

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

**Thirtieth
North American
Manufacturing Research Conference**

NAMRC XXX

May 21-24, 2002

West Lafayette, Indiana, USA



Hosted by

**Purdue University
School of Mechanical Engineering
School of Industrial Engineering**



North American Manufacturing
Research Institution of the
Society of Manufacturing Engineers

NAMRI 

Dear Colleagues and Friends:

We welcome you to the Thirtieth North American Manufacturing Research Conference. The Schools of Engineering at Purdue University are pleased to host the 30th North American Manufacturing Research Conference (NAMRC) on May 21-24, 2002. NAMRC has been an established international forum for the presentation of cutting edge research results throughout universities and industry 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 XXX provides the authors far-reaching recognition of their work, as well as yields valuable insight from other leaders in manufacturing research.

This year 89 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 XXX and publication 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 21, with a welcoming reception at the East and West Faculty Lounge located in Stewart Center of Purdue University. On Wednesday, May 22, the conference Opening Ceremony will feature welcoming remarks by the president of Purdue University, Dr. Martin Jischke, Dean of Engineering, Dr. Linda P.B. Katehi, and a keynote speech by the executive vice president of Cummins, Dr. John Wall.

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 XXX will be both an intriguing and beneficial experience for you.

Sincerely,

Yung C. Shin and C. Richard Liu
Co-Chairs

NAMRC XXX 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 between 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 XXX, 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.

Sponsorship

The NAMRC XXX Organizing Committee thanks Purdue University and its Schools of Engineering as well as Ford Motor Company for their sponsorship of this conference.

Conference Publication

Papers accepted and presented at NAMRC XXX will be contained in the hardbound Transactions of the North American Manufacturing Research Institution of SME, Volume 30, 2002. 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. 1600 or (800) 733-4763.

NAMRC XXX Program-at-a-Glance

Hosted by Purdue University West Lafayette, Indiana, USA

Morning		Afternoon		Evening					
Tuesday May 21	NAMRI/SME Board Meeting 8:30 a.m. - 5:30 p.m.			Registration and Welcoming Reception East and West Faculty Lounge Purdue Memorial Union 5:30-9:00 p.m.					
Wednesday May 22	Registration and Breakfast 7:30-8:30 a.m. Stewart Center	Welcoming Ceremony 8:30-10:00 a.m. Fowler Hall Stewart Center	Concurrent Sessions 10:30 a.m.-12:00 noon Stewart Center	Awards Luncheon and Founders Lecture 12:00-1:30 p.m. North Ballroom Purdue Memorial Union	Concurrent Sessions 1:30-3:00 p.m. Stewart Center	Concurrent Sessions 4:00-6:00 p.m. Stewart Center	NAMRC Banquet Trails Restaurant 7:00-9:30 p.m.		
Thursday May 23	Registration and Breakfast 7:30-8:30 a.m. Stewart Center	Concurrent Sessions 8:00 a.m.-12:00 noon Stewart Center		Luncheon 12:00-1:30 p.m. North Ballroom Purdue Memorial Union	Concurrent Sessions 1:30-3:00 p.m.	Laboratory Tours 3:15 - 5:00 p.m.	NAMRI/SME Membership Meeting 5:00-6:00 p.m. Stewart Center	ASME Membership Meeting 6:00-7:00 p.m. Stewart Center	Reception 7:30-9:30 p.m. University Inn And Conference Center
		ASME MED Executive Committee Meeting 8:30 a.m.-12:00 noon Stewart Center		COMEC Sessions 1:30-5:30 p.m. Stewart Center					
Friday May 24	Registration and Breakfast 7:30-8:30 a.m. Stewart Center	Concurrent Sessions 8:00 a.m.-12:00 noon Stewart Center		Luncheon 12:00-1:30 p.m. North Ballroom Purdue Memorial Union	Industry Tour 1:30-5:00 p.m.				
		ASME/IMECE 2002 Organization Meeting 10:00 - 11:00 a.m. Stewart Center							

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Purdue University is a coeducational, state-assisted system in Indiana. Founded in 1869 and named after benefactor John Purdue, the University is one of the nation's leading research institutions with a reputation for excellent and affordable education. Building upon historical strengths in engineering and agriculture, the West Lafayette Campus now offers nearly 6,100 courses in more than 200 specializations in the schools of Agriculture, Consumer and Family Sciences, Education, Engineering, Health Sciences, Liberal Arts, Management, Nursing, Pharmacy and Pharmacal Sciences, Science, Technology, and Veterinary Medicine.

The main campus of Purdue University is located in West Lafayette, Indiana, in America's heartland. It is located 65 miles north of Indianapolis, the capital of Indiana, and 126 miles southeast of Chicago. The conference will be held at Stewart Center, the conferencing facility at Purdue University, which is located at the center of campus. Many campus buildings and local stores are within a few minutes walking distance.

With an undergraduate enrollment of nearly 6,000, graduate enrollment of about 1,800 and a faculty of about 270, Purdue's engineering program is one of the largest in the United States. It encompasses 13 schools. Research expenditures in the School of Engineering exceed \$70,000,000 annually. This research is carried out in laboratories located in the individual academic units and in several multidisciplinary research centers and school research laboratories. Some of these research facilities include:

- Birck Nanotechnology Center
- Center for Collaborative Manufacturing
- Center for Laser-based Manufacturing
- Intelligent Manufacturing Laboratory
- Center for Computational Image Analysis and Data Visualization
- Center for Customer Driven Quality
- Center for the Management of Manufacturing Enterprises
- Computer Integrated Process Operations Consortium (CIPAC)
- Dauch Center for Management of Manufacturing Enterprises
- Purdue University Materials Consortium (MatCon)
- Software Engineering Research Center

The conference will be held at Stewart Center, adjacent to the Purdue Memorial Union. Three large meeting rooms, Fowler Hall (seating 400), and another conference room for board member meetings and special sessions have been reserved. Stewart Center also offers a fully equipped registration area. The center also features a comfortable lounge, spacious lobbies and complete telecommunications capabilities. A ballroom has been reserved for the reception, lunch, and dinner banquet.

In connection with NAMRC XXX:

- Welcoming Reception on Tuesday, May 21 from 5:30-9:00 p.m. in the East and West Faculty Lounge in the Purdue Memorial Union (PMU).
- Welcoming Ceremony and Keynote Address by Dr. Martin Jischke, President of Purdue University, Dr. Linda P.B. Katehi, Dean of Engineering, and Dr. John Wall, Executive Vice President and Chief Technical Officer, Cummins Engine Company, May 22 from 8:30-10:00 a.m. in Fowler Hall of Stewart Center.
- NAMRI/SME Awards Luncheon and Founders Lecture on Wednesday, May 22 from 12:00-1:30 p.m. in the North Ballroom of PMU. The Founders Lecture will be presented by Professor John A. Schey, University of Waterloo.
- COMEC will meet on Wednesday, May 23 from 1:30-5:30 p.m. in Room 204 of Stewart Center.
- NAMRI/SME Technical Committees will meet from 7:30-8:30 a.m. on May 22, 23, and 24 in Room 204 of Stewart Center.
- NAMRC Banquet on Wednesday, May 22 from 7:00-9:30 p.m. at the Trails.
- Luncheon on Thursday, May 23 from 12:00-1:30 p.m. at the North Ballroom of PMU.
- NAMRI/SME Member Meeting on Thursday, May 23 from 5:00-6:00 p.m. in Fowler Hall of Stewart Center.
- ASME MED Member Meeting on Thursday, May 23 from 6:00-7:00 p.m. in Fowler Hall of Stewart Center.
- NAMRC Reception on Thursday, May 23 from 7:30-9:30 p.m. at University Inn and Conference Center
- Luncheon on Friday, May 24 from 12:00-1:30 p.m. in the North Ballroom of PMU.

NAMRC XXX will provide tours of various manufacturing related laboratories located on campus. Two time slots are available to tour the facilities: Wednesday, May 22 from 4:00-6:00 p.m., and Thursday, May 23 from 3:15-5:00 p.m.

You may also want to take a tour of the Purdue University campus on your own. Maps of the campus will be provided in your registration packet.

NAMRC XXX will provide tours of local manufacturing companies. The Caterpillar plant located in Lafayette produces very large engines used for power generators and ships. Fairfield Manufacturing is the largest gear producer in North America. Visitors will be able to see various manufacturing processes and systems used by these two companies.

Brooklin Twinrocker Tour

Over twenty-five years ago, Kathryn and Howard Clark combined their knowledge to start Twinrocker Papers in San Francisco. Needing more affordable working space, they returned to the family farm near Brookston, Indiana and have been working to create an awareness of the beauty and advantages of handmade papers ever since. Their client list includes the giants of contemporary art such as Rauschenberg, Johns, Rosenquist, Motherwell and Dine. They have also created limited edition prints and books for publishers such as Arion Press, Osiris Editions, and the Whitney Museum. In their store front in Brookston you can buy all the paper making supplies listed in their catalog, see beautiful papers, stationery, and hand bound books. While in Brookston you will have an opportunity to visit the Violet and Ivy Flower shop as well as eat lunch at an authentic German restaurant - Klein Brat Haus.

Frank Lloyd Wright Home Tour

Frank Lloyd Wright home constructed especially for Dr. John Christian and his wife in 1956. The home is named "Samara" and is one of only six homes where the people who commissioned Frank Lloyd Wright to build the home still live. You will be given a personal tour by Dr. Christian and see and hear the wonders of living in this exciting home and grounds! Lunch will be provided at a nearby restaurant.

Fowler House Museum

Check out the historic Fowler House Museum - a grand home built by one of John Purdue's best friends. Located in the historic district you will have an opportunity to see how the other half lived many years ago. Lunch will be served at a local Bed and Breakfast. After that you will have an opportunity to explore and visit with the owner of the Flower Mill - a wonderful Flower Shop owned by Jim Maillioux - a local florist who has been retained by the White House on several occasions to help decorate for holidays, as well as Inaugurations.

All fees are in U.S. dollars and payable to Purdue University. We accept cash, check, money orders, VISA or MasterCard. Complete one registration form per person. Guest Program participants should complete their own registration form. Make additional copies of the form as needed.

All fees except the guest registration include entrance to all technical sessions, and all conference materials, publications, meal functions, laboratory tours and industry tours. Included in the guest registration fees are conference breakfasts, banquet and two receptions; and guest program tour (see Guest Program for details).

There are no single-day registration fees. There are no reduced registration fees for authors or session chairs.

Refunds, less an administrative fee of \$100.00 will be made for all cancellations received in writing and postmarked before May 10, 2002. 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 refund checks. Credit card refunds will be issued to the credit card used for payment. Should this event cancel in entirety, University's liability is limited to a refund of the registration fees paid.

Attendees of NAMRC XXX can stay at Purdue Union Hotel or University Inn and Conference Center. Sixty rooms have been reserved at a rate of \$75 per night at Purdue Union Hotel, with an additional 100 rooms reserved at University Inn and Conference Center at the reduced rate of \$70 for single and \$75 for double per night. Please mention "NAMRC" when making your reservations. The Purdue Memorial Union also offers various restaurants and cafeterias for guests and students as well as various recreational facilities, including bowling and billiards.

Purdue Memorial Union
(Conference site)
The Union Club Hotel
West Lafayette, IN 47907
800-320-6291
765-494-8913
Fax 765-494-8924
Deadline: May 3, 2002

University Inn and Conference Center
(About 3 miles from Conference site)
3001 Northwestern Avenue,
West Lafayette, IN 47906
800-777-9808
765-463-5511
Fax 765-497-3850
Deadline: May 3, 2002

If necessary there are more than 1,600 rooms available in motels within five miles of campus. For information, visit the web site:
www.lafayette-in.com/Lodging.html

PARKING: Ample free parking is available at the parking garage across from the Purdue Memorial Union. Parking is free for those staying at the PMU and \$3 per day for others.

***Note:** Courtesy shuttle service will be available from University Inn and Conference Center to the conference site.

Purdue University is connected to several major highways. The campus is located approximately 65 miles northwest of Indianapolis and 150 miles southeast of Chicago. The campus can be accessed by driving via Exit 172, 175 or 178 on Interstate 65 from Indianapolis or Chicago airports. The conference site, Stewart Center, is located right behind the Purdue Memorial Union.

Shuttle service from the Indianapolis Airport is provided by Lafayette Limo every two hours at \$33 for round trip to any hotel in the Lafayette area. Call (765) 497-3828 to make your shuttle reservation or visit www.lafayettelimo.com.

The Purdue University Airport is also located near campus. Daily commuter flights from Detroit are provided by the Northwest AirlinK. The flight schedule from the Purdue University Airport is available through www.adpc.purdue.edu/PhysFac/airport/.

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

Climate

The average temperature in May is 62 degrees Fahrenheit. Plan on sunny and warm weather. The temperature can drop in the evening, so you may want to bring a light jacket.

Time Zone

October to April: Eastern Standard Time (EST)

April to October: Central Standard Time (No Daylight Savings Time)

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

Business Office, Conference Division
Purdue University
1586 Stewart Center, Room 110
W. Lafayette, In. 47907-1586

FAX

(765)494-0567

Attention: Business Office, Conference Division

Visit the NAMRC XXX Web site: www.sme.org/namri and link to the NAMRC XXX information or directly at widget.ecn.purdue.edu/~namrc/, or call (765)494-2758 or email kfhyman@cea.purdue.edu.

NAMRC XXX Technical Sessions and Programs

8:30 a.m. – 5:30 p.m.

NAMRI/SME Board Meeting

204, Stewart Center

5:30 p.m. – 9:00 p.m.

Conference Registration and Welcoming Reception

East and West Faculty Lounge in the Purdue Memorial Union

7:30 a.m. – 8:30 a.m.

Registration and Breakfast

Common Area – East Foyer, Stewart Center

8:30 a.m. – 10:00 a.m.

Welcoming Ceremony

Fowler Hall, Stewart Center

Opening Remarks:

Yung C. Shin, Chair NAMRC XXX

Welcoming Remarks:

Dr. Martin Jischke, President, Purdue University

Dr. Linda P.B. Katehi, Dean of Engineering, Purdue University

Introductory Remarks:

Phil Abramowitz, President, NAMRI/SME

Keynote Address:

21st Century Engine Requirements Pushing Manufacturing to the Limits
John Wall, Executive Vice President and Chief Technical Officer, Cummins
Engine Company

10:00 a.m. – 10:30 a.m.

Refreshment Break

10:30 a.m. – 12:00 noon

Concurrent Technical Sessions

Session 1-A: Forming I

214AB, Stewart Center

Co-Chairs: Bill Wilson, University of Washington
Jian Cao, Northwestern University

Forming of Metal Foams

A. Smith, G.L. Niebur and S. Schmid, University of Notre Dame

Experiment Investigation of Internal Defects in the Cross Wedge Rolling Process

Q. Li, M. Lovell and W. Slaughter, University of Pittsburgh

Production of Aluminum Extrusion Dies Using A Laser-Based Flexible Fabrication Technique

W. Jiang, M. Stock and P. Molian, Iowa State University

Session 1-B: Material Removal I – Novel Hybrid Processes

214CD, Stewart Center

Co-Chairs: Robert Williams, University of Nebraska
Bin Wei, GE Corporate Research

Performance Characteristics in Rotary Abrasive Electrodischarge Machining (RAEDM)
J. Kozak, Visiting Professor from Warsaw University of Technology, K.P. Rajurkar, H.G. Khilnani, University of Nebraska-Lincoln

Finishing of Mold Corner By Ultrasonic-Vibration Planing Method
S. Yamada, INCS Inc., M. Jin and M. Murakawa, Nippon Institute of Technology

Comparative Assessment of Laser-Assisted Machining For Various Ceramics
P.A. Rebro, F.E. Ffefferkorn, Y.C. Shin, Purdue University, and F.P. Incropera, University of Notre Dame

Session 1-C: Manufacturing Systems I –Microtechnology

218AB, Stewart Center

Co-Chairs: B.K. Paul, Oregon State University
M.L. Philpott, University of Illinois at Urbana-Champaign

Subsurface Damage Measurement in Silicon Wafers by Laser Scattering
J.M. Zhang, Kansas State University, J.G. Sun, Argonne National Laboratory and Z.J. Pei, Kansas State University

Micro-Scale Laser Shock Processing - Modeling, Testing and Microstructure Characterization
W. Zhang and Y. L. Yao, Columbia University

Micro-Manufacturing of A Nano-liter-scale, Continuous-flow Polymerase Chain Reaction System
W. Zheng and S. Chen, Iowa State University

Session 1-D: Material Removal II – Grinding

218CD, Stewart Center

Co-Chairs: Marion B. Grant, Cummins Engine Company
Bi Zhang, University of Connecticut

An Experimental Investigation of the Grinding Forces and Surface Finish on Nanostructured Ceramic Coatings
J.K. Dey, B. Zhang and Z.H. Deng, University of Connecticut

A Comparison of Grinding Forces Arising From Oscillating Workpiece Speed and Chip Thickness
R.A. Qureshi, M. A. Mannan, National University of Singapore, S.J. Drew and B.J. Stone, University of Western Australia

Interfacial Fracture of Vitrified Corundum (a-Al₂O₃)
M.J. Jackson, University of Cambridge and B. Mills, University of Liverpool

12:00 noon – 1:30 p.m.**NAMRI/SME Awards Luncheon and Founders Lecture**

North Ball Room at Purdue Memorial Union
Presiding: Phil Abramowitz, President, NAMRI/SME
Lecturer: Professor John A. Schey, University of Waterloo

1:30 p.m. – 3:30 p.m.**Concurrent Technical Sessions****Session 2-A: Forming II – Sheet Metal Forming**

214AB, Stewart Center

Co-Chairs: Jian Cao, Northwestern University
J. Ian Shi, University of Michigan

Prevention of Seizure by Oxide Coatings in Multi-stage Deep Drawing of Pure Titanium Sheets
K. Mori, T. Murao, and Y. Harada, Toyohashi University of Tech

Rapid Prototyping of a Headlight with Steel Sheet
J. Jeswiet and E. Hagan, Queen's University

Optimal and Robust Design of Laser Forming Processes
C. Liu and Y. L. Yao, Columbia University

An Overview of Math-based Applications in Automotive Sheet Metal Design and Prototype
K. Licht, K. Johnson, General Motors Corporation, A. Tung, EDS Corporation, V. Prabhakar, AutoForm Engineering USA, and K. Kannan, EASi Engineering USA

Session 2-B: Material Removal III – Modeling/Characterization

214CD, Stewart Center

Co-Chairs: David Stephenson, General Motors
Shounak Athavale, Ford Research Laboratory

Morphology of Chips Formed During High Speed Milling of Die and Mold Tool-Steel Using Ball End Mills
H.A. Kishawy, University of New Brunswick, and C.E. Becze, Pratt & Whitney Canada

Experimental Observations of Cutting Force and Tool Wear Effects in Ramp Cuts in End Milling
Y. Choi and R. Narayanaswami, Iowa State University

Role of Cutting Parameters and Microstructure on Chip Formation and Surface Integrity During Machining of AISI 316L
R. M'Saoubi and H. Chandrasekaran, Swedish Institute for Metals Research

Micromechanical Modeling of Rock Cutting Under Pressure Boundary Conditions Using Distinct Element Method
S. Lei and P. Kaitkay, Kansas State University

Session 2-C: Manufacturing Systems II – Processing Techniques

218AB, Stewart Center

Co-Chairs: Jerald Brevick, Ohio State University
Blaine Lilly, Ohio State University

A Proposed Novel Approach to Manufacturing Low Cost High Temperature Composite Materials
T. Siegmund, R. Cipra, J. Liakus, Purdue University and W. Strieder, Notre Dame, F.R. Jacobs, Indiana University, A. Fatz, T. Cordell, National Composite Center, C. Parker, F. Dillon, M. La Forest, Honeywell Aircraft Landing Systems

A New Heat Transfer Model for Friction Stir Welding
M. Song and R. Kovacevic, Southern Methodist University

Development of a Wireless Pressure Sensor with Remote Acoustic Transmission
L. Zhang, C.B. Théurer, R.X. Gao, and D.O. Kazmer, University of Massachusetts

An Experimental Study of the Fume Particulate Produced by the Shielded Metal Arc Welding Process
W. Chan, K.L. Gunter, J.W. Sutherland, Michigan Technological University

Session 2-D: Material Removal IV – Machine Tools

218CD, Stewart Center

Co-Chairs: John Ziegert, University of Florida
Y. Kevin Rong, Worcester Polytechnic Institute

Study On In Situ Digital Engineering of CNC Machine Tool Spindle
N.S. Chaphalkar, X. Zhang, K. Yamazaki, University of California at Davis and M. Mori, Mori Seiki Co., Ltd.

Reverse Kinematic Approach for Error Analysis of Machine Tools Using Ball Bar Test of Hemispherical Helix
S.H. Yang, Y.M. Lee, M.H. Lee, and J.H. Lee, Kyungpook National University, M.W. Cho, Inha University and T.I. Seo, Korea Institute of Industrial Technology

Operational Practices For Using HSK Tool-Holder-Spindle Systems in Machining Applications
J.S. Agapiou, P. Bandyopadhyay, C.H. Shen and D.A. Stephenson, General Motors

AI-Based Classification Methodologies For The Modelling of Machine Tool Thermal Error
R. Ramesh, M.A. Mannan, and A.N. Poo, The National University of Singapore

3:30 p.m. – 4:00 p.m.

Refreshment Break

4:00 p.m. – 6:00 p.m.

Concurrent Technical Sessions

Session 3-A: Forming III – Design and Control

214AB, Stewart Center

Co-Chairs: Steven Schmid, University of Notre Dame
Jack Jeswiet, Queen's University

Adapting dSpace Control to a Dome Height Tester for Sensitivity Enhancement
K. Foerster, Brandenburg Technological University, and K.J. Weinmann, Michigan Technological University

Numerical and Experimental Analysis of Miniature Stamping Process
T.W. Ku and B.S. Kang, Pusan National University

Relationship Between Blanking Conditions and Products in Counterblanking Processes
M. Murakawa, S. Thipprakmas, and M. Jin, Nippon Institute of Technology

Session 3-B: Material Removal V – Meso/Micro Machining

214CD, Stewart Center

Co-Chairs: John Patten, University of North Carolina at Charlotte
Tony Schmitz, National Institute of Standards and Technology

Experimental Analysis of Chip Formation in Micro-Milling
C.J. Kim, M. Bono, and J. Ni, University of Michigan

An Experimental Study on Burr Formation in Micro Milling Aluminum and Copper
K. Lee and D. Dornfeld, University of California at Berkeley

Drilling of Noncircular Blind Micro Holes by Micro EDM
Z. Yu, K.P. Rajurkar, and H. Shen, University of Nebraska, Lincoln

Session 3-C: Manufacturing Systems III – Planning and Set-up

218AB, Stewart Center

Co-Chairs: Michael Bieterman, The Boeing Company
Daniel Walcsyk, Rensselaer Polytechnic Institute

Integrated Setup Planning and Fixture Design: Issues and Solutions
S.H. Huang, University of Cincinnati, Y. K. Rong, Worcester Polytechnic Institute, D.W. Yen, Delphi Automotive Systems

Determination of Clamping Force Based on Minimization of Workpiece Elastic Deformation
S. Satyanarayana and S. N. Melkote, Georgia Institute of Technology

An Integrated Approach to Tolerance Allocation, Process Planning and Scheduling
S. Anand, R.P. Pallapati, S. Uttam, and C. McCord, University of Cincinnati

An Architecture For Distributed Process Planning Using Function Blocks
L. Wang, National Research Council of Canada, and H.Y. Feng The University of Western Ontario

Session 3-D: Multi-disciplinary Manufacturing Research Panel

218CD, Stewart Center

Co-Chairs: Yung C. Shin, Purdue University
C. Richard Liu, Purdue University

Speakers: To be determined

1:30 p.m. – 5:30 p.m.

Council of Manufacturing Engineering Chairs/Coordinators (COMEC) Meeting

204, Stewart Center

4:00 p.m. – 6:00 p.m.

Concurrent Laboratory Tours

Purdue University Campus

Small tour groups will leave Stewart Center at 4:00 p.m. to visit different laboratories. Student guides will escort the groups.

7:00 p.m. – 9:30 p.m.

NAMRC Banquet

At Trails

Busses will begin loading at 6:45 p.m. in front of Purdue Memorial Union and University Inn and Conference Center. The busses will depart from the Trails at 9:30 p.m. to return to the hotels.

7:30 a.m. – 8:30 a.m.

Registration and Breakfast

Common Area – East Foyer, Stewart Center

8:00 a.m. – 10:00 a.m.

Concurrent Technical Sessions

Session 4-A: Material Removal VI - Grinding

214AB, Stewart Center

Co-Chairs: T. R. Kurfess, Georgia Institute of Technology
I. Marinescu, The University of Toledo

Thermal Aspects For Grinding of Granite

X. Xu, H. Huang, W. Zeng, Huaqiao University and S. Malkin, University of Massachusetts

Predictive Modeling of Cutting Fluid Aerosol Generation in Cylindrical Grinding

Professor Steven Y. Liang, Georgia Institute of Technology Z. Chen, IBM Corporation, H. Yamaguchi, Utsunomiya University and S. Liang, Georgia Institute of Technology

Wear of Perfectly Sharp Abrasive Grinding Wheels

M.J. Jackson, University of Liverpool

In-Process Monitoring of Truing Using a Sensor Integrated Diamond Grinding Wheel

B. Varghese, GE Superabrasives, S. Pathare, Tellabs Operations, R. Gao, S. Malkin, University of Massachusetts and C. Guo, United Technologies Research Center

Session 4-B: Material Removal VII - Modeling

214CD, Stewart Center

Co-Chairs: I.S. Jawahir, University of Kentucky
William J. Endres, Michigan Technological University

Least Square Method For Determination of Cutting Force Parameters In End Milling - Model and Experimental Verification

I.S. Shaha, G. Yucesan, A.E. Bayoumi and J.A. Khan, University of South Carolina

Prediction of Forces in Ball-End Milling Using RBF Neural Networks

H. El-Mounayri and J.F. Briceno, Purdue and M. Gadallah, Cairo University

Accurate 3D Cutting Force Prediction Using Cutting-Condition - Independent Coefficients In Ball-End Milling

J.H. Ko and D.W. Cho, Pohang University of Science and Technology

Modeling and Analysis of Internal Thread Forming

S. Chowdhary, O. B. Ozdoganlar, S. Kapoor and R. DeVor, University of Illinois at Urbana-Champaign

Session 4-C: Manufacturing Systems IV – Production Strategies

218AB, Stewart Center

Co-Chairs: Richard Furness, Ford Motor Co.
Soundar Kumara, Pennsylvania State University

An Efficient Pull System With Look-Ahead Strategy: Model, Simulation and Case Study

N. Pramanik, Syracuse University and James Simko, New Venture Gear Inc.

Assembly Strategies To Reduce Gear Whine In Planetary Gear Transmissions

S.M. Athavale, Ford Motor Co.

Selecting Manufacturing System Configurations Based on Performance Using AHP

V. Maier-Speredelozzi and S.J. Hu, University of Michigan

The Manufacturing System Design Decomposition in the Automotive Electronics Industry

D.S. Cochran, G. Oropeza, C. Tapia and Y.S. Kim, Massachusetts Institute of Technology

8:30 a.m. – 12:00 noon

ASME Manufacturing Engineering Division (MED) Executive Committee Meeting

204, Stewart Center

10:00 a.m. – 10:30 a.m.

Refreshment Break

10:30 a.m. – 12:00 noon

Concurrent Technical Sessions

Session 5-A: Forming IV – Numerical Modeling

214AB, Stewart Center

Co-Chairs: Taylan Altan, The Ohio State University
Amit Bagchi, Shiloh Industries, Inc.

Comparison of Different Methods for Estimating Anisotropy with Rotational Axial Symmetry in Bulk Metal Forming

H. Han, Royal Institute of Technology

Automatic Hexahedral Mesh Generation for Finite Element Simulation of Metal Forming

S.R. Ryoo and S.M. Hwang, Pohang University of Science and Technology

A Study On The Stress Distribution In Coil Wrapping and Its Effect On Final Coil Deformation

S. Li and J. Cao, Northwestern University

Session 5-B: Material Removal VIII – Difficult-to-cut Materials

214CD, Stewart Center

Co-Chairs: C.H. Shen, General Motors
Walter W. Olson, The University of Toledo

Machining Hardened Steel With Ceramic-Coated and Uncoated CBN Cutting Tools

T.G. Dawson and T. Kurfess, Georgia Institute of Technology

High Speed Facing of Age Hardened Inconel 718 Using Silicon Carbide Whisker Reinforced Ceramic Tools

R.M. Arunachalam and M. A. Mannan, National University of Singapore

N2+ Implanted Cubic Boron Nitride Tools For Finish Hard Machining

Y. K. Chou and H. Song, University of Alabama

Session 5-C: Manufacturing Systems V – Meso/Micro Technology

218AB, Stewart Center

Co-Chairs: Y. Lawrence Yao, Columbia University
X. Xu, Purdue University

Development of Meso-Scale Machine Tool (mMT) Systems

M.P. Vogler, X. Liu, S.G. Kapoor, R.E. DeVor, University of Illinois at Urbana-Champaign
and K.F. Ehmann, Northwestern University

Thermally-Enhanced Edge Registration For Aligning Metallic Microlaminated Devices

J.S. Thomas and B.K. Paul, Oregon State University

Novel Powder Processing Techniques To Fabricate Efficient Meso-Scale Heat Exchanger

H.W. Shin, E.D. Case and P.Y. Kwon, Michigan State University

12:00 noon – 1:30 p.m.**Luncheon**

North Ball Room at Purdue Memorial Union

1:30 p.m. – 3:00 p.m.**Concurrent Technical Sessions****Session 6-A: Material Removal IX - Dynamics**

214AB, Stewart Center

Co-Chairs: David W. Yen, Delphi Automotive Systems
David Shamine, Caterpillar

The Stability Analysis of Machining with Controllable Time Varying Dynamics

M. Wang and R. Fei, Beijing Polytechnic University

Predicting The Variations In Process Dynamics During Sculptured Surface Machining

T. Bailey, United Technologies Research Center, T.I. El-Wardany, M. Dumitrescu and M.A. Elbestawi, McMaster University

Time Domain Chatter Prediction Including Tool Wear Effects During Face Turning of Nickel Based Super Alloys

B.E. Clancy, B. Rao and Y.C. Shin, Purdue University

Session 6-B: Material Removal X - Wear

214CD, Stewart Center

Co-Chairs: Warren DeVries, Iowa State University
Shuting Lei, Kansas State University

Tool Temperature and Tool Life in Machining with Restricted Contact Tools

J. A. Arsecularatne, University of New South Wales

Tool Wear When Tapping Holes On Gray Cast Iron Using High Cutting Speed

R.T. Coelho, A.A. Bezerra, University of Sao Paulo and M.S. Ice, Titex Plus Precision Cutting Tools S.A.

The Effects of Corner Radius and Edge Radius on Tool Flank Wear

W.J. Endres, Michigan Technological University and R.K. Kountanya, University of Michigan

Session 6-C: Material Removal XI – Material Characterization

218AB, Stewart Center

Co-Chairs: John Sutherland, Michigan Technological University
Ajay P. Malshe, University of Arkansas

Characterization of Cast Iron Surfaces With Graphite Pullouts Using Morphological Filters

Professor J. Raja, University of North Carolina at Charlotte
B. Muralikrishnan and J. Raja, University of North Carolina at Charlotte,

Titanium Aluminate - Thermal Diffusivity, Heat Capacitance, and Coefficient of Thermal Expansion as a Function of Temperature

W.L. Stone and T.R. Kurfess, Georgia Institute of Technology

Mechanical Behavior Characterization of the Secondary Shear Zone in Metal Cutting

Y.B. Guo, University of Alabama

Session 6-D: Manufacturing Engineering Education

218CD, Stewart Center

Co-Chairs: Christopher A. Brown, Worcester Institute of Technology
Elsayed A. Orady, University of Michigan – Dearborn

*Invited papers:**PRIME - THE Partnership for Regional Innovation in Manufacturing Education*

W.F. Erevelles, Robert Morris University, K. Harris, Penn State New Kensington, P. Cunningham, Community College of Allegheny County, S. Faseyitan, Butler County Community College, R. Myers, Westmoreland County Community College

An Approach to Education in Life Cycle Engineering – 2001

J. Jeswiet, Queen's University

Teaching Controls and Integration with the Hands-On use of Industrial Hardware

H. Jack, Grand Valley State University, Padnos School of Engineering

3:00 p.m. – 3:15 p.m.**Refreshment Break****3:15 p.m. – 5:05 p.m.****Session 6-D: Manufacturing Engineering Education**

218CD, Stewart Center

Accomplishments of Manufacturing Engineering Department at the University of Texas – Pan American
S.B. and R. Nambiar, University of Texas - Pan American

Manufacturing Learning Center: A Model to Enhance Manufacturing Engineering Education

B.A. Kramer, Kansas State University, F. Azadivar, The University of Massachusetts at Dartmouth, J. Tucker, Kansas State University

Experience in Technology-Based Instruction and Active Learning for a Manufacturing Course

Z.J. Pei, S. Hanna, T. Deines and S. Lei, Kansas State University, Manhattan

Manufacturing Engineering Education: A Unified Approach

K.F. Ehmann and W. Hopp, Northwestern University

5:05 p.m. – 6:00 p.m.

Panel on the Future of Manufacturing Engineering Education

3:15 p.m. – 5:00 p.m.

Concurrent Laboratory Tours

Small tour groups will leave Stewart Center at 4:00 p.m. to visit different laboratories. Student guides will escort the groups.

5:00 p.m. – 6:00 p.m.

NAMRI/SME Member Meeting

Fowler Hall, Stewart Center

6:00 p.m. – 7:00 p.m.

ASME MED Member Meeting

Fowler Hall, Stewart Center

7:30 p.m. – 9:30 p.m.

Reception

University Inn and Conference Center

Transportation will be provided from Purdue Memorial Union to University Inn and Conference Center

7:30 a.m. – 8:30 a.m.

Registration and Breakfast

Common Area – East Foyer, Stewart Center

8:00 a.m. – 10:00 a.m.

Concurrent Technical Sessions

Session 7-A: Forming V – Hydro Forming

214AB, Stewart Center

Co-Chairs: Klaus J. Weinmann, Michigan Technological University
S.M. Hwang, Pohang University of Science and Technology

Finite Element Analysis of Sheet Metal Hydroforming

Y.C. Chang, S.M. Hwang and B.S. Kang, Pusan National University

Influence of Initial Thickness Deviation in Tube Periphery on Tube Deformation During Free Hydraulic Bulging

A. Shirayori, S. Fuchizawa and M. Narazaki, Utsunomiya University

Preforming and Expansion of an Aluminum Alloy in Tube Hydroforming - Comparison of FEA Predictions with Existing Experimental Data

S. Kaya, I. Gorospe and T. Altan, Ohio State University

Numerical Analysis and Design for Tube Hydroforming Process By Rigid-Plastic Finite Element Method

J. Kim, B.S. Kang, Pusan National University and H.H. Choi, Pukyong National University

Session 7-B: Material Removal XII – Planning and Optimization

214CD, Stewart Center

Co-Chairs: James Stori, University of Illinois – Urbana Champaign
Sam Anand, University of Cincinnati

Optimization of Length of Travel in Face Milling Operations for Flat Surfaces

S. Ramakrishnan and R. Wysk, Pennsylvania State University

WEBNC: Internet Based System For Intelligent Auditing and Reverse Engineering of CNC Part Programs

A. A. Deshpande, Massachusetts Institute of Technology, and S.S. Pande, Indian Institute of Technology Bombay

Design of a High-Speed Parallel Kinematics X-Y Table and Optimal Velocity Scheduling For High-Speed Machining

J. Stori and P.M. Ferreira, University of Illinois at Urbana-Champaign

Engine Crank Bore Analysis For Boring Operation

S. Gu and H. Ho, DaimlerChrysler Corporation

Session 7-C: Manufacturing Systems VI – Product/Process Design

218AB, Stewart Center

Co-Chairs: Bilal Meiteh, Delphi Interior Systems
Yuan-Shin Lee, North Carolina State University

Virtual Clay Modeling System Used For Creating Basic Idea of Product Shape

H. Aoyama and H. Fujiki, Keio University

Context Sensitive Assistance In Computer Aided Design Systems

R. Narayanaswami and A. Ajmera, Iowa State University

Fabrication of a Micro Humidity Sensor on a Thin Flexible Substrate

B.K. Ng, S. Tung and S.A. Batzer, University of Arkansas

Management and Analysis of Design Constraints For Electronic-Mechanical Product Manufacturing

P.K. Wright, D.A. Dornfeld, M.G. Montero and C.H. S'equin, University of California at Berkeley

10:00 a.m. – 11:00 a.m.

ASME MED 2001 IMECE Symposia Organizers Planning Meeting

218C, Stewart Center

10:00 a.m. – 10:30 a.m.

Refreshment Break

10:30 a.m. – 12:00 noon

Concurrent Technical Sessions

Session 8-A: Material Removal XIII - Dynamics

214AB, Stewart Center

Co-Chairs: Jun Ni, University of Michigan
K. Scott Smith, University of North Carolina at Charlotte

Dynamic Modeling of Face Milling Process Including The Effect of Fixture Dynamics
I.M. Deiab, S.C. Veldhuis and M. Dumitrescu, McMaster University

An Illustrative Reduction Approach in Machining Dynamics
M.S. Fofana, Worcester Polytechnic Institute

Experimental Investigation of Friction-Induced Vibrations In Turning
D. Maus, M. Wiese and G. Warnecke, University of Kaiserslautern

Session 8-B: Material Removal XIV - Tribology
214CD, Stewart Center

Co-Chairs: Patrick Kwon, Michigan State University
Robert Ivester, National Institute of Standards and Technology

Novel Composite cBN-TiN Coating: Synthesis and Performance Analysis
S.N. Yedave, A.P. Malshe, W. Brown, University of Arkansas and W. Russell, Valenite, Inc.

Towards An Improved Friction Model In Material Removal Processes: Investigating the Role of Temperature
Z. Tao and M. Lovell, University of Pittsburgh

Study of Airborne Dust Emission and Process Performance During Dry Machining of Aluminum-Silicon Alloy with PCD and CVD Diamond Coated Tools
P.U. Arumugam, A.P. Malshe, S.A. Batzer and D.G. Bhat, University of Arkansas

Session 8-C: Material Removal XV - Monitoring and Control
218AB, Stewart Center

Co-Chairs: Barry Fussell, University of New Hampshire
Richard Wysk, Pennsylvania State University

Software Implementation of a Computer-Vision-Based Tool Condition Monitoring System
M.A. Mannan, A.A. Kassim, C.S. Ho and Z. Mian, National University of Singapore

Control of the Cutting Force Normal to a Machined Surface Using the Current of a Stationary Feed Motor
Y.H. Jeong and D.W. Cho, Pohang University of Science and Technology

Geometry Compensation For 5-Axis Abrasive Waterjet Cutting of Profiled Edge Lamination Tools
D.F. Walczyk and Y.T. Im, Rensselaer Polytechnic Institute

12:00 noon - 1:30 p.m.

Luncheon

North Ball Room at Purdue Memorial Union

1:30 p.m.

Conference Adjournment

1:30 pm - 5:00 p.m.

Industry Tour

Caterpillar and Fairfield Manufacturing (Transportation Provided)

Busses will begin loading at 1:30 p.m. in front of the hotel main entrance. Return to the hotels at 5:00 p.m.

Conference Registration Form

NAMRC XXX

May 21-24, 2002. West Lafayette, Indiana, USA

Complete a form **for each individual attending** (including Guest Program Registrants).
Make necessary copies for additional registrants, prior to completing.

First Name: _____ Last Name: _____

Name, as it should appear on nametag: _____

Professional Title: _____

Organization: _____

Address: _____

City: _____ State/Province: _____

Postal Code: _____ Country: _____

E-mail Address: _____

Day Phone: _____ Fax: _____

Additional Information

(Check all that apply)

- I require auxiliary aids/services due to a disability. Please contact me at the above address.
- I have special dietary needs - please indicate needs: _____
- AUTHORS: AV Requirements: _____
- I will be bringing my spouse/significant other. Name for badge: _____
- He/She would like to participate in the spouse tours.
- Please reserve my seat for the Industry Tour on Friday.
- I will attend Friday Luncheon.

Registration Fees

- Full Registration before May 1, 2002\$375 USD
- Full Registration after May 1, 2002\$425 USD
- Student/Retiree Registration\$125 USD
- Guest Registration.....\$155 USD

TOTAL: _____

Purdue University is not responsible for costs due to cancellation.

Payment Method

Enclosed is a check for \$_____ made payable to **Purdue University** in US Dollars.

I will be using a company purchase order for the payment

PO# _____

Please charge to my

Master card VISA Discover

Account Number _____ Expiration Date: _____

Signature: _____

Mail or Fax form with payment to:

Business Office, Conference Division
Purdue University
1586 Stewart Center, Room 110
W. Lafayette, In. 47907-1586
FAX 765-494-0567

PARKING: Ample free parking is available at the parking garage across from the Purdue Memorial Union. Parking is free for those staying at the PMU and \$3 per day for others.