

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

*Thirty-Fifth North American
Manufacturing Research Conference*

NAMRC 35

An International Forum



May 22-25, 2007

Ann Arbor, Michigan, USA

Hosted by

University of Michigan

Department of Mechanical Engineering

Endorsed by the ASME Manufacturing
Engineering Division

SME NIST-ATP Technology Transfer Workshop
on Intelligent Optimization and Control of
Grinding Processes
May 25, 2007

<http://me.engin.umich.edu/NAMRC>



NAMRI 

North American Manufacturing
Research Institution of the
Society of Manufacturing Engineers

Dear Friends and Colleagues:

We are pleased to invite you to the University of Michigan for the 35th Annual North American Manufacturing Research Conference. Since 1973, NAMRC has served as the premier international forum for academic research and industrial applications in manufacturing where global academic and industrial leaders in manufacturing interact with each other and advance the field.

This year, 70 technical papers will be presented for discussion by researchers from universities, research institutes and industrial research laboratories located around the world. All of the complete manuscripts have been accepted for presentation at NAMRC 35 and for publication in the *Transactions of NAMRI/SME* based on a stringent peer-review process conducted by the Scientific Committee of the North American Manufacturing Research Institution of SME (NAMRI/SME).

Guests to NAMRC 35 will have full access to the University of Michigan campus and the cultural hallmarks of southeast Michigan. While participating in NAMRC 35 in Ann Arbor, we invite you to visit our new facilities that are part of a thriving nucleus of manufacturing research. In addition to over a dozen individual research programs, there are four major centers that are supported by industry, the National Science Foundation and other government agencies with research activities that either focus primarily on manufacturing or have manufacturing as a significant component.

Our Department of Mechanical Engineering is proud to host this premier gathering and we warmly welcome you. We invite you to contact us with any questions that you may have regarding the NAMRC 35 conference and look forward to seeing you in Ann Arbor.

Regards,

Steven J. Skerlos
NAMRC 35 Conference
Co-Chair
University of Michigan

S. Jack Hu
NAMRC 35 Conference
Co-Chair
University of Michigan

Elijah Kannatey-Asibu
NAMRC 35 Conference
Co-Chair
University of Michigan

NAMRC—An International Forum

NAMRC is an international forum for the presentation and critical discussion of results from 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 35 you will:

- gain insight into 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 35 Organizing Committee thanks our sponsors as of March 1, 2007: the Department of Mechanical Engineering at The University of Michigan, The University of Michigan Program in Manufacturing, the Joel D. Tauber Institute for Global Operations (formerly the Tauber Manufacturing Institute), Ford Motor Company, DaimlerChrysler, General Motors, Chicago Mercantile Exchange and John Deere. Please see the complete list of sponsors on our Web site: <http://me.engin.umich.edu/NAMRC/>.



Conference Publication

Papers accepted for and presented at NAMRC 35 are contained in the hardbound *Transactions of NAMRI/SME*, Volume 35, 2007. Participants who have paid the full registration fee will receive a copy at the time of registration along with a CD of the papers. Additional copies and past volumes (as available) of the *Transactions* may be purchased by contacting an SME Customer Service Representative at 313.271.1500, ext. 4500 or 800.733.4763.

2006/2007 NAMRI/SME Board of Directors

PRESIDENT

Steven Y. Liang

Georgia Institute of Technology

PAST PRESIDENT

Ralph Resnick

The ExOne Company

PRESIDENT ELECT

Thomas R. Kurfess

Clemson University

DIRECTORS

Thomas S. Babin

Motorola Corporation

Jian Cao

Northwestern University

Jay S. Gunasekera

Ohio University

Steven Hayashi

GE Global Research Center

Jack Jeswiet

Queen's University

E. Jennings Taylor

Faraday Technology, Inc.

SECRETARY

K. Scott Smith

University of North Carolina at Charlotte

SCIENTIFIC COMMITTEE CHAIR

Y. Lawrence Yao

Columbia University

NAMRC 35 Organizing Committee

University of Michigan

Steven J. Skerlos, Mechanical Engineering

(Co-Chair)

S. Jack Hu, Mechanical Engineering

(Co-Chair)

Elijah Kannatey-Asibu, Jr., Mechanical Engineering

(Co-Chair)

Suman Das, Mechanical Engineering

Yoram Koren, Mechanical Engineering

Jyotirmoy Mazumder, Mechanical Engineering

Khalil Najafi, Electrical Engineering and Computer Science

Jun Ni, Mechanical Engineering

Amit Ghosh, Materials Science and Engineering

Jianjun Shi, Industrial and Operations Research

Albert Shih, Mechanical Engineering

Dawn Tilbury, Mechanical Engineering

Henry Wang, Chemical Engineering, Biomedical Engineering

Graduate Student Leadership Organizing Committee

April Bryan, Mechanical Engineering

Angela Park, Mechanical Engineering

Bin Shen, Mechanical Engineering

Liang Zhou, Mechanical Engineering

2007 NAMRI/SME Scientific Committee

CHAIR

Y. L. Yao
Columbia University
2007, 2008

MEMBERS

J. Agapiou
General Motors Corporation
2007, 2008

T. Altan
Ohio State University
2007, 2008, 2009

T. Babin
Motorola Corporation
2007, 2008, 2009

C. Brown
Worcester Polytechnic
Institute
2007, 2008

J. Cao
Northwestern University
2007

D. Dornfeld
University of California-
Berkeley
2007, 2008

N. Duffie
University of Wisconsin-
Madison
2007, 2008

K. Ehmann
Northwestern University
2007, 2008

M. Elbestawi
McMaster University
2007, 2008

W. Endres
Michigan Technological
University
2007, 2008

N. Fang
Utah State University
2007

B. Fussell
University of New Hampshire
2007, 2008

J. Gunasekera
Ohio University
2007, 2008, 2009

Y. Guo
University of Alabama
2007

S. Hayashi
GE Global Research Center
2007, 2008, 2009

R. Ivester
NIST
2007, 2008, 2009

R. Jerard
University of New Hampshire
2007, 2008

J. Jeswiet
Queen's University
2007

S. Kapoor
University of Illinois at
Urbana-Campaign
2007, 2008

T. Kurfess
Clemson University
2007, 2008

P. Kwon
Michigan State University
2007

G. Lahoti
The Timken Company
2007, 2008

S. Liang
Georgia Institute of
Technology
2007, 2008

D. Lucca
Oklahoma State University
2007, 2008

I. Marinescu
University of Toledo
2007, 2008, 2009

S. Melkote
Georgia Institute of
Technology
2007, 2008, 2009

B. Ozdoganlar
Carnegie Mellon University
2007, 2008

J. Patten
Western Michigan University
2007

Z. Pei
Kansas State University
2007, 2008, 2009

K. Rajurkar
University of Nebraska-
Lincoln
2007, 2008

R. Resnick
The ExOne Company
2007, 2008, 2009

J. Roth
Penn State Erie,
The Behrend College
2007, 2008, 2009

T. Schmitz
University of Florida
2007

C. Shen
General Motors Corporation
2007, 2008

A. Shih
University of Michigan
2007, 2008, 2009

S. Smith
University of North Carolina
at Charlotte
2007, 2008, 2009

A. Srivastava
TechSolve
2007

D. Stephenson
Third Wave Systems, Inc.
2007

R. Stevenson
GM Research &
Development Center
2007, 2008

D. Storti
University of Washington
2007, 2008

J. Sutherland
Michigan Technological
University
2007, 2008

E.J. Taylor
Faraday Technology, Inc.
2007, 2008, 2009

J. Wang
Texas A&M University
2007

L. Wang
National Research Council
of Canada
2007

B. Wei
GE Global Research Center
2007

R. Wilhelm
University of North Carolina
at Charlotte
2007, 2008, 2009

R. Williams
University of Nebraska-
Lincoln
2007, 2008

W. Winfough
Ameri-Forge
2007

J. Ziegert
Clemson University
2007, 2008

GUEST REVIEWERS

S. Anand
University of Cincinnati

S. Bukkapatnam
Oklahoma State University

S. Chen
University of Texas at Austin

D.-W. Cho
Pohang University of Science
& Technology

S.-C. Chung
Hanyang University

R. Gao
University of Massachusetts

S.J. Hu
University of Michigan

E. Kannatey-Asibu, Jr.
University of Michigan

B. Kinsey
University of New Hampshire

Y-S. Lee
North Carolina State
University

W. Li
University of Washington

X. Li
University of Wisconsin-
Madison

S. Luckey
Ford Motor Company

P. Molian
Iowa State University

T. Ozel
Rutgers University

B. Paul
Oregon State University

M. Ramulu
University of Washington

J. Rice
Marquette University

Steven Schmid
University of Notre Dame

J. Shi
University of Michigan

Y. Shin
Purdue University

S. Skerlos
University of Michigan

M. Sundaram
University of Nebraska-
Lincoln

P. Wright
University of California-
Berkeley

R. Wysk
Pennsylvania State University

Y. Zhang
University of Kentucky

S. Zhou
University of Wisconsin-
Madison

Conference Site & Facilities

The University of Michigan, one of the oldest public institutions in the country, was founded in 1817 in Detroit and moved to Ann Arbor in 1837. Ann Arbor, a university town of 110,000, is located 40 miles west of Detroit along the banks of the Huron River. Regularly listed among the best places to live, Ann Arbor's cosmopolitan ambiance is matched only by its classic small-town charm. The quality of its academic programs places the University of Michigan among the top 10 colleges and universities nationwide. It is recognized across the country as a center of cultural leadership as well as a voice for academia.

The College of Engineering, currently in its 153rd year, maintains a strong tradition as one of the top engineering schools in the world for education and research. In Fall 2005, there were more than 2,500 graduate and nearly 5,000 undergraduate students enrolled in the College. Set apart by its scale and scope of inquiry, the College is expanding its leadership with assets that include:

- Annual research expenditures of \$131 million in FY04
- Two prestigious National Science Foundation Engineering Research Centers
- Eleven top-ranked academic departments, six interdisciplinary professional programs and one of the world's most collaborative research communities
- A new computer science and engineering building serving as the meeting location for NAMRC 35

The University of Michigan has an extensive research program in manufacturing. In addition to more than a dozen individual research programs, there are four major centers with research activities that either focus primarily on manufacturing or have manufacturing as a significant component. These are the:

- Engineering Research Center for Reconfigurable Manufacturing Systems
- Engineering Research Center for Wireless Integrated Microsystems (ERC/WIMS)
- S.M. Wu Manufacturing Research Center
- General Motors Collaborative Research Laboratory (GMCRL)

In addition to these research activities, the University of Michigan also has extensive programs in manufacturing education, both at the graduate and undergraduate levels. These include the:

- Undergraduate Manufacturing Systems Concentration in Mechanical Engineering
- Graduate Program in Manufacturing
- Joel D. Tauber Institute for Global Operations (formerly the Tauber Manufacturing Institute)

Special Activities

In connection with NAMRC 35:

- NAMRI/SME Board Meeting, Tuesday, May 22, from 8:30 a.m. to 3:30 p.m. in the GM Board Room of the Lurie Engineering Building
- U of M Manufacturing Research Lab Tours on Tuesday, May 22, from 4:00 to 6:00 p.m. and on Friday, May 25, from 12:30 to 3:00 p.m.
- Welcoming Reception and Registration on Tuesday, May 22, from 6:00 to 8:00 p.m. at the Holiday Inn North Campus (main conference hotel)
- Welcoming Ceremony and Keynote Address on Wednesday, May 23, from 8:00 to 10:00 a.m. at the North Campus Chesebrough Auditorium
- NAMRI/SME Awards Luncheon on Wednesday, May 23, from Noon to 1:30 p.m. in Tishman Hall, Computer Science and Engineering (CSE) Building Atrium
- Manufacturing Education Lecture and Q&A with Frank Mayadas (Program Director, Alfred P. Sloan Foundation), Wednesday, May 24, from 4:00 to 6:00 p.m. at the Lydia Mendelssohn Theatre in the Michigan League
- NAMRC Banquet on Wednesday, May 24, from 6:00 to 9:00 p.m. in the Ballroom of the Michigan League
- Founder's Lecture by Marvin F. DeVries, Emeritus Professor, University of Wisconsin-Madison, on Thursday, May 24, from Noon to 1:30 p.m. in the Michigan Union Ballroom
- NAMRI/SME meeting on Thursday, May 24, from 3:30 to 4:30 p.m. in 1670 CSE Building
- ASME/MED membership meeting on Thursday, May 24, from 4:30 to 5:30 p.m. in 1670 CSE Building
- Parallel event KorenFest from 5:30 to 10:00 p.m. on Thursday, May 24. See Web site for details and registration (<http://erc.engin.umich.edu/KorenFest.htm>)
- SME NIST-ATP Technology Transfer Workshop on Intelligent Optimization of Grinding Processes from 1:00 to 5:00 p.m. Separate registration required.
- Golf outing at the Alister MacKenzie UM Golf Course at 12:30 p.m. on Friday, May 25
- Industrial tour at the Ford Rouge Plant starting at 12:30 p.m. on Friday, May 25
- Companion program tentatively including Auto Baron Home Tours (Wednesday, May 23), a Walking Tour of Ann Arbor and U of M (Thursday, May 24), and trip to the Jiffy Mix factory (Friday, May 25)

Student Research Presentation Contest

NAMRC 35 will host the third Student Research Presentation Contest to recognize contributions to NAMRC and to encourage students to pursue a career in manufacturing research, which is of vital importance to the long-term goals of the manufacturing community. The contest is based on the student's oral presentation of a paper that he or she coauthors. The student presentations will be part of regular technical sessions and have the same time limitation. The presentations will be judged by a panel comprised of NAMRI/SME Honors Committee members or their delegates. The judges will not judge their own students. The judgment will be primarily based on clarity of presentation, including oral expression and use of visual aids. Originality and scientific merit of material presented may also be taken into account. First, second and third-place winners will be announced at the NAMRI/SME General Membership Meeting on Thursday, May 24, 2007.

Laboratory and Campus Tours

Tuesday, May 22, 4:00–6:00 p.m. and Friday, May 25, 12:30–3:00 p.m.

NAMRC 35 will provide tours of the following research laboratories as well as other manufacturing-related facilities located on campus. You may also want to take a tour of the University of Michigan campus on your own. Maps of the campus will be provided in your registration packet. The tentative tour plan is provided below.

Tour Stop	Lab	Building	Focus
1	Integrated Manufacturing Systems Lab	Dow	Intelligent maintenance, tools, e-manufacturing
2	S.M. Wu Manufacturing Research Lab	Dow	Drilling, micro/meso-scale machining, micro engine, EDM, grinding
3	Engineering Research Center for Reconfigurable Manufacturing Systems	Dow	Reconfigurable machine tools, measurement machines and manufacturing systems
4	Center for Laser Aided Intelligent Manufacturing	GG Brown	Laser deposition, surface conditioning, machining and welding
5	Environmental and Sustainable Technologies Lab	GG Brown	Manufacturing fluid formulation and evaluation; microbiological and chemical analysis.
6	GM Collaborative Research Lab on Advanced Vehicle Manufacturing	GG Brown	Automotive assembly, welding, forming and system research
7	Engineering Research Center for Wireless Integrated Microsystems	EECS	Design and manufacturing of precision sensors, micropower circuits, wireless interfaces and wafer-level packaging.

Additional tours of the Lay Automotive Research Center, Fuel Cell Control Systems Lab and Center for Ultra Fast Optical Science at University of Michigan North Campus can also be arranged on request of individual participants.

Engineering Research Center for Reconfigurable Manufacturing Systems (ERC/RMS)

Reconfigurable manufacturing—a living, evolving factory—is increasingly recognized today as a requirement for industrial growth in a global economy. Next-generation manufacturing systems will be those whose production capacity can be rapidly adjusted to fluctuations in product demand and whose functionality can be cost-effectively adapted to new products from a given product family. The Center's research is therefore organized into four thrust areas: (1) System-Level Design, (2) Machine/Control Design, (3) Ramp-Up and Diagnostics and (4) Responsive Maintenance. Integration among research projects is established within a research testbed.

Center participants include about 20 faculty, 10 research scientists, 40 graduate and more than 40 undergraduate students from the Mechanical, Industrial, and Electrical Engineering and Computer Science Departments, as well as from the Business School and the School of Art and Architecture. Each project has an advisory team of industrial partners.

Engineering Research Center for Wireless Integrated Microsystems (ERC/WIMS)

The WIMS Engineering Research Center is focused on the intersection of three key areas: microelectronics, wireless communications and microelectromechanical systems (MEMS). The WIMS Center is devoted to making these microsystems a reality by developing the technology base needed to produce them, including precision sensors, micropower circuits, wireless interfaces and wafer-level packaging. It is also developing the interdisciplinary educational programs that will produce engineering leaders for the emerging microsystems field. And finally, the center is studying the societal impacts that these developments will have on how we live.

The research program of the WIMS ERC is divided into five thrust areas dealing with: Micropower Integrated circuits, Biomedical Sensors and Subsystems, Environmental Sensors and Subsystems, Micropackaging and Wireless Interfaces. These thrusts span the topics necessary to realize the intended microsystems and are all made interdependent by the system requirements of small size, low power, high accuracy, and long range.

S.M. Wu Manufacturing Research Center (WuMRC)

The S.M. Wu Manufacturing Research Center is a College of Engineering Center with participating faculty and researchers from the Departments of Mechanical Engineering (ME) and Industrial and Operations Engineering (IOE). The WuMRC also has ties with over 60 industrial partners, including General Motors, DaimlerChrysler, Ford, Boeing and many of their suppliers. In addition, many of the research projects have been supported by various government agencies including National Science Foundation, National Institute of Standards and Technology (ATP Programs), Department of Defense and Department of Energy.

Research activities at the Center address a number of innovative issues in manufacturing and can be grouped under the following thrust areas:

- Laboratory for Assembly and Materials Joining
- Laboratory for Dimensional Measurement
- Laboratory for Drill Research
- Laboratory for In-Process Quality Improvement
- Laboratory for Machine Tools and Machining
- Laboratory for Sheet Metal Stamping and Material Forming
- The Center for Intelligent Maintenance Systems, co-established by the University of Michigan and the University of Wisconsin–Milwaukee, is a national resource for research, technology evaluation and deployment, education and information transfer. It plays a key role in serving the mutual interests of private industry, government agencies and academia.

Laboratory and Campus Tours (cont.)

General Motors Collaborative Research Laboratory (GMCRL)

The General Motors Collaborative Research Laboratory at the University of Michigan was established to support a long-term, strategic and productive relationship between GM Research & Development Operations and the College of Engineering at the University of Michigan. The University of Michigan hosts three such laboratories:

- Engine System Research
- Advanced Vehicle Manufacturing
- Sensors and Smart Materials

The Manufacturing CRL includes research projects in forming, welding/joining, manufacturing systems and product variety.

Industrial Tour: Sustainable Manufacturing at the Ford Rouge Plant

The once-mighty Ford Rouge factory has not been immune to the ravages of time. And today, people in every corner of the world are worried about natural resource depletion. But instead of abandoning the aging brownfield site, Ford is revitalizing the Rouge in ways that are good for business as well as the environment. In doing so, Ford is proving that environmentally sound manufacturing processes can, in fact, be profitable. Ford's approach, often referred to as sustainable design, might also be described as high-performance design. A high-performance building will:

- Lower annual energy costs
- Lower long-term maintenance costs
- Use non-toxic, easily recycled materials
- Create healthier work environments
- Improve employee productivity
- Attract talented recruits
- Improve market image
- Help protect the environment

By combining emerging technologies with timeless understandings, Ford is cleaning storm water and renewing degraded soil using natural processes, bringing daylight and fresh air back into the factory and much more.

The Rouge is not only being rebuilt, it's being "re-imagined" as a model of sustainable manufacturing—a workplace that helps protect the environment for future generations while it inspires a new paradigm for economic growth.

Companion Program

A variety of activities are being planned, and the participants will be consulted regarding an itinerary of activities that best suit their interests. The plan will be modified per the interests of the companion program participants. The tentative plan is as follows:

Auto Baron Home Tours (Day 1)

We plan a full-day tour of two of the following three houses, including lunch. *Fair Lane* (Dearborn, Mich.) is Henry and Clara Ford's 31,000 sq ft mansion built in 1914 in a blend of late English Gothic and Prairie style. *Meadow Brook Hall* (Rochester, Mich.) is an 80,000 sq ft Tudor-revival mansion built in the late 1920s for the widow of the auto pioneer John Dodge. The *Edsel and Eleanor Ford House* in Grosse Pointe Shores, Mich., is a 60-room Cotswold-style mansion built in 1929.

City Highlights (Day 2)

Short walking tours of campus including the Law Quad, Michigan Union and one or more campus museums. Tour of Kerry Town. Lunch on Main Street in downtown. Afternoon at the Botanical Gardens and Arboretum, weather permitting. Possible free time for shopping.

Jiffy Baking Mix Factory (Day 3)

Slide show presentation, walk-through of the packaging plant and refreshments. One and one-half hour tour. Located in Chelsea, Mich. (20 minutes from Ann Arbor).

Registration Fees

To register by fax or mail, fill out the registration form in the back of the brochure (page 31) and return a completed copy to our office. Faxed registrations must include credit card number and signature; keep your original if you register by fax. Payment must accompany registration. Payments are accepted via VISA, Amex, Discover, MasterCard, check, money order or purchase orders. Make checks/money orders payable to University of Michigan and mail them to Conference Services, 627 Oxford Road, Vandenberg Hall, Ann Arbor, MI 48104-2634.

All fees are in U.S. dollars. 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 and laboratory tours. Included in the companion registration fees are conference breakfasts, banquet and two receptions; and companion program tour (see Companion Program for details). Industry tours are charged separately to cover transportation costs. There are no single-day registration fees. There are no reduced registration fees for authors or session chairs. Student attendees do not receive the *Transactions of NAMRI/SME*.

Register online at: <http://conferences.housing.umich.edu/NAMRC>.

Cancellation and Refunds

Refunds, less an administrative fee of US \$100, will be issued for all cancellations received in writing before May 18, 2007. No refunds will be made after that date, but a substitution of attendees may be made by notifying Conference Services 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. Those who register but fail to cancel by the deadline and do not attend the conference will not be eligible for a refund. Should this event cancel in entirety, the University's liability is limited to a refund of the registration fees paid.

Travel and Accommodation Information

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

Holiday Inn near the University of Michigan (main conference hotel)

3600 Plymouth Road • Ann Arbor, Michigan 48105

Tel: 734.769.9800 • Fax: 734.761.1290

Toll Free: 800.800.5560

<http://www.hiannarbor.com/location.php>

NAMRC35 Room Rate (Single/Double): \$89/night – Prior to April 24, 2007

Hawthorn Suites

3535 Green Court • Ann Arbor, MI 48105

Tel: 734.327.0011 • Fax: 734.327.6109

<http://www.hawthorn.com/reservations/locationdetail.asp?facid=346>

NAMRC35 Room Rate (One Bedroom Suite): \$98/night – Prior to April 24, 2007

Microtel Inn and Suites

3610 Plymouth Rd • Ann Arbor, MI 48105

Tel: 734.997.9100 • Fax: 734.997.9012

<http://www.microtelannarbor.com/>

NAMRC35 Room Rate: \$55/night (single) \$65/night (double) – Prior to April 24, 2007

Visit the NAMRC 35 Web site at <http://me.engin.umich.edu/NAMRC> for more information about:

- Dining near Conference Hotels
- Ann Arbor Commerce and Attractions
- Other Area Hotels

Explore Ann Arbor

City parks and lakes and recreational areas to the north of the city provide year-round outdoor recreation. There is a rich program of cultural events in the city, ranging from the celebrated May Festival and Summer Art Fair to programs presented by touring artists and orchestras. As a cultural center, Ann Arbor is also home to regular visits by professional opera, ballet and dance companies as well as art exhibits and motion pictures.

More on Ann Arbor Commerce at <http://www.annarbor.org>

More on Ann Arbor History at http://en.wikipedia.org/wiki/Ann_Arbor_Michigan

Directions to Campus

Ann Arbor is located approximately 25 minutes west from Detroit Metropolitan Airport (DTW) on Interstate 94. From I-94, exiting northbound on U.S. 23 and traveling 3 miles brings you to Plymouth Road where the conference hotels are located (just west of the exit). The conference hotels are approximately 2 miles from the North Campus where the technical sessions are located. Busing from the conference hotels to the event will be provided.

By Car

Computer Science and Engineering (CSE) Building, 2260 Hayward Street , Main Atrium

- Exit 180 from I-94 onto Northbound US 23
- Take Exit 41 off of US 23 onto Plymouth Road.
- Travel west to Murfin and turn left (at traffic light).
- Travel two blocks and turn left on Hayward.
- The first driveway on the right is the parking lot of the CSE Building

By Air

Over the last few years, Detroit Metropolitan Wayne County Airport (DTW) has undergone a dramatic transformation with a new terminal; a sixth runway; a south entrance road; new parking garage; and a luxury-class Westin Hotel. Visit www.metroairport.com.

Cab/Taxi

Detroit Metro Airport (DTW) is about a 25-minute cab ride to campus and the Holiday Inn (conference main hotel). The airport's taxi stand can be found by following signs from the luggage claim.

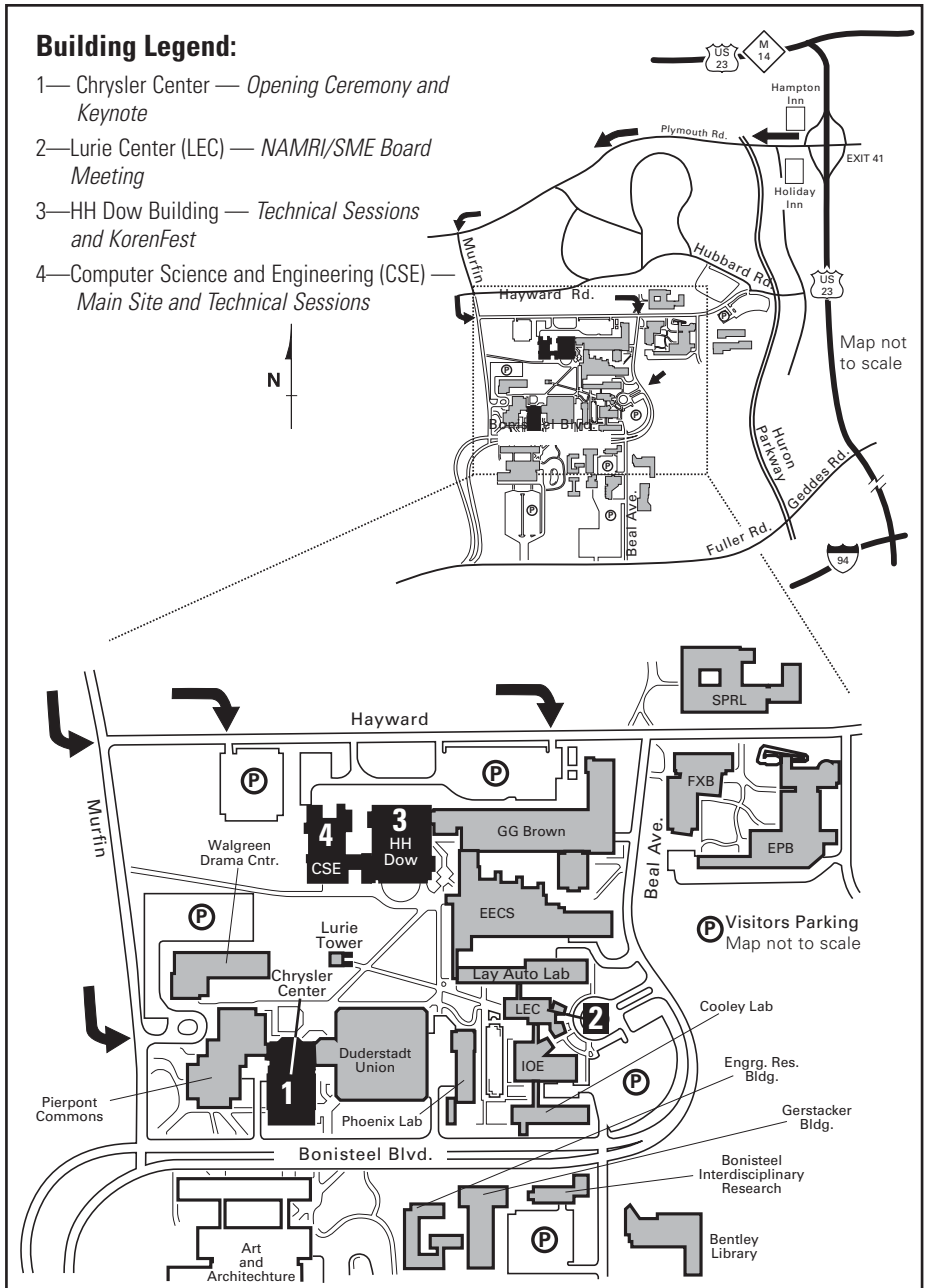
For other modes of transportation and information, visit
www.annarbor.org/visitors_guide/transport.asp

Visitor Parking

Those not staying at the Holiday Inn have the option to use the conference transportation, which departs and returns to the main conference hotel on a periodic basis. Parking is available at the Holiday Inn. Anyone wishing to drive to the technical sessions at the Computer Science and Engineering Building must obtain a parking pass. This parking pass is only valid for the CSE parking lot and costs \$9 per day. Parking passes are obtained from the registration desk, or can be ordered along with your conference registration and will be included in your conference pack. The parking pass must be hung from the rear-view mirror of your vehicle.

North Campus Map

An interactive campus map can be found at www.engin.umich.edu/facilities/tour



Climate

The average high temperature in May is 70 degrees Fahrenheit. The average low is 48 degrees Fahrenheit. The temperature can drop in the evening, and significant deviations from high/low averages can exist. Please check the weather forecast for the area before leaving for your visit to Ann Arbor.

How to Register - Mail, Fax, or Online

Online registration at: <http://me.engin.umich.edu/NAMRC>

For mail or fax, complete the registration form at the back of the program brochure.

If mailing, send the completed form with your payment to:

University of Michigan Conference Services
627 Oxford Road
Vandenberg Hall
Ann Arbor, MI 48104-2634

If faxing, please fax with your payment information to:

University of Michigan Conference Services
734.764.1557

For information regarding the conference registration process, please contact U-M Conference Services at 734.764.5297 or at conferences@umich.edu.

NAMRC 35

Technical Sessions and Programs

TUESDAY, MAY 22, 2007

8:30 a.m. – 3:30 p.m.

NAMRI/SME Board Meeting

GM Board Room, Lurie Engineering Center, UM North Campus

4:00 p.m. – 6:00 p.m.

Manufacturing Laboratory Tours

Meet at Tishman Hall, Computer Science and Engineering Building, UM North Campus

6:30 p.m. – 8:30 p.m.

Conference Registration and Welcoming Reception

Holiday Inn Ballroom

WEDNESDAY, MAY 23, 2007

7:00 a.m. – 8:00 a.m.

Registration and Breakfast

Chesebrough Auditorium Lobby, Chrysler Center, UM North Campus

8:15 a.m. – 10:00 a.m.

Welcoming Ceremony

Chesebrough Auditorium, Chrysler Center, UM North Campus

10:00 a.m. – 10:30 a.m.

Morning Coffee Break

Tishman Hall, Computer Science and Engineering Building Atrium, UM North Campus

10:30 a.m. – Noon

Concurrent Technical Sessions

Session 1-A: Machining Process Analysis

Room 1670, Computer Science and Engineering Building

Co-Chairs: John Patten, Western Michigan University

Yadong Liu, University of California, Davis

*Study of Heat Partition at the Primary Shear Plane Using Finite Element Analysis of Heat and Mass Transfer**

A. Deshpande, V. Madhavan

3-D FEA of Hard Turning: Investigation of PCBN Cutting Tool Micro-Geometry Effects

Y. Karpat, T. Özel

*An Experimental Investigation of Material Removal Rate in Polishing of Silicon Wafers**
X.H. Zhang, Z.J. Pei, M. Esayanur, G.L. Bowers, G.R. Fisher

Session 1-B: Manufacturing Systems 1: Planning and Design

Room 1690, Computer Science and Engineering Building

Co-Chairs: Satyandra Gupta, University of Maryland
Theodor Freiheit, University of Calgary

GA-Based Adaptive Setup Planning with Machine Tool Capability and Availability
N. Cai, L. Wang, H-Y. (Steve) Feng

*A Scheduling Algorithm for Dynamic Distributed Manufacturing Maintenance**
C. Wang, H. Ghenniwa, W. Shen

*Adaptive Production Scheduling for One-of-a-Kind Production with Mass Customization**
W. Li, X. Luo, Y. Tu, D. Xue

Session 1-C: Material Behavior in Machining and Forming

Room 1013, Dow Building

Co-Chairs: Albert Shih, University of Michigan
Kevin Chou, University of Alabama

Prediction of White Layer in Turning of 1045 Annealed Steel Including Thermo-Mechanical Effects
S. Han, S. Subbiah, S.N. Melkote

Formability of Porous Tantalum Sheet Metal
P.S. Nebosky, S.R. Schmid

*Particle Rotations During Plastic Deformation in Hard Turning and Grinding**
S. Anurag, Y.B. Guo

Noon – 1:45 p.m.

NAMRI/SME Awards Luncheon

Tishman Hall, Computer Science and Engineering Building Atrium

2:00 p.m. – 3:30 p.m.

Concurrent Technical Sessions

Session 2-A: Modeling and Simulation of Machining

Room 1670, Computer Science and Engineering Building

Co-Chairs: Ciro Rodriguez, Tecnologico de Monterrey
Andres Clarens, University of Michigan

*Finite Element Modeling of High-Throughput Drilling of Ti-6Al-4V**
R. Li, A.J. Shih

NAMRC 35 Program-at-a-Glance

Hosted by Department of Mechanical Engineering,
University of Michigan • Ann Arbor, MI, USA

	MORNING			AFTERNOON				EVENING		
Tuesday May 22	<i>NAMRI/SME Board Meeting</i> (8:30 a.m. – 3:30 p.m.) GM Board Room in Lurie Engineering Center			<i>NAMRI/SME Board Meeting</i> (8:30 a.m. – 3:30 p.m.) GM Board Room in Lurie Engineering Center <i>UM Lab Tours</i> (4:00 – 6:00 p.m.) Bus from Holiday Inn at 3:30 p.m. to CSE Atrium				<i>Registration</i> Holiday Inn Lobby 6:00–8:00 p.m. <i>Reception</i> Holiday Inn • Ballroom 6:00–8:00 p.m.		
	8:30 a.m. 6:00 p.m.									
Wednesday May 23	<i>Registration & Breakfast</i> Chesebrough Lobby 7:00 – 8:00 a.m.	<i>Welcoming Ceremony</i> Chesebrough Auditorium 8:15 – 10:00 a.m.	<i>Morning Coffee Break</i> Tishman Hall (CSE) 10:00 – 10:30 a.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1013 Dow 10:30 a.m. – Noon	<i>Awards Luncheon</i> Tishman Hall (CSE) Noon – 1:45 p.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 1013 Dow 2:00 – 3:30 p.m.	<i>Afternoon Coffee Break</i> Tishman Hall (CSE) 3:30 – 3:45 p.m.	<i>Bus Xportation</i> CSE to Michigan League 3:45 – 4:15 p.m.	<i>Lecture/Q&A Mfg Education</i> Mendelssohn Theater at Michigan League 4:30 – 6:00 p.m.	<i>Banquet</i> Ballroom at Michigan League 6:00 – 10:00 p.m.
Thursday May 24	<i>Registration & Breakfast</i> Tishman Hall (CSE) 7:00 – 8:00 a.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 8:00 – 9:30 a.m.	<i>Morning Coffee Break</i> Tishman Hall (CSE) 9:30 – 9:45 a.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 1013 Dow 9:45 – 11:45 a.m.	<i>Founder's Lecture and Luncheon</i> Roundtrip Bus CSE to Michigan Union 11:45 a.m. – 1:30 p.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 2:00 – 3:30 p.m.	<i>NAMRI/SME Membership Meeting</i> 1670 CSE 3:30 – 4:30 p.m.	<i>ASME Membership Meeting</i> 1670 CSE 4:30 – 5:30 p.m.	<i>Special Event: KorenFest*</i> 5:30 — 10:00 p.m. -or- Return to Holiday Inn 5:30 p.m.	
Friday May 25	<i>Registration & Breakfast</i> Tishman Hall (CSE) 7:30 – 8:30 a.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 8:30 – 10:00 a.m.	<i>Morning Coffee Break</i> Tishman Hall (CSE) 10:00 – 10:30 a.m.	<i>Concurrent Sessions</i> 1670 CSE 1690 CSE 1005 Dow 10:30 a.m. – Noon	<i>Closing Ceremony and Box Lunch</i> Tishman Hall (CSE) Noon – 12:30 p.m.	<i>SME NIST-ATP Technology Transfer Workshop on Intelligent Optimization and Control of Grinding Processes</i> 1:00 – 5:00 p.m. Meet in CSE Atrium at 12:30 p.m. for: <i>Industry Tour at Ford Rouge Plant</i> — Arrive DTW Airport by 5:30 p.m. <i>Laboratory Tours</i> — Return to Holiday Inn at 3:00 p.m. <i>Golf at Alister MacKenzie UM Golf Course</i> — Return to Holiday Inn by 6:00 p.m. Special Event Details at http://me.engin.umich.edu/NAMRC				

Detailed information about the conference program and schedule may be found on the NAMRC 35 Web site at <http://me.engin.umich.edu/NAMRC>.

*Separate registration is required for KorenFest. For KorenFest registration: <http://erc.engin.umich.edu/KorenFest.htm>

OVERVIEW OF TECHNICAL SESSION TRACKS AND SCHEDULE

	Machining (1670 CSE)	Forming (1690 CSE)	Mfg. Systems (1690 CSE)	Assembly (1005 Dow)	Micro/Nano (1005 Dow)	Laser Processes (1005 Dow)	Materials (1013 Dow)
Wednesday							
10:30–12:00 1	Machining Process Analysis 1-A	—	Manufacturing Systems 1: Planning and Design 1-B	—	—	—	Material Behavior in Machining and Forming 1-C
1:30–3:30 2	Modeling and Simulation in Machining 2-A	Forming 1: Process Design and Control 2-B	—	—	Micro/Nano 1: Process Modeling and Tool Wear 2-C	—	Processing Polymer and Bimetal Parts 2-D
Thursday							
8:00–9:30 3	Tool Wear, Life, and Surface Roughness 3-A	—	Manufacturing Systems 2: Scheduling and Planning 3-B	—	Micro/Nano 2: Processing of Non-Traditional Materials 3-C	—	—
9:45–11:45 4	Sensors and Process Monitoring 4-A	—	Process Planning and Numerical Control 4-B	Assembly 1: Novel Methods and Control 4-C	—	—	Material Behavior in Welding and Material Testing 4-D
2:00–3:30 5	Machining Fluids 5-A	Forming 2: Forming of Advanced Materials 5-B	—	—	—	Laser Processes 1: Material Investigations 5-C	(see Forming track)
Friday							
8:30–10:00 6	Surface Finishing and Micro Milling 6-A	—	Manufacturing Systems 3: Modeling and Simulation 6-B	—	(see Machining track)	Laser Processes 2: Novel Applications 6-C	—
10:30–12:00 7	Model Based Process Design and Optimization 7-A	—	Novel Approaches to Machining, Part Positioning, and Manufacturing Systems Representation 7-B	Assembly 2: Modeling and System Design 7-C	—	—	—

*Pattern Recognition Approaches for Diagnosis of Cutting Tool Wear Condition**
A.J. Vallejo, R. Morales-Menendez, L.E. Garza-Castanon, J.R. Alique

Comparison Between Numerical Simulations and Experiments for Single-Point Diamond Turning of Silicone Carbide
J.A. Patten, J. Jacob, B. Bhattacharya, A. Grevstad

Session 2-B: Forming 1: Process Design and Control

Room 1690, Computer Science and Engineering Building

Co-Chairs: Yuebin Guo, University of Alabama
Steven Schmid, University of Notre Dame

Computer-Aided Blankholder Design for Sheet Panel Drawing
W. Neher, W.J. Emblom, K.J. Weinmann

Wrinkling Detection in Tube Bending Simulations
H. Orban, G. Lin, S.J. Hu, M. Koc

*Quality Prediction and Control in Rolling Processes Using Logistic Regression**
R. Jin, J. Li, J. Shi

Session 2-C: Micro/Nano 1: Process Modeling and Tool Wear

Room 1005, Dow Building

Co-Chairs: John Roth, Penn State Erie, The Behrend College
Shiyu Zhou, University of Wisconsin–Madison

*Development of an Accurate Process Model for Microscale Forward Extrusion**
R.M. Onyancha, B.L. Kinsey, N. Krishnan, J. Cao

*Experimental Study of Tool Wear in Micro Ultrasonic Machining**
X. Hu, Z. Yu, K.P. Rajurkar

*Micro Electro Discharge Machining by Uniform Tool Shape Method—
Study of Relative Wear*
M.M. Sundaram, K.P. Rajurkar

Session 2-D: Processing Polymer and Bimetal Parts

Room 1013, Dow Building

Co-Chairs: Tugrul Özel, Rutgers University
Bin Shen, University of Michigan

Improving Reliability in Peeling Thin PDMS Films
S. Krishnan, S. Sarma

Comparing Drilling and Circular Milling for Hole Making in Carbon Fiber Reinforced Plastic (CFRP) Laminates

H. Yagishita

Dry Drilling Process for Bimetal Component

X. Song, D. Yen, J. Lieh

3:30 p.m. – 3:45 p.m.

Afternoon coffee break

Tishman Hall, Computer Science and Engineering Building Atrium

3:45 p.m.

Board Bus for Michigan League

Meet at Tishman Hall North Entrance,
Computer Science and Engineering Building Atrium

4:30 p.m. – 6:00 p.m.

Lecture and Discussion on Manufacturing Engineering Education

Frank Mayadas, Program Director, Alfred P. Sloan Foundation
Lydia Mendelssohn Theatre, Michigan League

6:00 p.m. – 10:00 p.m.

NAMRC Banquet

Ballroom, Michigan League
Speaker: William L. Miller, President, 4G Innovation LLC

THURSDAY, MAY 25, 2006

7:00 a.m. – 8:00 a.m.

Registration and Breakfast

Tishman Hall, Computer Science and Engineering Building Atrium

8:00 a.m. – 9:30 a.m.

Concurrent Technical Sessions

Session 3-A: Tool Wear, Tool Life, and Surface Roughness

Room 1670, Computer Science and Engineering Building

Co-Chairs: Fu Zhao, Purdue University
Andres Clarens, University of Michigan

Surface Roughness Considerations for Machining Economics in Toroidal End Milling of Titanium Alloy Ti-6Al-4V

R. Toledo, C.A. Rodriguez

On Stress Analysis of Diamond Coating Cutting Tools

J. Hu, Y.K. Chou, R.G. Thompson

*Real-Time Failure Forecasting for Flat, Ball-Nose, Roughing, and Tapered Endmills Using an Accelerometer**

C.A. Suprock, J.T. Roth, L.M. Downey

Session 3-B: Manufacturing Systems 2: Green and Optimal Product/System Design

Room 1690, Computer Science and Engineering Building

Co-Chairs: Steven J. Skerlos, University of Michigan

Steven Schmid, University of Notre Dame

"Technology Wedges" for Implementing Green Manufacturing

D. Dornfeld, P. Wright

*Achieving Higher Material Recovery Rates from End-of-Use Vehicles**

V. Kumar, J.W. Sutherland

Identification of the Optimal Product Design Considering Three Levels of Customer Requirements in One-of-a-Kind Production

H. Song, D. Xue, Y. Tu

Session 3-C: Micro/Nano 2: Processing of Nontraditional Materials

Room 1005, Dow Building

Co-Chairs: Simon Park, University of Calgary

Jeonghan Ko, University of Michigan

Numerical Study of Cell Droplet and Hydrogel Coating Impact Process in Cell Direct Writing

W. Wang, Y. Huang, D.B. Chrisey

*Fabrication of Transparent Silica Thin Film by Room Temperature Deposition from a Sol**

S.K. Tiwari, B.K. Paul

*Comparison of Batch Mixing and Micromixing Approaches in the Synthesis and Deposition of Ceria Nanoparticles**

C.H.T. Tseng, B.K. Paul

9:30 a.m. – 9:45 a.m.

Morning Coffee Break

Tishman Hall, Computer Science and Engineering Building Atrium

9:45 a.m. – 11:45 a.m.

Concurrent Technical Sessions

Session 4-A: Sensors and Process Monitoring

Room 1670, Computer Science and Engineering Building

Co-Chairs: John Roth, Penn State Erie, The Behrend College
Antonio Vallejo, Tecnologico de Monterrey

Machine Integrated Non-Contact Excitation (MINE) Device for Dynamic Measurement of Frequency Response Functions

B. Woody, K.S. Smith, M.S. Smith, M.A. Davies

*Statistical Detection of Process and Sensor Faults for Manufacturing Quality Control**

Z. Li, T. Wu, S. Zhou

Force Measurement in Cone Shaped Parts with a Spindle-Mounted Force Sensor

A. Szekeres, M. Ham, J. Jeswiet

Describing Function Representation from Measured Nonlinearities in Machine Joints

J.S. Dhupia, B. Powalka, A.G. Ulsoy, R. Katz

Session 4-B: Process Planning and Numerical Control

Room 1690, Computer Science and Engineering Building

Co-Chairs: Wenzhen Huang, University of Massachusetts–Dartmouth
Angela Park, University of Michigan

Design and Implementation of NURBS Pre-Interpolator for Five-Axis Machining in FPGA

W. Li, Y. Liu, K. Yamazaki, M. Fujishima, M. Mori

*Six Sigma in Machining Process Development**

E.I. Agba, E. Exner, P. Akinyemi

A Novel Design of NC Program Converter for CNC Machine Tool

X. Guo, Y. Liu, K. Yamazaki, K. Kashihara, M. Fujishima

Session 4-C: Assembly 1: Novel Methods and Control

Room 1005, Dow Building

Co-Chairs: Weihang Zhu, Lamar University
George Luckey, Ford Motor Company

*Feedforward Control of Multistage Assembly Processes Using Programmable Tooling**

L.E. Izquierdo, J. Shi, S.J. Hu, C.W. Wampler

Development of In-Mold Assembly Process for Realizing Mesoscale Revolute Joints

A. Ananthanarayanan, S.K. Gupta, H.A. Bruck, Z. Yu, K.P. Rajurkar

A 3-DOF Translational Parallel Mechanism for Reconfigurable Automotive Engine Assembly Pallets

C-H. Shen, C.M. Gosselin, F. Cote

Session 4-D: Material Behavior in Welding and Impact Testing

Room 1013, Dow Building

Co-Chairs: Pal Molian, Iowa State University

Vis Madhavan, Wichita State University

Frequency Response Function Uncertainty for Impact Tests

H.S. Kim, T.L. Schmitz

Effect of Weld Quality on Fatigue Life of Post-Weld Cold Worked 1008

Resistance Spot Weld Joints

D. Blake, D. Kim

Dual Bypass GMAW of Aluminum

X. Liu, K. Li, Y. Zhang, M. Johnson

11:45 a.m.

Board Bus for Michigan Union

Meet at Tishman Hall North Entrance,

Computer Science and Engineering Building Atrium

Noon – 1:30 p.m.

Founder's Lecture Luncheon

Michigan Union, UM Central Campus

1:30 p.m.

Board Bus to Return to Computer Science and Engineering Building

2:00 p.m. – 3:30 p.m.

Concurrent Technical Sessions

Session 5-A: Machining Fluids

Room 1670, Computer Science and Engineering Building

Co-Chairs: David Dornfeld, University of California, Berkeley

Emmanuel Agba, Ford Motor Company

Transiently Stable Emulsions for Metalworking Fluids

P.J. Bittorf, S.G. Kapoor, R.E. DeVor, N. Rajagopalan

Evaluating Activation Conditions for Extreme Pressure Additives in Metalworking Fluids

Using the Thread Forming Test

F. Zhao, S.J. Skerlos, A.F. Clarens, K.F. Hayes

*Abrasive Jet Machining for Edge Generation**

M.W. Chastagner, A.J. Shih

Session 5-B: Forming 2: Forming of Advanced Materials

Room 1690, Computer Science and Engineering Building

Co-Chairs: Vishesh Kumar, Michigan Technological University
Chi-Hung Shen, General Motors Corporation

Post Processing Effects on the Fatigue Crack Propagation of Titanium (Ti-6Al-4V) Alloy After Simulated Superplastic Forming Conditions

F.S. Pitt, S. Young, M. Ramulu

*Superplastic Forming of Magnesium Sheet**

G.T. Cooper, S.G. Luckey, W.B. Copple, D.Q. Houston, P.A. Friedman

Microscale Laser Peen Forming of Single Crystal: Dynamic Deformation and Anisotropy

Y. Fan, Y. Wang, J.W. Kysar, Y.L. Yao

Session 5-C: Laser Processes 1: Material Investigations

Room 1005, Dow Building

Co-Chairs: Tony Schmitz, University of Florida
Zhigang Wang, University of California, Davis

Surface Finish and Flexural Strength of CO₂ Laser-Cut Alumina by Evaporative and Thermal Stress Fracture Modes

G. Shehata, P. Molian, A. Bastawros, P. Shrotriya

Laser Forming by Shock Peening

E. Kannatey-Asibu, Jr., B. Lathia

*FE Modeling and Analysis of 3D Pressure and Mechanical Behavior at High Strain Rate in Micro Laser Peening**

A.W. Warren, Y.B. Guo

3:30 p.m. – 4:30 p.m.

NAMRI/SME Membership Meeting

Room 1670, Computer Science and Engineering Building

4:30 p.m. – 5:30 p.m.

ASME/MED Membership Meeting

Room 1670, Computer Science and Engineering Building

5:30 p.m.

Buses Return to Holiday Inn

Meet at Tishman Hall North Entrance,
Computer Science and Engineering Building Atrium

5:30 p.m. – 9:30 p.m.

KorenFest (Separate Registration Required)

Engineering Research Center on Reconfigurable Manufacturing Systems,
Dow Building
<http://erc.engin.umich.edu/KorenFest.htm>

9:30 p.m.

Buses Return to Holiday Inn

Meet at Tishman Hall North Entrance,
Computer Science and Engineering Building Atrium

FRIDAY, MAY 25, 2007

7:30 a.m. – 8:30 a.m.

Registration and Breakfast

Tishman Hall, Computer Science and Engineering Building Atrium

8:30 a.m. – 10 a.m.

Concurrent Technical Session

Session 6-A: Surface Finishing and Micro Milling

Room 1670, Computer Science and Engineering Building
Co-Chairs: Xingui Guo, University of California, Davis
Yong Huang, Clemson University

Investigation of Micro Milling Forces for Aluminum

M. Malekian, S.S. Park

Numerical Simulation of High Productive Surface Finishing by Electron Beam Irradiation with Vibration Assistance

Z. Wang, K. Yamazaki, Z. Yu, S. Sano

Comprehensive Curvature Analysis Approach to Detecting Local Gouging in 3-Axis Sculptured Surface Finish Machining

Z.C. Chen, S. Khan

Session 6-B: Manufacturing Systems 3: Modeling and Simulation

Room 1690, Computer Science and Engineering Building
Co-Chairs: Laine Mears, Clemson University
S-C. Chung, Hanyang University

Simulating Materials Handling Processes Using Both Discrete Event and Agent-Based Technologies

Q. Hao, W. Shen

Shop Floor Modeling with Concept Maps
S.A. Habib, T.I. Freiheit

Determination of Cap Model Parameters for Powder Metal Compaction Using Numerical Optimization Methods
C. Lu, J.A. Rice, J. Kim

Session 6-C: Laser Processes 2: Novel Applications

Room 1005, Dow Building

Co-Chairs: Elijah Kannatey-Asibu, Jr., University of Michigan
Andres Clarens, University of Michigan

Computer-Aided Energy and Material Savings for the SIS Process
B. Asiabanpour, C. Subbareddy, S. Kolichala, L. VanWagner

An Experimental Study of Laser Assisted Milling of Silicon Nitride Ceramic
B. Yang, T.W. Deines, C.M. Geist, S. Lei

Identification of Direct Metal Deposition (DMD) Process Parameters for Manufacturing Thin Wall Structures from Shape Memory Alloy (NiTi) Powder
K. Malukhin, K.F. Ehmann

10:00 a.m. – 10:30 a.m.

Morning Coffee Break

Tishman Hall, Computer Science and Engineering Building Atrium

10:30 a.m. – Noon

Concurrent Technical Session

Session 7-A: Model Based Process Design and Optimization

Room 1670, Computer Science and Engineering Building

Co-Chairs: Zezhong (Chevy) Chen, Concordia University
Qi Hao, Integrated Manufacturing Technologies Institute

Model-Based Optimization of the OD Plunge Grinding Process via Generalized Intelligent Grinding Advisory System (GIGAS)
N. Subrahmanya, T. Choi, Y.C. Shin

Study on Systematic CNC Core Design Method Following Model-Driven Design Strategy
Y. Liu, X. Guo, W. Li, K. Yamazaki, K. Kashihara, M. Fujishima

Smart Machining Systems: Robust Optimization and Adaptive Control for Turning Optimization
R. Ivester, J.C. Heigel

Session 7-B: Novel Approaches to Machining, Part Positioning and Manufacturing System Representation

Room 1690, Computer Science and Engineering Building

Co-Chairs: Kornel Ehmann, Northwestern University

Fu Zhao, Purdue University

Experimental Investigation of a Combined Drilling and Thread Milling Process: Thrilling
A.C. Araujo, M.B.G. Jun, S.G. Kapoor, R.E. DeVor

Impulse-Actuation Part Positioning Through Constrained Energy Balance Planning
L. Mears, T.R. Kurfess

Description Logic for Representation of Manufacturing Resources
F. Ameri, D. Dutta

Session 7-C: Assembly 2: Modeling and System Design

Room 1005, Dow Building

Co-Chairs: Wei Li, University of California, Davis

April Bryan, University of Michigan

An Infrastructure Toward Haptic Virtual Assembly with Native 3D Models in Mainstream CAD Systems

W. Zhu, Y-S. Lee

Integration of Part Geometric Error and Rigid Assembly Stack-Up Errors in Assembly Modeling

W. Huang, Z. Kong

Synthesis of the Digital Mock-Up System for Heterogeneous Assembly

I-H. Song, S-C. Chung

Noon – 12:30 p.m.

Closing Ceremony and Box Lunch

Tishman Hall, Computer Science and Engineering Building Atrium

12:30 p.m. – 3:00 p.m.

UM Lab Tours

Meet at Tishman Hall North Entrance,

Computer Science and Engineering Building Atrium

Buses Return to Holiday Inn at 3:00 p.m.

12:30 p.m. – 5:30 p.m.

Industry Tour: Ford Rouge Plant

Meet at Tishman Hall North Entrance,
Computer Science and Engineering Building Atrium
(Bus stop at Holiday Inn at 12:45 p.m.; Bus stop at DTW Airport by 5:30 p.m.)

12:30 p.m. – 5:30 p.m.

Golf Outing (Alister MacKenzie UM Golf Course)

Meet at Tishman Hall North Entrance,
Computer Science and Engineering Building Atrium

1:00 p.m. – 5:00 p.m.

SME NIST-ATP Technology Dissemination Workshop on Intelligent Optimization and Control of Grinding Processes

Room 1670, Computer Science and Engineering Building
Separate registration for this workshop is required. See the Registration Form for details.

*** Papers presented by student authors entered in the Student Research Presentation Contest**

SME NIST-ATP Technology Dissemination Workshop on Intelligent Optimization and Control of Grinding Processes

May 25, 2007

Sponsored by the Machining & Material Removal Community of SME

This is the first of three technology dissemination workshops for the National Institute of Standard and Technology's Advanced Technology Program (NIST-ATP) on Intelligent Optimization and Control of Grinding Processes. It is being held in conjunction with NAMRC 35—An International Forum at the University of Michigan, Ann Arbor, Michigan. The workshops are designed to broadly disseminate technologies developed through the three-year NIST-ATP program to grinding industries and grinding practitioners. The intended workshop participants are NAMRI/SME members and grinding professionals from many metalworking industries, such as automotive, aerospace, medical device, precision machinery and electronics.

Grinding processes are usually highly nonlinear and multivariable, thus rendering difficulties in establishing accurate analytical models. Often their input-output relationships are ill defined, and most existing analytical models only describe partial relationships between design (input) variables and process (output) variables. In addition, the input-output relations often are available only in heuristic form or in empirical data. In such cases, an attempt to optimize or control the process faces a major challenge. Conventional feedback control or optimization techniques encounter severe limitations in dealing with such problems.

In practice, when a new process is designed, engineers often have to utilize all available information such as analytical models, expert knowledge, experimental data, handbooks and vendor recommendations. Integrating all of the heterogeneous information and designing an optimal solution is not an easy task, often requiring a long lead time and a number of trial-and-error iterations. In view of the complex nature of the grinding process and stringent finish, accuracy and surface integrity requirements of the ground part, a Generalized Intelligent Grinding Advisory System (GIGAS) was developed to provide a more robust and scientific approach to the optimization and control of grinding processes.

This workshop will cover the GIGAS technology fundamentals and its applications and case studies for centerless and internal grinding operations.

AGENDA — NIST-ATP Workshop

Friday, May 25, 2007

Noon – 1:00 p.m.

Registration

Tishman Hall, Computer Science and Engineering Building Atrium

Separate registration for this workshop is required. See the Registration Form for details.

1:00 p.m. – 5:00 p.m.

SME NIST-ATP Technology Dissemination Workshop on Intelligent Optimization and Control of Grinding Processes

Room 1670, Computer Science and Engineering Building

1:00 p.m. – 2:00 p.m.

Session 1: Principles and Theories on Generalized Intelligent Grinding Optimization System

This presentation will cover the overall ideas and principles underlying the development of the generalized intelligent grinding optimization scheme as well as the overall structure of the software “Generalized Intelligent Grinding Advisory System” (GIGAS) and its utilization. It will also show how different models and knowledge are incorporated into the database for optimization.

2:00 p.m. – 2:50 p.m.

Session 2: Design of Experiments and Demo of GIGAS

The talk will show how one can perform design of experiments necessary to generate the model coefficients which are incorporated into the model database. A step-by-step and interactive demonstration of GIGAS will be shown.

2:50 p.m. – 3:00 p.m. Break

3:00 p.m. – 3:30 p.m.

Session 3: Test-Bed for Surface Grinding and Implementation Result (TechSolve)

The test-bed designed and developed at TechSolve for surface grinding processes will be described. This test-bed embedded with various sensors has been interfaced with a PC for online data acquisition and process models development that are finally implemented in GIGAS software for process optimization. The process optimization results will be demonstrated for cycle time minimization with various process constraints using GIGAS software.

3:30 p.m. – 4:00 p.m.

Session 4: Test-Bed for Centerless Grinding and Implementation Result (Landis, Delphi)

The test-bed designed and developed at Landis for centerless grinding will be described. This test-bed embedded with various sensors and open-architect controller is used for online data acquisition and process model development. The process optimization results will be demonstrated for cycle time minimization with various process constraints using GIGAS software.

4:00 p.m. – 4:30 p.m.

Session 5: Test-Bed for Internal Grinding and Implementation Result (AGT, Delphi)

The test-bed designed and developed at AGT for internal grinding will be described. This test-bed embedded with various sensors and an open-architect controller is used for online data acquisition and process model development. The process optimization results will be demonstrated for cycle time minimization with various process constraints using GIGAS software.

4:30 p.m. – 5:00 p.m.

Session 6: Test-Bed for Cylindrical Grinding and Implementation Result (Purdue)

The test-bed for cylindrical grinding processes to implement GIGAS will be described as well as its embedded sensors and their functions. Process optimization results will be demonstrated for cycle time minimization with various process constraints.

5:00 p.m. Adjournment

Separate registration for this workshop is required. See the Registration Form for details.

NAMRC 35 CONFERENCE REGISTRATION FORM

NAMRC 35: North American Manufacturing Research Conference
May 22-25, 2007, University of Michigan, Ann Arbor, Michigan, USA

COMPLETE A FORM FOR EACH INDIVIDUAL ATTENDING (INCLUDING COMPANION PROGRAM PARTICIPANTS)

Surname: _____ First Name: _____

Name to appear on nametag: _____

Professional Title: _____

Organization: _____

Address: _____

City: _____ State/Province: _____

ZIP/Postal Code: _____ Country: _____

Day Phone: _____ Fax: _____

E-mail: _____

Yes, I have special needs (dietary or disability) Please specify: _____

Yes, I will attend the luncheon on Friday, May 25.

REGISTRATION FEES

All fees are in US Dollars and made payable to the University of Michigan.

Registration fees include entrance to all technical sessions, all conference materials, publications, and meal functions.

- Full Conference Registration before April 13, 2007
(SME or NAMRI/SME member #: _____)\$470.00
- Full Conference Registration after April 13, 2007
(SME or NAMRI/SME member #: _____)\$515.00
- Full Conference Registration before April 13, 2007 (Non-SME or NAMRI/SME member)\$495.00
- Full Conference Registration after April 13, 2007 (Non-SME or NAMRI/SME member)\$530.00
- Student/Retiree Conference Registration before April 13, 2007 (photocopy of student ID w/registration)**\$225.00
- Student/Retiree Conference Registration after April 13, 2007 (photocopy of student ID w/registration)**\$275.00
- **Student attendees do not receive hard-copy of NAMRI Transactions
- Companion Program Registration*\$250.00
- * for details of what the Companion fee includes, please visit: <http://me.engin.umich.edu/NAMRC/registration.html>
- Donation to NAMRI/SME Fund: \$20 \$50 \$100 Other _____
- Lab Tour: **PLEASE SELECT DATE:** Tuesday, 5/22 OR Friday, 5/25
- Industrial Tour on Friday, 5/25\$20.00
- SME NIST-ATP Technology Transfer Workshop on Intelligent
Optimization and Control of Grinding Processes, Friday, 5/25\$95.00
- Yes, I will attend the golf outing (18 holes) on Friday, 5/25 at 1:00 p.m.\$40.00
- Yes, I am interested in renting a golf cart for the outing.\$13.00

TOTAL: _____

Parking is available for \$10/day. Passes will also be available on-site at the conference. Please check appropriate dates:

Tuesday, May 22 Wednesday, May 23 Thursday, May 24 Friday, May 25 Number of days x \$10 = _____\$

(for parking instructions, please visit <http://me.engin.umich.edu/NAMRC/maps.html>)

Total Registration Fees and Miscellaneous Fees: \$ _____

LODGING INFORMATION

Lodging: Lodging is not included in the registration fee and participants are responsible for making their own lodging arrangements.

For more information regarding rooms reserved for NAMRC 35, please visit the conference website at

<http://me.engin.umich.edu/NAMRC/index.html>

PAYMENT

Check/Money Order (in U.S. funds) made payable to: **University of Michigan** Purchase Order#: _____

Credit Card Visa MasterCard

Card Number: _____ Expiration Date: _____

Name on Card: _____ Signature: _____

Billing Address _____

Payments and refunds: Payments must accompany the registration form. All attendees, including presenters, must register for the conference. There will be a \$100 processing fee for cancellations made prior to May 11, 2007. There will be no refunds after May 11, however, your registration may be transferred to another delegate by contacting UM Conference Services.

FOR CONFIRMATION OF REGISTRATION, COMPLETE AND RETURN THIS FORM VIA FAX OR MAIL BY MAY 11, 2007 TO:

University of Michigan • Conference Services • 627 Oxford Road • Ann Arbor, MI 48104-2634 USA

Phone: 734.764.5297 • Fax: 734.764.1557 • Email: conferences@umich.edu

Conference Website: <http://me.engin.umich.edu/NAMRC/registration.html>

Where educational opportunities and resources come together

The North American Manufacturing Research Institution (NAMRI/SME) is a significant part of the **Manufacturing Education & Research Community (MER)** of SME. The MER concentrates on the latest education and research in manufacturing through promoting manufacturing careers and educational opportunities that enhance the diverse workforce needs of the manufacturing enterprise. Technical groups within this community include NAMRI/SME and :

- Credentialing
- Graduate Education in Support of Manufacturing
- Future of Manufacturing
- Industry/Continuing Education in Manufacturing
- Information Resources for Manufacturing Education
- Manufacturing Engineering Undergraduate Programs
- Manufacturing Technology Programs
- Technology Watch

SME members involved in the MER community and technical groups share knowledge and monitor manufacturing innovation to develop resources and opportunities that advance the industries they serve. SME members can participate in the MER community at any time. If you're not currently an SME member, join today by visiting www.sme.org/edu or call 800.733.4763.

Are you interested in hosting a future NAMRC?

Since 1973, NAMRC has been held on the campus of a host institution to encourage a dialogue between conference attendees, offer opportunities for laboratory tours and disseminate state-of-the-art manufacturing knowledge. Institutions wishing to host a NAMRC event are encouraged to submit a proposal.

The NAMRI/SME Board of Directors reviews proposals annually. NAMRC site selections are usually made two to three years in advance to allow for adequate planning and promotion. The NAMRI/SME Operating Procedures detail the responsibilities of the host institution and the Society of Manufacturing Engineers. Submission of a written proposal and formal presentation of the proposal at a NAMRI/SME Board of Directors meeting is required. If the proposal is selected, the host institution will enter into a conference agreement with SME. The NAMRI/SME Board of Directors requires conference planning updates at its semi-annual meetings. An outline of information to include when submitting a proposal is online at www.sme.org/namri. The deadline for receipt of the proposals is April 15 each year to allow for review by the NAMRI/SME Board of Directors prior to their meeting at NAMRC. Proposals should be submitted to:

Mark Stratton
Community Relations Manager
Society of Manufacturing Engineers
One SME Drive
Dearborn, MI 48121-0930
Phone: 313.425.3307
E-mail: mstratton@sme.org

NOTES



Society of
Manufacturing
Engineers

One SME Drive, P.O. Box 930
Dearborn, MI 48121-0930 USA

www.sme.org



The North American
Manufacturing Research
Institution of the Society of
Manufacturing Engineers
www.sme.org/namri

NAMRC 35

An International Forum

May 22-25, 2007