverse environments and learn more about how their designs will function in different environmental conditions.

More powerful simulations will reduce the need for certain specialists in engineering by making it easier for end users to go from information to usable knowledge. For example, complex computational fluid dynamics (CFD) simulations for physic-chemical processes in industrial furnaces now require CFD experts to interpret results. More advanced simulation systems let the end users to do more of the evaluation and interpretation themselves. Reducing the use of highly trained specialists for interpretation, in turn, reduces both the time and cost of developing new technologies.

Future teams connected by high speed networks will be able to work faster and cheaper than stand-alone groups. There will still be strong demand for specialized expertise in

ASME
SETTING THE STANDARD

these larger networks, but there will be even more demand for integrators that have a broad base of knowledge. These mechanical engineers will need this broad base of knowledge to integrate different components of much more complex systems.

CAD design and simulation systems will merge with advances in computer gaming to create powerful new tools for virtual engineering. Video game makers are using faster processor speeds, powerful graphic processing units and broadband speeds to create immersive interactive virtual worlds where residents can interact and create with friends around the world. The result will be fully immersive environments where mechanical engineers can collaborate with colleagues and clients around the world on product designs.

The ability to work together in virtual environments will further increase the demand for globally integrated engineering teams. Companies will draw team members together based on needed skills rather than geography. They will also be able to stagger teams across time zones so large or complex products can be worked on 24/7 by contiguous teams of engineers. This globalization will include more outsourcing to lower salaried professionals in developing countries.

ASME Implications

ASME membership will have a more global orientation and worldview influenced by their work with global colleagues. They will be more comfortable working with complex systems and using advanced simulation software to help manage complexity. This is likely to create a new generation of mechanical engineers that can easily conceptualize large scale problems and are comfortable with global, large scale strategic thinking. Both of these attributes will serve mechanical engineering well as the profession grapples with the grand challenges of the 21st century such as global warming.

Mechanical engineers will be much more open to virtual teaming and will expect ASME to have similar capabilities for their members. Within five years it will be easier for ASME to hold virtual meetings and conferences in virtual worlds. These can be a great way for ASME to connect with a global membership base and create social networks around key ASME areas similar to the existing ASME communities of practice.

ASME could also nurture open source communities for their members where they can work together to innovate new technologies. Virtual engineering could be the low cost design tool needed spark open source efforts in engineering. These communities could be structured around some of the grand challenges in engineering providing an avenue for mechanical engineering to address some of the most pressing issues of the next 20 years.

ASME should monitor advances in virtual engineering in order to better serve their members. Virtual engineering will provide a range of important topics for ASME's work in professional education and will also provide important tools that ASME can leverage in creative ways to build strong communities among its membership. By taking a lead in this area, ASME can help meet the following strategic objectives:

- Better serve our core customers (C1)
- Secure and incorporate emerging markets & technologies (C2)
- Stimulate & support diversity and active participation in all Communities of Interest (I1)
- Develop new and expanded market relevant content (I4)