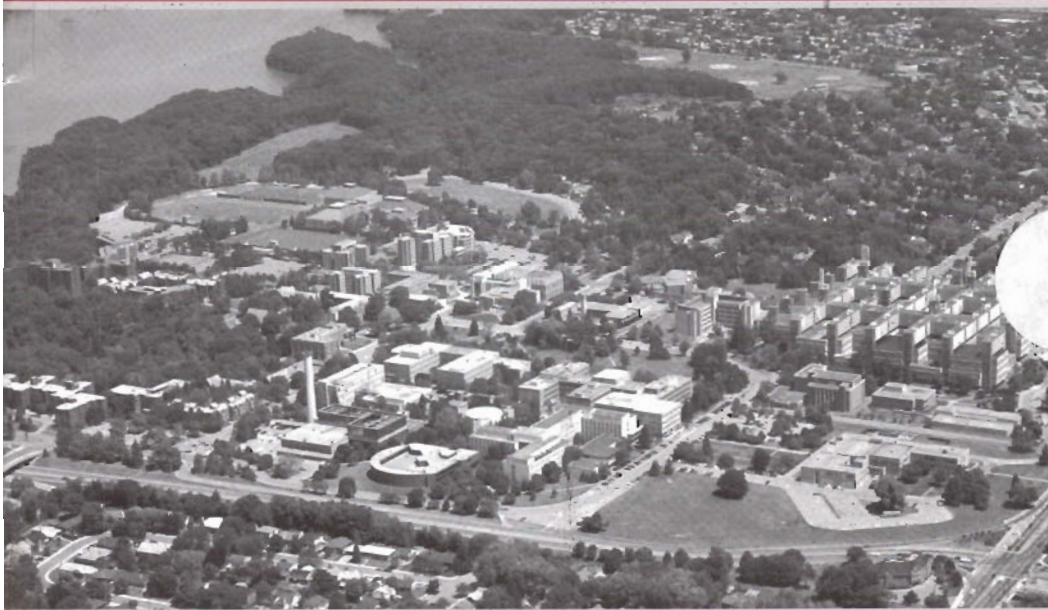


The North American Manufacturing Research Institution of the
Society of Manufacturing Engineers invites you to attend the

**Thirty-first North American
Manufacturing Research Conference**

NAMRC 31



May 20-23, 2003

Hamilton, Ontario, Canada

Hosted by

McMaster University

Faculty of Engineering

McMaster Manufacturing Research Institute

NAMRI  [®]

The North American Manufacturing
Research Institution of the
Society of Manufacturing Engineers

Dear Colleagues and Friends:

We welcome you to the Thirty-first North American Manufacturing Research Conference. The Faculty of Engineering at McMaster University is pleased to host the 31st North American Manufacturing Research Conference (NAMRC) from May 20-23, 2003. NAMRC has been an established international forum for the presentation of cutting-edge research results throughout universities and industries from around the world since 1973. Leaders in manufacturing research have come to this conference to exchange findings and leading edge technological information. Participation in NAMRC 31 provides the authors with far-reaching recognition of their work, as well as yields valuable insight from other leaders in manufacturing research.

This year, 82 technical papers will be presented at the conference by researchers from universities, research institutes, and industrial research laboratories located around the world. All of these complete manuscripts have been accepted for presentation at NAMRC 31 and published in the Transactions of the conference based upon a stringent peer review process conducted by the Scientific Committee of the North American Manufacturing Research Institution of the Society of Manufacturing Engineers (NAMRI/SME).

The conference will begin in the early evening of Tuesday, May 20, with a welcoming reception at the Sheraton Hotel, downtown Hamilton. On Wednesday, May 21, the conference Opening Ceremony will feature welcoming remarks by Mr. Norm Lockington, Vice President of Technology at Dofasco, Inc.

We want to extend a special invitation to our colleagues and friends in industry and academia to attend the conference. We look forward to your participation in this important event, renewing acquaintance with those of you who are regular attendees at this conference, and to meeting many of you who will be attending for the first time. We believe that participation in NAMRC 31 will be both an intriguing and beneficial experience for you.

Sincerely,

Mohamed A. Elbestawi and Tim Nye
Co-Chairs
NAMRC 31 Organizing Committee

What is NAMRC

NAMRC is an international forum for the presentation and critical discussion of the results of basic and applied research in material forming, material removal, and manufacturing systems and controls. It is one of only a few events of its kind where technical innovations, new methods and applications of leading-edge technology from throughout the world are shared among manufacturing research, design, engineering, and production professionals from academia and industry. Because NAMRC takes place every year, the findings and breakthroughs presented here are topical and of current interest.

Why Should You Attend?

By attending NAMRC 31, you will:

- Gain insight on the most recent developments in material removal and forming processes, automation and control of processes and systems, equipment accuracy and precision, and many other manufacturing related topics,
- Participate in a dialogue between industry and academia on future needs for manufacturing processes and applications,
- Enhance your knowledge of alternative manufacturing processes and applications,
- Make valuable contacts with other leading manufacturing researchers and professionals.

About NAMRI/SME

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers (NAMRI/SME) is an organization dedicated to manufacturing research and technology development. Its mission is to advance manufacturing engineering by promoting research and its application in industry. To learn more about NAMRI/SME or to become a member, visit the Web site at www.sme.org/namri.

Sponsorship

The NAMRC 31 Organizing Committee thanks the McMaster Manufacturing Research Institute at McMaster University for their sponsorship of this conference.

Conference Publication

Papers accepted for and presented at NAMRC 31 will be contained in the hardbound Transactions of the North American Manufacturing Research Institution of SME, Volume 31, 2003. Participants who have paid the registration fee will receive a copy at the time of registration. Additional copies may be purchased by contacting an SME Customer Service Representative at (313) 271-1500, ext. 4500 or (800) 733-4763.

NAMRC 31 Program-at-a-Glance

Hosted by McMaster University, Hamilton, Ontario, CANADA

	Morning			Afternoon		Evening
Tuesday May 20	NAMRI/SME Board Meeting 8:30 a.m. - 5:30 p.m.			Industry Tour – Dofasco 2:00 a.m. - 4:30 p.m.		Registration and Welcoming Reception Sheraton Hotel 5:30 - 8:00 p.m.
Wednesday May 21	Registration and Breakfast 7:30 - 8:30 a.m.	Welcoming Ceremony 8:30 - 9:45 a.m.	Concurrent Sessions 10:30 a.m. - 12:00 noon	Awards Luncheon and Founders Lecture 12:00 - 1:30 p.m.	Concurrent Sessions 1:30 - 3:30 p.m.	NAMRC Banquet Canadian Warplane Heritage Museum 7:00 - 10:30 p.m.
					Concurrent Sessions 4:00 - 6:00 p.m.	
Thursday May 22	Registration and Breakfast 7:30 - 8:30 a.m.	Concurrent Sessions 8:00 - 10:00 a.m.		BBQ Luncheon on Terrace 12:00 - 1:30 p.m.	Concurrent Sessions Panel Discussion 1:30 - 3:30 p.m.	Reception 7:30 - 10:30 p.m. Hamilton Museum of Steam and Technology
		Concurrent Sessions 10:30 a.m. - 12:00 noon				
Friday May 23	Registration and Breakfast 7:30 - 8:30 a.m.	Concurrent Sessions 8:30 a.m. - 10:00 a.m. 10:30 a.m. - 12:00 noon		Industry Tour Siemens Westinghouse 9:30 a.m. - 12:00 noon		

Detailed information about the conference program and schedule may be found on the NAMRC 31 Web site at mmri.mcmaster.ca/namrc

NAMRC 31 Technical Program

Wednesday, May 21, 2003 – Technical Paper Presentations

Forming Design and Analysis

One-Piece Press Forming of Automobile Steel Wheels Without Welding
Ken-ichiro Mori, Seijiro Maki, Daisuke Nakagawara

An Optimum Design Model for Down Acting Press Brakes of High Precision and Medium Span
Wenlung Li

Design of a Fastener Clinching Process Using FEM
Patrick H. Wenning, Gracious Ngaile, Taylan Altan, Ken Cardina

Three Dimensional UBET Simulation Tool for Seamless Ring Rolling of Complex Profiles
Vipul Ranatunga, Jay S. Gunasekera, Suhas P. Vaze, Urban De Souza

Machining Models

An Analytical Solution to Cutting Forces and Chip Thickness in Machining with a Grooved Tool Including the Tool-Chip Contact on the Tool Secondary Rake Face
N. Fang, C. Wood, W. Wang

A Hybrid Model for Analysis of 3D Machining Operations
Amir H. Adibi-Sedeh, Vis Madhavan

Off-Line Feed Rate Scheduling for 3D Ball-End Milling Using a Mechanistic Cutting Force Model
Jeong Hoon Ko, Dong-Woo Cho, Tae Jo Ko

A Simplified Approach for Determining Empirical Cutting Force Coefficients for Ball-End Milling
Abdullahil Azeem, Hsi-Yung (Steve) Feng, Lihui Wang

Microsystems

Development of a Low F-Number Micro-Lens and Micro-Injection Mold Master Using Micro-Stereolithography Technology
In Hwan Lee, Dong-Woo Cho, Dong Sung Kim, Tai Hun Kwon, Kijang Oh, Seung-Han Yang

Study of Pulse Electrochemical Micro Machining
J. Kozak, K.P. Rajurkar, Y. Makkar

Manufacturing of Micro-Scale Open-Cell Polymeric Foams Using the Solid-State Foaming Process
Wei Li, Krishna Nadella, Vipin Kumar

An Evaluation of Packaging Architectures for Tissue-Based Microsystems
Brian K. Paul, Chuckaphun Aramphongphun, Frank Chaplen, Rosalyn Upson

Formability

An Advanced Method to Describe the Forming Limit of Metals
Fritz Klocke, Dirk Breuer, Hans-Willi Raedt

Microstructure-Based Modeling of Anisotropic Superplastic Deformation
Marwan K. Khraisheh, Fadi K. Abu-Farha

Formability Improvement in Aluminum Tailor Welded Blanks via Material Combinations
Amit V. Bhagwan, Ghassan T. Kridli, Peter A. Friedman

An Experimental Investigation of Coating Durability in Forming Pre-Coated Sheet Metal
Jyhwen Wang, Richard Alexander, Sony Pauly

Machinability

Ultra High Speed Machining of Aluminum Alloys: Machinability Aspects and Attainable Accuracy
M. Dumitrescu, T.J. El-Wardany, E-G. Ng, M.A. Elbestawi, H.A. Kishawy

A New Approach to Characterize the Machinability of Powder Metals
Edmond Ilia, Michael O'Neill, Anil Srivastava, Michael Finn

Machinability of Sintered and Hipped Fe-Mo Components
Ke Li, M.A. Mannan

Nanometer Scale Ductile Cutting of Tungsten Carbide
Kui Liu, Xiaoping Li, Steven Y. Liang

Manufacturing Systems Design

Virtual Visualisation and Prototyping Environment for Component-Based Production Machinery
D.A. Vera, A.A. West, R. Harrison, D.W. Thomas

An Innovative Reconfigurable and Totally Automated Fixture System for Agile Machining Applications
Chi-Hung Shen, Yhu-Tin Lin, John S. Agapiou, Gary L. Jones, Mark A. Kramarczyk, Pulak Bandyopadhyay

Fixture Configuration Synthesis for Reconfigurable Assembly Using Procrustes-Based Pairwise Optimization
Zhenyu Kong, Dariusz Ceglarek

Integrated Machining of a Centrifugal Impeller
Hong-Tsu Young, Li-Chang Chuang

Rapid Prototyping

Rapid Prototyping Non-Uniform Shapes from Sheet Metal Using CNC Single Point Incremental Forming
J. Jeswiet, E. Hagan

Design and Fabrication of Injection Mould Insert via Laminated Metal Tooling Process
Mingliang Chen, AbdulHai Al-Alami, Gene Zak

FEM Based Process Design for Laser Forming of Doubly Curved Shapes
Chao Liu, Y. Lawrence Yao

Three-Dimensional Laser Forming of Sheet Metal Using Triangular Patches
Masaaki Otsu, Hideshi Miura, Michiya Matsushima, Kozo Osakada

Cutting Tools

Facing of Inconel 718 Using Alumina Based Ceramics and PVD-TiAlN Coated Carbide Tools - A Comparison
RM. Arunachalam, M.A. Mannan

Experimental Study of PCD Tool Performance in Drilling (Al₂O₃)p/6061 Metal Matrix Composites
M. Ramulu, D. Kim, H. Kao, P.N. Rao

Experimental Analysis of Turning Centrifugally Cast SiCp Aluminum Metal Matrix Composites with PCD and Thick Film CVD Diamond Tools
William E. Pedersen, M. Ramulu

An Assessment of Carbide Self-Propelled Rotary Tools During Machining Hardened Steel
Y. Zhang, J. Wilcox, H.A. Kishawy

Tool Path Planning

Torch Path Planning for Solid Freeform Fabrication Based on Welding
Rajeev Dwivedi, Zoran Jandric, Radovan Kovacevic

A New Tool Path Generation Method for 3-Axis Sculptured Part Machining
Zezhong C. Chen, Geoffrey W. Vickers, Zuomin Dong

Edge Point Extraction for Two Dimensional Analysis
Meghan Shilling, Thomas Kurfess

A Study on Geometric Feature Recognition of Free Form Surface Product
Xingquan Zhang, Jie Wang, Kazuo Yamazaki

Thursday, May 22, 2003 - Technical Paper Presentations

Modeling 1

Modeling Schemes, Transiency, and Strain Measurement for Microscale Laser Shock Peening
Hongqiang Chen, Y. Lawrence Yao

Model Based Tampering for Improved Process Performance - An Application to Grinding of Shafts
Rajkumar Palanna, Satish Bukkapatnam

Neuro-Fuzzy Process Control System for Sinking EDM
A. Behrens, J. Ginzl

Modeling of Bond Formation in FDM Process
Longmei Li, Peihua Gu, Qian Sun, Céline Bellehumeur

Machine Tool Accuracy Control

Valid Machine Tool Setup for Helical Groove Machining
Zhongde Shi, Stephen Malkin

Diagnosis of Multiple Fixture Faults in Machining Processes Using Designated Component Analysis
Jaime Camelio, S. Jack Hu, Weiping Zhong

Accuracy Improvement of the On-Machine Inspection System by Correction of Geometric and Transient Thermal Errors
Kyung-Don Kim, Sung-Chong Chung

Experimental Validation of Prediction Accuracy Using a Hybrid Thermal Error Model in Machine Tool Positioning Error Compensation
R. Ramesh, M.A. Mannan, A.N. Poo

Neural Network Applications

A Radial Basis Neural Network for Integrated Modeling and Optimization of CNC End Milling
Hazim El-Mounayri, Haiyan Deng, Snehasis Mukhopadhyay

Accuracy Prediction in Flat End Milling Using Neural Network Approach
Zakir G. Dugla, Hazim El-Mounayri, Mohamed Gadallah

Neural Networks Modeling of Turning Surface Roughness Parameters Defined by ISO13565
Chang-Xue (Jack) Feng, Zhiguang (Samuel) Yu

Investigation of Inverse ANN - FEM Frameworks for Grain Size and Temperature Control in Multipass Hot Rolling
Meixing Ji, Satish Kini, Rajiv Shivpuri

Non-Traditional Machining

Instrumentation, Experimentation, and Mapping Techniques for Vibrations in Drilling
David N. Dillay, Philip V. Bayly, Adam J. Schaut

Study on Ultrasonic Vibration Milling Using Small-Diameter Ball-Nosed End Mill
Masahiko Jin, Hidenari Kanai, Masao Murakawa, Shin-jiro Yamada

EDM Characteristics of 15 and 35 Vol% SiCp/Al Metal Matrix Composites
D. Kim, M. Ramulu, W.E. Pedersen, Y.W. Seo

Metrology

Development of a 3D Laser Ball Bar for the Volumetric Error Measurement of Multi-Axis Machines
Kuang-Chao Fan, Hai Wang, Fang-Jung Shiou, Chih-Wei Ke

A Study on the Vibration Free High Speed Operation of Three Dimensional Coordinate Measuring Machine
Pinet Sriyotha, Xingquan Zhang, Kazuo Yamazaki

On the Selection of CMM Based Inspection Methodology for Circularity Tolerance
Sam Anand, Nitin Maheshwari, Christopher McCord

Sensors

Multisensor Process Performance Assessment Through the Use of Autoregressive Modeling and Feature Maps
Nicolas Casoetto, Dragan Djurdjanovic, Rhett Mayor, Jun Ni, Jay Lee

Sensor to Detect Cutting Force Components, Cutting Torque, and Cutting Tool Deflections
Hideki Aoyama, Tomoya Ishii

Analysis of Grain Size Measurement Methods in Semiautomatic Image Analysis Setup
Chaiya Praneetpong, Jaramporn Hassamontr

Grinding

Analysis and Design of Grinding Processes Within Process Chains of Ceramic Components
Kristian Eichgrün, Lothar Schäfer, Günter Warnecke, Jan C. Aurich

Analysis of Wheel Topography and Grit Force for Grinding Process Modeling
Rogelio L. Hecker, Igor M. Ramoneda, Steven Y. Liang

Experimental Comparison Between Two- and Three-Body-Abrasion Processes as Applied to Alumina Ceramics
Christian E. Spanu, Ioan D. Marinescu, Mariana Pruteanu, Mike Hitchiner

Tribological Properties of ELID-Grinding Wheel Based on In-Process Observation by Using CCD Microscope Tribosystem

Teruko Kato, Hitoshi Ohmori, Ioan Marinescu

Emerging Technologies on Web-enabled E-Manufacturing Research

Panel Discussion

Tolerancing

Optimal Tolerance Allocation and Process-Sequence Selection Incorporating Manufacturing Capacities and Quality Issues
Natalia Robles, Utpal Roy

Simultaneous Tolerance Synthesis Through Variation Propagation Modeling of Multistage Manufacturing Processes
Qiang Huang, Jianjun Shi

Functional Tolerancing of a Gearbox
H. Wang, U. Roy, R. Sudarsan, R.D. Sriram, K.W. Lyons

Process Capability Analysis for Production Tolerance Assignment
Anshum Jain, Nuo Xu, Samuel H. Huang, Y. Kevin Rong

Friday, May 23, 2003 - Technical Paper Presentations

Modeling 2

Modeling and Control of Process Induced Warpage and Residual Stresses in Molded Composite Components
A. Sherif El-Gizawy, Yean-Der Kuan

A Predictive Modeling Methodology for Part Quality From Machining Lines
John S. Agapiou, Eric Steinhilper, Fangming Gu, Pulak Bandyopadhyay

Analysis of the Real Area of Contact and Interfacial Friction in Cutting Tool Coatings
Zhenhua Tao, Michael R. Lovell

Machine Tools

Fast Response Control for Machine Tool Feed Drives
Mohamed F. Aly, Gary M. Bone, Stephen C. Veldhuis

A Shop-Floor-Programming System for STEP-CNC
S.H. Suh, B.E. Lee, D.H. Jung, I.J. Choi

An Approach to Tripod Optimization and Remote Manipulation
Lihui Wang, Fengfeng Xi, Dan Zhang, Marcel Verner

Professional Information

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State _____
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No. _____
- Certified Manufacturing Technologist (CMT)T
No. _____
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Tens of thousands of manufacturing professionals participate in local SME chapters and in technical associations, communities and groups. Through these groups, you have the opportunity to participate in discussions, evaluations, and in-person or online forums with your colleagues. You can increase your knowledge, improve your expertise, increase your contacts, and stay ahead of evolving technologies and processes to help advance your industry and technical specialty.

SME Career Resource Center at

Process Planning

Probabilistic Precision Process Planning - P4
Arvind Rangarajan, David A. Dornfeld, Paul K. Wright

A Process Model Based Methodology for Comprehensive Process-Planning of Contour Turning Operations
Jingrong Lu, O. Burak Ozdoganlar, Shiv G. Kapoor, R.E. DeVor

A Grammar-Based Approach to Capturing and Managing Processes: An Industrial Case Study
Yichong Zeng, Patrick Kwon, Brian T. Pentland, Ahmad Chahine

Thermal Measurement and Modeling

Noninvasive, Predictive Measurement of Temperature in the Presence of Strong Disturbances
Thamar E. Mora, Swavik A. Spiewak

A Thermal Interface Model for Finite Element Simulation of Hot Forging
William R.D. Wilson, Steven R. Schmid, Jiyong Liu

Thermal Fatigue Prediction in Die Casting Shot Sleeves
Qi Shi, Jerald R. Brevick, Blaine W. Lilly

Metalworking Fluids and Environment

Expedient Identification and Quantification of Mycobacteria Species in Metalworking Fluids Using Peptide Nucleic Acid Probes
Steven J. Skerlos, Laura A. Skerlos, Carlos A. Aguilar, Fu Zhao

Evaluating Performance Changes Due to Gradual Component Depletion in Metalworking Fluids
M.H. Greeley, R.E. DeVor, S.G. Kapoor, N. Rajagopalan

Environmentally Benign Manufacturing: Status and Vision for the Future
J.W. Sutherland, K.L. Gunter, K.R. Haapala, K. Khadke, S.J. Skerlos, J.B. Zimmerman, W.W. Olson, R. Sadasivuni

Process Design

Designed Experimental Study on Set-Up Parameters of Laser Scattering System
J.M. Zhang, Z.J. Pei, J.G. Sun

Development of an Automated System for Measuring Grinding Wheel Wear Flats
Stephane Lachance, Andrew Warkentin, Robert Bauer

Frequency Design of an Ultrasonic Transmitter for Injection Molding Pressure Measurement
Li Zhang, Charles B.Theurer, Robert X. Gao, David O. Kazmer



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Number of years employed in manufacturing Date of Birth

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Indicate the technical specialties most related to your interests.

- Assembly & Joining Automation & Controls Communication Systems Composites Manufacturing Computer-Integrated Manufacturing Consulting & Training Services Contract Manufacturing Services Education & Training Electronics Manufacturing Environmental Equipment & Protection Finishing & Coating Food Processing Forming & Fabricating Internet & E-Manufacturing Lasers & Related Equipment Lean Manufacturing Machining & Material Removal Machine Vision Systems Manufacturing Management Manufacturing Services Materials Mold, Tool & Die Design NC, CNC & DNC Packaging Plant Engineering & Maintenance Plastics Molding & Manufacturing Process Design & Automation Product Design & Automation Quality Rapid Prototyping Research & Development Robotic Fundamentals Software & CAD/CAM

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One Year Membership: \$85 (includes NAMRI membership)

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Add \$15 for each additional selection per year (or \$27 for two years*)

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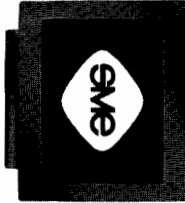
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List the scientific publications that have published your work:

List the related conferences/educational events (including previous NAMRI conferences) you have attended:

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Conference Site & Facilities

The NAMRC Conference will be held in the newly built McMaster University Student Centre, located on central campus at McMaster University, Hamilton, Ontario, Canada.

The University is minutes from downtown Hamilton, Ontario, and the activities that a major city has to offer. Buses from the region's public transit system make frequent stops on campus, facilitating travel between McMaster, Hamilton, and the surrounding area. The conference hotel, Sheraton Hamilton, is situated in the heart of downtown. Shuttle bus service will be provided daily to and from the University.

McMaster campus, which is restricted to pedestrian traffic, is at the western end of Lake Ontario. Area attractions include the Royal Botanical Gardens, Cootes Paradise, the Bruce and Waterfront Trails, the Niagara Escarpment, and Dundurn Castle.

McMaster is a full-service university. With well-established strengths in health care, engineering, business, social sciences, science, and humanities research and education, the University offers both students and professors exciting and unique opportunities for research, education, and collaboration.

With a long-standing reputation as Canada's "most innovative" university, McMaster has pioneered a number of programs that have changed how professors teach and students learn. Problem-based-learning (PBL), pioneered at McMaster, has now spread across North America as a preferred method of instructing undergraduate students.

Through its continued dedication to innovative education and ground-breaking research, the University has earned its reputation as one of the leading post-secondary institutions in Canada. McMaster continues in its commitment to be Canada's most student-centered research university.

Special Activities

In connection with NAMRC 31:

- NAMRI Board Meeting, Tuesday May 20 from 8:30 a.m. - 5:30 p.m.
- Industry tour of Dofasco, Tuesday May 20, 2:00 p.m. - 4:30 p.m.
- Welcoming Reception & Registration on Tuesday, May 20 from 5:30 p.m. - 8:00 p.m. at the Sheraton Hotel
- Welcoming Ceremony and Keynote Address by Mr. Norm Lockington, VP of Technology at Dofasco, Inc. on May 21 from 8:30 a.m. - 9:45 a.m.
- NAMRI/SME Awards Luncheon and Founders Lecture on Wednesday, May 21 from 12:00 noon - 1:30 p.m.
- NAMRC Banquet on Wednesday, May 21 from 7:00 p.m. -10:30 p.m. at the Canadian Warplane Heritage Museum
- NAMRI/SME BBQ Lunch on the Terrace, on Thursday, May 22 from 12:00 noon -1:30 p.m.
- NAMRI and ASME/MED membership meetings on Thursday, May 22 from 4:00 p.m. - 6:00 p.m.
- NAMRC Reception on Thursday, May 22 from 7:30 p.m. -10:30 p.m. at the Hamilton Museum of Steam and Technology
- Industry tour of Siemens Westinghouse, Friday, May 23, 9:30 a.m. -12:00 noon

Laboratory and Campus Tours

Tour the McMaster Manufacturing Research Institute

May 21 & May 22, 4:00 pm - 6:00 pm

The MMRI is one of the largest University Manufacturing Research Institutes in Canada, which supports academic programs that compete favorably with existing international research institutes.

The institute was created in 2000, as a result of major funding grants from the Canadian Foundation For Innovation (CFI), Ontario Innovation Trust (OIT), Ontario Research and Development Challenge Fund (ORDCF), Industry, and McMaster University. The MMRI provides a focus for high profile research, and is a vehicle for University - Industry - Government interaction in the field of Manufacturing Engineering. The Institute promotes, encourages, and performs fundamental and applied research, in cooperation with its industrial partners, and provides systematic mechanisms for technology transfer and diffusion of knowledge and research results.

Industry Tours

Dofasco, Inc.

Hamilton, Ontario
Tuesday, May 20 2:00 pm

Dofasco is North America's most successful integrated steel producer, serving customers throughout North America with high quality flat rolled and tubular steels and laser-welded blanks. This position was recently bolstered when Dofasco was selected by the Dow Jones Sustainability Index as the global leader in the basic resources market sector.

Dofasco's facilities in Hamilton, Ontario, produce hot rolled, cold rolled, galvanized, Extragal™, Galvalume™, tinplate, chromium-coated and prepainted flat rolled steels, as well as tubular products.

We will have the opportunity to tour the Steelmaking Business Unit which includes a KOBM furnace, Ladle Refining Facility and Continuous Caster. Our tour will also include the DoSol Galva Line which produces galvanized steel for the automotive industry.

Siemens Westinghouse

Hamilton, Ontario Canada
Combustion Turbine Manufacturing and Industrial Turbines
Friday, May 23, 9:30 am (limited space - please register)

Combustion Turbine Manufacturing

The Hamilton Turbine Manufacturing and Service facility, established in 1903, focuses on gas turbine manufacturing and provides parts and service for mature frame gas turbines and industrial steam turbines. The employee population consists of 1,000 talented individuals challenged with meeting the demands of our customers. This 550,000 square foot facility is distinguished by a superior safety record and the organization is made up of process teams supported by business and engineering teams. Hamilton's Engineering Department, utilizing design expertise in a number of disciplines, provides our customers with unparalleled levels of quality in all stages of development.

Industrial Turbines

The Industrial Turbine group has a Regional Center of Competence located in Hamilton Canada and services North America and Westinghouse Turbines worldwide. This group is fully integrated into the Siemens Westinghouse and managed by the SWPC Diverse Business organization. The Industrial group provides turbines as generator sets and as mechanical drives. The main products and services include factory repairs and refurbishment of Westinghouse or Siemens turbines, services for Siemens and Westinghouse turbines 100MW or less, new Siemens Steam Turbines 100MW or less with or without generators, new Mechanical drives for process applications 2 - 100MW, and Boiler Feed Turbine pumps - turbine driven.

Companion Program

The Companion Program will involve scenic trips to the Niagara Region, St. Jacobs village and the Royal Botanical Gardens. A variety of activities are being planned and the Companion Program coordinator will work with the participants to plan the activities to suit the interests of the participants.

Niagara Falls

No trip to Canada is complete without a visit to the beautiful Niagara Falls area. A geological feature known as the Niagara Escarpment cradles the Niagara region in a beautiful setting of natural splendor. At the center of interest is the Falls itself, which consists of two cataracts: the Horseshoe, or Canadian, Falls (57 m/187 ft high), and the American Falls (55 m/182 ft high).

The region is known for its excellent cuisine, fine wines, as well as interesting shops and boutiques. The day will be planned to sample from many of the attractions that the Niagara region has to offer. More details on the Niagara region can be found at www.infoniagara.com

St. Jacobs

The village of St. Jacobs provides an excellent sample of what rural Ontario has to offer. The village is the center of commerce of a wide region of Mennonite farmers. It is known for its farmer's market as well as antiques, arts and crafts, heartwarming attractions and gracious hospitality. Information about St. Jacobs can be found at www.stjacobs.com

Hamilton's Royal Botanical Gardens

The Royal Botanical Gardens is made up of a collection of sites representing a cross section of the horticulture of the region. In May we expect that the Lilac Dell will provide stunning landscape and beautiful fragrances. Also, depending on the weather, the Iris and Peony displays in the Laking Garden may be in bloom. Please visit www.rbg.ca for more details.

Registration Fees

All fees are in U.S. dollars and payable to McMaster University. We accept VISA, MasterCard, checks, money orders, and purchase orders. Please complete one registration form per person. Companion Program participants should complete their own registration form. Make additional copies of the form as needed.

All fees except the companion registration include entrance to all technical sessions, all conference materials, publications, meal functions, laboratory tours and industry tours. Included in the companion registration fees are conference breakfasts, banquet and two receptions, and companion program tour (see Companion Program for details). There are no single-day registration fees. There are no reduced registration fees for authors or session chairs. A special student rate is offered to full-time students, and will include the proceedings and a special student barbeque dinner.

Cancellation and Refunds

Refunds, less an administrative fee of US \$100, will be issued for all cancellations received in writing with a postmark before May 9, 2003. No refunds will be made after that date, but a substitution of attendees may be made by notifying the Conferencing Center prior to the conference. Please allow six to eight weeks to receive check refunds. Credit card refunds will be issued to the credit card that had made payment. Should this event cancel in entirety, the University's liability is limited to a refund of the registration fees paid.

Lodging

A block of rooms is reserved at the Sheraton Hamilton Hotel, located just 5 km from campus. Reservations must be made before April 20, 2003 to guarantee the conference rate of CDN \$119/129 single/double. Be sure to mention "NAMRC" when making your reservation.

Sheraton Hamilton, 116 King Street West, Hamilton, Ontario

Toll Free: 1-800-514-7101

Tel: (905) 529-5515

Fax: (905) 529-8266

Underground parking with in/out privileges is available \$7.99 per night. A shuttle service will run daily from the hotel to the McMaster Campus. Rates for on-campus parking are \$12.00 per day.

A block of rooms has also been reserved on campus in one of McMaster's residences. Conference rates are CDN \$44.80/\$36.96 single/per-person double, and include parking.

Travel Information

Hamilton is conveniently located in the heart of Southeastern Ontario, one of Canada's most prosperous areas. The Great Lakes and the Niagara region are within easy drives, and the flight possibilities are excellent. The McMaster campus is a 45-minute drive from Toronto's Pearson International Airport, 25 minute drive from Hamilton's John C. Munro International Airport, and 90 minute drive from Buffalo Niagara International Airport.

Airport shuttle service has been arranged through Airways Transit, www.airwaystransit.com. Mention NAMRC to obtain the conference rate.

All international participants are responsible for their own visa and health insurance needs.

Climate: the average temperature in May is 70 degrees Fahrenheit. The temperature can drop in the evening, so you may want to bring a light jacket.

How to Register

Mail:

Complete the registration form at the back of this brochure and mail it with your payment using check, money order, or charge card number to

Janet Delsey
Faculty of Engineering – JHE-201A
McMaster University
1280 Main St. West
Hamilton, ON, Canada L8S 4L7
Fax: 905-577-9099

For More Information:

Visit the NAMRC 31 Web site: mmri.mcmaster.ca/namrc

Call: Janet Delsey, 905-525-9140, ext. 24910

Email: delsey@mcmaster.ca

Conference Registration Form

NAMRC 31 May 20-23, 2003, Hamilton, Ontario, Canada

Complete a form for each individual attending (including Companion Program Registrants)

Surname: _____ First Name: _____

Name to appear on nametag: _____

Professional Title: _____

Organization: _____

Address: _____

City: _____ State/Province: _____

Postal Code: _____ Country: _____

Day Phone: _____ Fax: _____

E-mail Address: _____

Dietary Restrictions/Special Needs: _____

Name of companion attending: _____

I will participate in the following activities:

- | | |
|--|---|
| <input type="checkbox"/> Companion Program | <input type="checkbox"/> Student BBQ - May 21 |
| <input type="checkbox"/> Welcome Reception - May 20 | <input type="checkbox"/> Warplane Museum Banquet - May 21 |
| <input type="checkbox"/> Dofasco Tour - May 20 | <input type="checkbox"/> Steam Museum Reception - May 22 |
| <input type="checkbox"/> Siemens Westinghouse Tour - May 23
(limited space) | |

I require auxiliary aids/services due to a disability. Please contact me.

Registration Fees

- | | |
|---|-----------|
| <input type="checkbox"/> Full Registration before May 1, 2003 | \$375 USD |
| <input type="checkbox"/> Student/Retiree Registration | \$125 USD |
| <input type="checkbox"/> Full Registration after May 1, 2003 | \$425 USD |
| <input type="checkbox"/> Companion Registration | \$155 USD |

TOTAL: _____

There will be a \$100 administration fee for cancellations made prior to May 9, 2003. There will be no refunds after May 9, however your registration may be transferred to another delegate.

Payment Method

Check (made payable to McMaster University) Money Order

Purchase Order # _____

Visa Mastercard Cardholder's Name: _____

Card Number: _____ Expiration Date: _____

Signature: _____

Mail or Fax form with payment to:

Janet Delsey
Faculty of Engineering, JHE-201A
McMaster University
1280 Main St. West
Hamilton, ON, Canada L8B 2L7
Tel: 905-525-9140, ext. 24910 Fax: 905-577-9099

Parking

Parking is available on campus for \$12.00 CDN per day. There will be a shuttle service from the Sheraton Hotel to campus.

FUTURE NAMRC HOSTS

NAMRC 32

June 1-4, 2004

The University of North Carolina at Charlotte
William States Lee College of Engineering
Charlotte, North Carolina, USA
Conference Co-Chairs, Robert G. Wilhelm and Scott Smith

NAMRC 33

May 24-27, 2005

Columbia University
School of Engineering and Applied Science
New York, New York, USA
Conference Chair, Y. Lawrence Yao

Are you interested in hosting a future NAMRC?

Since 1973, NAMRC has been held on the campus of a host institution to encourage dialogue between conference attendees and offer opportunities for tours of the host's laboratory and other research facilities. Institutions wishing to host a future NAMRC are encouraged to submit a proposal.

The Board of Directors of NAMRI/SME reviews proposals annually. Selections are usually made two to three years ahead to maximize planning and promotion of the conference. Operating procedures which detail the responsibilities of the host institution and the Society of Manufacturing Engineers are available. Submission of a written proposal and willingness to attend and present a brief overview and answer questions at the NAMRI/SME Board of Directors meeting is required.

The deadline for receipt of proposals is April 15 of each year. Proposals will be reviewed at the spring NAMRI/SME Board of Directors meeting held immediately prior to the opening of the NAMRC conference. For more information on hosting the conference and preparing the proposal, visit the NAMRI/SME web site at www.sme.org/namri or contact Marcie Colling, NAMRI/SME Association Manager. Email her at mcolling@sme.org or telephone at (313) 425-3223.

The Society of Manufacturing Engineers is the world's leading professional society supporting manufacturing education. Through its member programs, publications, expositions, and professional development resources, SME promotes an increased awareness of manufacturing engineering and helps keep manufacturing professionals up to date on leading trends and technologies. Headquartered in Michigan, SME influences more than half a million manufacturing engineers and executives annually. The Society has members in 70 countries and is supported by a network of hundreds of chapters worldwide. Visit us at www.sme.org.

Membership in NAMRI/SME

Senior or Affiliate membership in SME is necessary before an individual can be considered for membership in NAMRI/SME. Membership grades include Senior Member and Student Member.

Election to Senior Member requires approval of the NAMRI/SME Board of Directors. The candidate should complete an application demonstrating active participation in manufacturing or manufacturing research.

Student member grade requires an application demonstrating the SME qualification for student membership. Attendance at the annual NAMRC is also required.

Use the NAMRI/SME membership form located in the center of the brochure to apply. The membership form is also available on line at www.sme.org/namri.