MMRI CONNECTION

Connecting University, Industry, and Government October 2003

McMaster hosts North American Manufacturing Research Conference

Sponsored by MMRI, the 31st North American Manufacturing Research Conference (NAMRC) was held on the campus of McMaster University, May 20 – 23, 2003. MMRI was proud to host the prestigious international Conference this year, exactly 30 years after the very first NAMRC was held at McMaster University in 1973.

The conference brought together leading academic and industrial researchers from around the world to present and view the latest research in machining, metal forming, manufacturing systems, non-traditional manufacturing processes and micro-machining. A highlight of the technical sessions was a panel discussion on e-manufacturing which included experts from both university research labs as well as industrial suppliers and customers.

In addition to the technical presentations, the Keynote Address was "Steel: How to Make a Difference," delivered by Mr. Norm Lockington, Vice President of Dofasco, which described how Dofasco has come to prosper due to their focus on innovation in everything they do. We were also honoured to have Professor Lucjan Kops of McGill University give our Founder's Lecture. Professor Kops provided a career overview of manufacturing research and education, as well as his predictions for the future.

The organizing committee for this conference would like to acknowledge the tremendous support provided by McMaster University, MMRI, the student organizing committee, and especially Jan Delsey, our administrative assistant. Although seriously threatened by the Toronto SARS outbreak, the conference was a tremendous success because of the enormous efforts of all those involved. ■

Dr. Tim Nye
Co-Chair NAMRC31 Organizing Committee

CIRP workshop on machining models evokes fruitful discussion

The 6th CIRP International Workshop on Modeling of Machining Operations was held on May 20, 2003 at McMaster University. Workshop objectives were to: foster an open discussion on the state of development and application of machining models; identify promising directions for future research; and establish a dialogue between those who apply machining models to production processes/problems and model developers.

Following the welcome address by Chairman Professor Elbestawi, Organizing Committee Member Prof. Jawahir provided introductory remarks. The workshop had 4 sessions comprising 16 presentations in all, each of them delivered by the respective authors. Each presentation was allowed 20 minutes, with an additional 10 minutes for discussion. Professor Tom Childs (Leeds, UK), Professor Philip Mathew (New South Wales, Australia), Dr. Robert Ivester (National Institute of Standards and Technology, USA) and Dr. Jurgen Leopold (Chemnitz, Germany) served as the Session Chairs. All presentations were of exceptional quality and evoked fruitful discussions. At the closing session, Dr. Rob Ivester presented a report on the "Assessment of Machining Models" project that is an outcome of the previous workshops. Dr. Philip Mathew concluded the Workshop, by providing a Summary. It was the general feeling of the attendees that the workshop was exceedingly successful in terms of realizing the

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The McMaster Manufacturing Research Institute – one of the country's most advanced and best equipped research laboratories – combines research excellence with state-of-the-art equipment to meet the sophisticated research and development needs of leading manufacturers. Created in 2000 with more than $10 million in funding from its founding sponsors – the Canadian Foundation for Innovation (CFI), the Ontario Innovation Trust (OIT) and the Ontario Research and Development Challenge Fund (ORDCF) and industry partners – the MMRI provides a focus for high-profile research and serves as a vehicle for university-industry-government interaction. In addition, the institute promotes, encourages, and performs fundamental and applied research in cooperation with its industrial partners and provides systematic mechanisms for technology transfer and infusion of knowledge and research results.

For more information

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McMaster University

Foam plastics and advanced composites focus of Auto21 research at McMaster

As Canadians, we are all familiar with the"brain drain" phenomenon – the flight of scientific and technical talent to greener pastures south of the border. However, in the case of Dr. Michael Thompson, the expression "brain boomerang" might be more appropriate. A former undergrad and graduate student at McMaster, Dr. Thompson headed south to work as a Senior Process Engineer at Davis-Standard Corporation (in Pawcatuck, Connecticut) , one of the world's largest manufacturers of extrusion machinery for the plastics industry, but he returned again to his alma mater in 2001 to join the faculty as an assistant professor in the Department of Chemical Engineering.

During his three-year tenure at Davis-Standard, Dr. Thompson was involved in R&D in the areas of feed-screw and machinery design. Using the knowledge and practical experience he gained there, he is now helping his colleagues in the MMRI to develop manufacturing processes for foamed plastics, and an exciting new class of compounds called nanocomposites, which combine non-polymer compounds with polymers.

Foam Plastic

The McMaster research, which is part of the federal "Auto21" initiative, seeks ways to manufacture high-strength, impact-resistant, rust-resistant auto parts, using foamed plastic materials. Foamed plastic is a material produced by mixing gases with polymer to form a low-density product that is both light-weight and sturdy. A common example is Styrofoam™ (The Dow Chemical Company), used extensively in packaging in the food industry and consumer products. The goal of the Auto21 research is to manufacture higher-value-added products, such as auto parts, using this same process. By modifying the polymer to give the plastic greater strength, it should soon be possible to produce not only decorative components like dashboards, but load-bearing parts like running boards and floor panels.

The technology of foamed plastics has existed for some time, but the traditional manufacturing method employed Freon™ gas, which is now a banned substance due to its harmful effects on the ozone layer. Alternative foaming gases are available, but they are more difficult to mix with polymers,

Dr. Thompson with his new twin-screw extruding machine, a customized version of the standard production model.

which means extrusion machinery must be redesigned for cost-effective mass production.

Dr. Thompson's efforts received support recently from the Canada Foundation for Innovation (CFI), which provided a grant for the purchase of a new mixing machine that will allow his team to experiment with different gases and compounds. This "co-rotating intermeshing twin-screw extruder", which is a customized version of a standard production model, will be operational this fall.

Fuel Cells

Looking to the future, Dr. Thompson sees interesting possibilities for his research in the area of fuel cell design. The dream of a functional fuel cell vehicle has so far eluded researchers due to the technical difficulties and economic inefficiencies of current fuel cell technology. One of the stumbling blocks is the composition of the bipolar plates, a critical component that conducts the electrical current. The internal environment of a hydrogen fuel cell is extremely corrosive, causing metal plates to rapidly erode. An alternative material, carbon fibre, is resistant to corrosion, but expensive to make. A possible solution, according to Dr. Thompson, is to use *metallic nanocomposites*, which combine the corrosion-resistant properties of plastic with the conducting properties of metal, in a compound that is potentially less expensive to fabricate than carbon fibre.

The technical challenges of manufacturing metallic nanocomposites are immense – mixing thin strands of metal with long chain polymer molecules to form a homogeneous extrudable compound is currently very difficult. But the potential benefits of a clean, alternative fuel source are immense, making the challenge all the more interesting to researchers like Dr. Thompson. ■

For further information, please contact Dr. Michael Thompson, Assistant Professor, Department of Chemical Engineering, McMaster University, at mthomps@mcmaster.ca.

CIRP workshop

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set objectives.

Despite international concerns with SARS, the workshop drew 50 attendees from Australia, Canada, Germany, Spain, Sweden, United Kingdom and United States. Copies of the Proceedings can be obtained from Dr. Philip Koshy, *koshy@mcmaster.ca*.

The CIRP workshop was sponsored by: the International Institution for Production Engineering Research (CIRP), the North American Manufacturing Research Institution (NAMRI), Materials and Manufacturing Ontario (MMO), the Faculty of Engineering, McMaster University and the McMaster Manufacturing Research Institute (MMRI). ■

Dr. P. Koshy, Dr. E. Ng
Local Coordination Committee (McMaster University)

New Mechanical Engineering Chair sees exciting times ahead

Dr. Samir Ziada has seen the future, and it's filled with work!

As the new Chair of the Department of Mechanical Engineering, Dr. Ziada knows he will face many challenges over the next five years. These include the launch of several new undergraduate and graduate programs that will give McMaster students an opportunity to earn combined Masters and Bachelor degrees; new areas of research slated to begin in micromachining, casting, energy, biomechanics, and environmental design; and the hiring of faculty to meet the needs of rising student enrollment and expanding research initiatives.

Achieving these goals will not be easy, but Dr. Ziada is confident his department will succeed. While a lot of responsibility rests on his shoulders, he can count on the support of a dedicated staff and fellow faculty members, who have strong academic credentials and an abundance of hands-on industrial experience. Another source of strength is the department's close association with the MMRI, which Dr. Ziada describes as "one of the finest manufacturing institutes in the world". So, while the department's plans may be ambitious, there are many talented people who are determined to make them happen.

Energy and enthusiasm are valuable commodities in any organization. Dr. Ziada brings those qualities in abundance to his new job as Chair of the Department of Mechanical Engineering.

Best and brightest

In order to launch these new educational programs and research areas, qualified faculty must be recruited to lead them. Currently, Dr. Ziada is striving to fill three spots – one in Micromachining, another in Casting (the Braley Orlick Chair), and a third in Thermofluids. Filling these positions means searching for the best and brightest candidates in each field, and persuading them to come to McMaster. The competition can be fierce and the search, which usually involves a great deal of professional networking, can take a year or more.

Recruiting faculty "stars" requires fundraising too, as there is a need to finance the research activities they will oversee. Some of this may come from government sources, but gifts from industry are critical for many projects, such as the department's plan to establish a Design Chair.

An accomplished researcher himself, Dr. Ziada understands how important fundraising can be. In 1999 he received the Premier's Research Excellence Award, which helped to fund his own projects in the areas of vibration, acoustics and fluid flow. Currently, McMaster is negotiating the licensing of one of his patented inventions for industrial use. As the department chair, he finds himself helping to raise funds to support the research of others. There is less time now for his own research, as administrative duties and teaching demand most of his time. He takes pride in his role as an educator, and was recognized in 2000 by the McMaster Student Union, which awarded him its *Merit Award for Excellence in Teaching*.

Innovative Programs

Dr. Ziada is most passionate when talking about the innovative new programs he is helping to develop in Engineering. He points out that McMaster was the first university in Canada to introduce computer engineering in the early 1980s, and created one of the first software engineering programs in 1998. That program saw its first graduating class in the spring of 2001.

Currently, the Department is planning three new 5-year programs for combined B.Eng/M.Eng Degrees in Manufacturing, Design, and Biomechanics. The Manufacturing and Design programs will cross departmental boundaries – drawing on the resources of mechanical and chemical engineering, engineering physics, and material science. The Biomechanics program, which will be developed in close cooperation with the Faculty of Health Sciences of McMaster, will complement the recently-launched bioengineering program in the Department of Chemical Engineering and biomedical program in the Department of Electrical and Computer Engineering.

The development of these cross-disciplinary programs reinforces McMaster's reputation as one of Canada's most innovative universities in learning and research. They also provide new learning opportunities for students, helping to educate and inspire them to meet the challenges they will face as the leaders of tomorrow.

ANTEC 2003

Society of Plastic Engineers Annual Technical Conference

The Society of Plastic Engineers (SPE) Annual Technical Conference (ANTEC) is a major event looked forward to and well attended by plastic engineers and people working in the plastic industry from across North America, Europe and Asia. The site of this year's conference, held May 5-7, 2003, was Nashville, Tennessee and for members of CAPPA-D (Centre for Advanced Polymer Production and Design) of MMRI the event was a success.

David D'Agostino, shown here with Mr. Glenn Beall (Founder of the SPE Rotational Molding Division) accepts his Award for Best Rotational Molding related ANTEC Technical Paper presented by a student.

Dr. John Vlachopoulos, Director of CAPPA-D, and Dr. Michael Thompson, Assistant Professor, Chemical Engineering were involved in the Technical Program of the Extrusion Division. Elizabeth Takacs, Laboratory Manager, CAPPA-D, was the Technical Program Chair in the Rotational Molding Division and was responsible for organizing the Technical Program in the Rotational Molding Division. Three MMRI CAPPA-D graduate students also in attendance were Art Tinson, David D'Agostino, and Claude Xi.

Claude Xi presented a paper in the Extrusion Division titled: "Study of the Micropelletization Process" co-authored with Elizabeth Takacs, Mark Tate, Dr. Michael Thompson and Dr. John Vlachopoulos.

David D'Agostino presented a paper in the Rotational Molding division titled: The Effect of Coupling Agents on Foaming with Polymer Microspheres in Rotational Molding" co-authored with Elizabeth Takacs and Dr. John Vlachopoulos. We are proud to advise that David's paper won the Best Student Technical Paper Award in the Rotational Molding Division. ■

Elizabeth Takacs received an award for Outstanding Effort in organizing the Technical Program of the Rotational Molding Division. She is shown here accepting the award from Marshall Lampson, Rotational Molding Division Chairman.

Liburdi Engineering – CNC workshop

Jim McLaren, MMRI Machine Shop Technician was approached by Scott Hastie, an ex-grad student working at Liburdi Engineering, to present a basic CNC training workshop to Liburdi operators. Jim, who is also a part-time instructor at Mohawk College, provided the course outline to Liburdi on basic fundamentals of CNC, Cartesian coordinates, simple programming, and referencing Post Processors. The 2-day workshop also included hands-on training in the Machining Systems Lab.

Liburdi employees at the Workshop are pictured here (from left to right): Alan MacCrimmon, Craig Johnson, Tim Cole, Terrence Karley, Rene Sabido and Jim McLaren, Instructor.

SPE Industry-University night

The 5th Annual Society of Plastics Engineers Industry-University Night was held on March 20 with a great turn out of representatives from McMaster University, University of Toronto and University of Waterloo, highlighting current research projects. MMO gave an overview of Ontario Centres of Excellence. One of the presenters at the University Night was Professor Andrew Hrymak, Director of MMRI. In the Best Poster Competition, David D'Agostino, MMRI graduate student, was the 2nd Place ($200) winner for his entry: "Foaming with Microspheres in Rotational Molding".

Welcome to new MMRI staff

Dr. Gabriel Benga, Post Doctoral Fellow, awarded an NSERC 2003 NATO Science Fellowship, is from the University of Craiora, Romania. He was drawn to MMRI because of the major metal working facility, state of the art machine tools and metrology equipment.

The new micro-machining lab will challenge the limits of his previous research work in surface finish and dimensional precision. Under Dr. Elbestawi and Dr. Veldhuis, Gabriel is working in the areas of manufacturing processes, machining of difficult-to-cut materials, and optimization of manufacturing processes. ■