

Window of Opportunities in Virtual Prototyping

Simulation-Based Design in Mechanical and Aeronautical Engineering

A main issue for the competitiveness of Quebec industry

August 13-14, 2001, Hôtel de l'Institut, Montréal

Simulation-based design systems, or virtual prototyping, represents a technological advance that offers the attraction of increased profitability for the manufacturing industry through its ability to lower system life-cycle costs. To remain competitive, the Québec industry must both design and test the majority of its products by virtual methodology using computer simulation.

A considerable number of commercial software codes for engineering simulation are now available to the design engineer. With such software, the design engineer is able to perform virtual simulations in all areas of engineering, including structure, vibration, heat transfer and fluid mechanics. Emerging technologies offer the possibility of carrying out on computer the design and optimization of products, before constructing the first real prototype of the product. The Windows of Opportunities in Virtual Prototyping Conference is an excellent occasion to illustrate the capacity of computer-aided technologies in increasing the quality of products while reducing development costs.

Objectives :

- To show the current maturity and future potential of simulation-based design technologies
- To highlight the economic impact and technical challenges of these technologies with respect to Québec industry

The Windows of Opportunities is intended for :

- Industry decision makers wanting to be informed of the economic benefits regarding the use of new design and simulation technologies
- Users and developers of simulation based design systems from industrial, institutional and academic sectors

Actual and potential users will be brought up to date on the potential power of existing and emerging technologies. Users of CAD and CAE technologies will find strategic information on the evolution of design tools. The industry decision makers who plan to use these technologies in their companies will be able to make contacts with the members of this industry and thus start up such an activity more rapidly and with additional insight.

Invited Speakers (Preliminary listing)

David Japikse : President, ConceptsNREC, USA. Dr. Japikse has received a golden award from the American Society of Mechanical Engineering ASME. He is the author of several publications in the area of turbomachinery and is also one of the main promoters in the U.S.A. of integrated virtual technologies for the design and optimization of turbomachines. (<http://www.conceptseti.com/>)

Clive Fletcher : Director, CANCES, Australia. Dr. Fletcher is a renowned author in the area of computational fluid mechanics. Since 1996, he has been in charge of a Technology-diffusion-and-transfer Center in the field of virtual simulations for solid and fluid mechanics which promotes a new approach geared towards technological diffusion in the industry.
(<http://www.cances.atp.com.au/>)

Garret Vanderplaats : Président, VR&D Inc., USA. Dr. Vanderplaats has a long career in optimization engineering. He is the author of “Numerical Optimization Techniques for Engineering Design” which is a classic in the field. His company, VR&D, markets optimization software which has been adopted by several companies working in engineering simulation and design. (<http://www.vrand.com/>)

Ilan Kroo : Professor, Aeronautics and Astronautics Department, Stanford University, USA. Professor Kroo is the Director of the “Aircraft Aerodynamics and Design Group” as well as the author of various papers on multidisciplinary optimization. He has developed a collaborative optimization strategy (CO) which allows many teams of engineers to work simultaneously on an engineering optimization design. (<http://aero.stanford.edu/adg.html>)

Vladimir Kudriavtsev : President, CFD Canada. Dr. Kudriavtsev is the representative of CFDRC in Canada. (<http://www.cfdrc.com/>) CFDRC is one of the world leaders in the field of simulations with multiple physics, including interaction between fluids, structures, chemical phenomena, electromagnetic phenomena, plasmas, etc. (<http://www.cfdcanada.com/>)

Brett Malone : President of Phoenix Integration, Virginia, USA. Phoenix Integration offers integration and automatization solutions for the aerospace and automotive industry. (<http://www.phoenix-int.com/>)

André Garon : Professor, Department of Mechanical Engineering, École polytechnique de Montréal. Professor Garon is in charge of one of the most advanced teams in the area of computer-aided design, simulation and optimization for the design of a cardiac assistance pump. (<http://www.polymtl.ca>)

Normand Brais: Vice-President, BMA Group, Montréal. Dr. Brais has brought together a team of researchers who are carrying out combustion design and analysis for industrial boilers, done entirely by computer. BMA is also a worldwide leader in its field, and is well equipped to conclude important contracts at the international level. (<http://www.bma.ca/>)

Jean-François Héту : Head of project, Simulation and optimization of processes, Industrial Materials Institute, NRC, Boucherville. At IMI, Dr. Héту is in charge of a team that supports the injection molding industry in the development of new products. Dr. Héту’s team has developed a unique finite element simulation and design software for injection molding processes, applicable for products made of plastic or metal. (<http://www.imi.nrc.ca/>)

Preliminary Program

August 13, 2001

8:00 Registration

8:15 Welcome

Theme 1 The virtual prototyping cycle: From CAD to CAE to CD

Geometric modelling systems (CAD) represent the basis of the virtual prototyping cycle on which are built simulations systems (CAE). Now, a third layer allows engineers to carry out product design and optimization (CD) based on product performance predicted in a virtual environment. All these technologies represent a new paradigm for the design engineers who can anticipate through their use the possibility of significantly reducing the development time while allowing the design of products to meet more and more specialized markets. Many companies have already started to work guided by such a vision.

8:30 - 9:15	Clive Fletcher, CANCES	From CAD to CAE to CD. Towards zero design cycle time.
9:15 - 10:00	David Japikse, ConceptsNREC	Agile Engineering for turbomachinery.
10:00 - 10:30	Break	
10:30 - 11:00	André Garon, École Polytechnique	
11:00 - 12:00	Moderator PANEL	

Theme 2 : Simulation packages: FEA and CFD

The simulation software available to the mechanical and aerospace engineers now allows engineers to test products virtually and to quantify their performance in all aspects well before the construction of the first real prototype. Such software has become more and more easy to use. However, one of the challenges for designers and users remains the issue of control of the validity of the simulations, mostly for problems involving many physical phenomena. For the industry, one of the challenges is therefore to be able to form and continually train a pool of experts knowledgeable in complex systems in order to ensure the validity of simulations.

1:30 - 2:15	Vladimir Kudriavtsev, CFD Canada	Multi-Physics Simulations using CFD-ACE and MDICE
2:15 - 3:00	Clive Fletcher, CANCES	FEA and CFD: A high tech methodology applicable to low tech engineering problems
3:00 - 3:30	Break	
3:30 - 4:00	Normand Brais, BMA	Simulation-based design of furnace burners for pollutants reduction
4:00 - 5:00	Moderator PANEL:	

6:00 Banquet - Invited Speaker : A venir)

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Theme 3 : Optimal Design and Multidisciplinary Optimization

Advanced design methods reside at the heart of a set of new technologies which will be used by engineers to design products. The consequences will include the reduction of the design cycle, the increase of the quality of products and therefore the lowering of costs. The formalism within which relevant problems should be cast, in order to reach these goals implies that design problems should be formulated as optimization problems. In cases where the complexity of problems is important, multidisciplinary teams are required and some challenges emerge at the collaborative level. Many solution avenues are being developed and will constitute the next generation of design tools for engineers.

8:30 à 9:15	G. Vanderplaats, VR&D	Large scale engineering design optimization
9:15 à 10:00	I. Kroo, Stanford University	Collaborative Optimization Challenges
10:00 à 10:30	Break	
10:30 à 11:00	J.-. F.Héту	IMI Simulation and optimization capabilities
11:00 à 12:00	Moderator PANEL	

Theme 4 : Integration and Internet

The Internet has already revolutionized many aspects of our lives and its new technologies have changed our relationship with information. The area of mechanical design should not be left out of this redefinition and many companies have already started to deal with the engineering market on Internet. It will be possible to make available many computer technologies developed for the distributed computing market in order to develop mechanical design Internet systems. This will result in a new set of more affordable and further integrated analysis and design products that can profit from the significant computational power that the Internet network offers.

1:30 à 2:15	Brett Malone, Phoenix Integration	The importance of integrated systems
2:15 à 3:00		
3:00 à 3:30	Break	
3:30 à 4:00	David Japikse ConceptsNREC	The future of Simulation-based design systems
4:00 à 5:00	Moderator PANEL	