TWENTY SECOND NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE

NAMRC XXII
May 23-27, 1994

Including the
S.M. Wu Symposium
May 27-28, 1994

Robert R. McCormick School of Engineering and Applied Science
Northwestern University
Evanston, Illinois, USA
Dear Friends:

Northwestern University is delighted to host the twenty second North American Manufacturing Research Conference. The Conference continues its historic role of providing a forum for the discussion of basic and applied research in material removal, material forming and manufacturing systems.

This year, there will be 76 papers presented at the Conference from universities, research institutes and industrial research laboratories from North America and nine overseas countries. All the papers have been accepted based on a peer review process conducted by the NAMRISME Scientific Committee. Featured speakers include Dr. Jay Hook who will provide some new ideas on university-industry interactions and professor Bill Rice who will tell us about the history of the Conference.

Immediately following the Conference there will be a week-end Symposium in honor of the late Professor S. M. Wu and his many contributions to manufacturing research and education.

The conjunction of the NAMRC Conference and Wu Symposium presents a unique opportunity for practitioners to discover what is going on in the manufacturing research community. We wish especially to encourage our colleagues in industry to attend one or both events. Be assured that we will do our best to provide a warm welcome and a productive environment. To misquote William Butler Yeats:

"there are no strangers at NAMRC, only friends who have not yet met."

We look forward to renewing old acquaintances and meeting new friends in Evanston at NAMRC XXII and the Wu Symposium. We hope that you will enjoy and profit from the experience.

Cordially yours,

Kory Ehrmann and Bill Wilson, Co-Chairs, NAMRC XXII Organizing Committee

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**PROGRAM AT A GLANCE**

**NAMRC XXII**

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**LEGEND:**

F: FORMING SESSIONS
C: CUTTING SESSIONS
S: SYSTEMS SESSIONS

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**FIRST S.M. WU SYMPOSIUM**

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Program at a Glance: NAMRC XXII, Thursday May 25, plenary session at 8:30, followed by C1, F1, S1, C2, S22, C3A, C3B, S3, Banquet. Thursday, May 26, C4, F4, S4, C5, F5, S5, C6, S6A, S6B, Lab, Beach Party Membership ASMPE. Friday, May 27, C7A, C7B, S7, C8, F8, S8, S88.

Legend:
F: Forming Sessions
C: Cutting Sessions
S: Systems Sessions

TWENTY SECOND NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE - NAMRC XXII

Prospectus
The twenty-second North American Manufacturing Research Conference, to be held May 25-27, 1994, is designed to provide a forum for the timely presentation and critical discussion of the results of basic and applied research in materials forming, material removal and manufacturing systems. The papers to be presented have been accepted based upon review of their full text. They report manufacturing research from universities, research institutes and industrial research laboratories from North America and nine overseas countries.

Transactions
All the papers to be presented at NAMRC XXII will be contained in either the two bound "Transactions at the North American Manufacturing Research Institution of SME '94" or self-bound proceedings. All registrants at NAMRC XXII participants will receive a copy of each at the time of registration. Additional copies of either document may be purchased at registration for $60 and $20 respectively. After the Conference, they may be purchased from the SME Publications Department.

Conference Site
The Conference will be held in the Norris Center at Northwestern University, Evanston, Illinois, which is located on the shore of Lake Michigan about 12 miles north of downtown Chicago. Guest rooms will be available at the nearby Omni Chicago Hotel. Trans to the site is facilitated by the wide variety of air, road and rail arteries which converge in Chicago. Evanston provides an excellent selection of shops and restaurants, while all the delights of the Chicago area are within half an hour by car or public transportation.

The conference banquet will be held on the evening of Wednesday, May 25, on board the cruise vessel "Cobalt." The vessel will depart from Navy Pier in Chicago at 7 P.M. and return at 10 P.M. The cruise will provide spectacular views of Lake Michigan and Chicago's glittering skyline. Transportation will be provided from and back to Evanston.

Registration Fees
Registration fees for the full conference are $315 for registrants presenting, $185 for registrants attending. The one day registration fee is $185 while the student or retiree registration is $75. These registrations include all NAMRC meals, the transactions and proceedings. There are no reduced registrations for authors or session chairs. Fees are refundable for cancellations received up to five working days prior to the start of the Conference. Cancellations after this date but prior to the start of the Conference will be assessed a $50 cancellation charge. No refunds will be given after the start of the Conference.

Accompanying Persons' Program
A non-technical program will be provided on Wednesday, May 25 and Thursday, May 26 for visiting spouses, guests and others who do not wish to attend the technical sessions. The program will include visits to the Art Institute of Chicago, the Field Museum, the Bahai Temple and the Chicago Botanical Gardens. There will also be time to shop and socialize. The program fee of $70 includes luncheon, transportation and admission fees.

FIRST S.M. WU SYMPOSIUM ON MANUFACTURING SCIENCE

Prospectus
The First Wu Symposium on Manufacturing Science, USA Venue, has been organized to provide a forum for the presentation and discussion of basic and applied research in the field of manufacturing. It is dedicated to Professor S. M. (Sam) Wu (1924 - 1992) who devoted more than thirty years of his professional life to the introduction and refinement of innovative approaches to the design, analysis, optimization, and control of manufacturing processes and systems. Professor Wu's legacy of graduate education and research continues through all of those that he taught and mentored.

Proceedings
A hard-bound proceedings, containing all of the papers presented during the symposium, including the keynote addresses, will be available at the symposium. All registrants will receive a copy of the proceedings of the Wu Symposium.

Symposium Site
The symposium will be held in the Ozilnong Hotel, adjacent to Northwestern University, Evanston, Illinois. Evanston is located on the shore of Lake Michigan about 12 miles north of downtown Chicago. Guest rooms will be available at the Ozilnong Hotel. Travel to the site is facilitated by the wide variety of air, road and rail arteries which converge in Chicago. Evanston provides an excellent selection of shops and restaurants, while all the delights of Chicago are within half an hour by car or public transportation.

Social Events
The Wu Symposium will feature a banquet on Friday night with a special tribute to Professor Wu, a continental breakfast buffet on Saturday morning, and a lunch on Sunday with a featured speaker. All of the social events for the symposium will be co-sponsored by The Chrysler Corporation, Modern Engineering, Inc. of Troy, MI, and Perception, Inc. of Farmington Hills, MI.

Registration Fees
The registration fee is $150 for the full symposium, which includes a copy of all the proceedings, the Friday banquet, continental breakfast on Saturday morning, Saturday lunch, and refreshment breaks. A $50 registration fee is available to graduate students, which includes all of the privileges of the full registration, including all meals and a copy of the bound proceedings.

NAMRC XXII registrants may attend the Friday afternoon plenty session and Friday afternoon concurrent paper presentation sessions without registering for the Wu Symposium. Wu Symposium Banquet tickets may be separately purchased. The Wu Symposium Proceedings are available to all Wu Symposium registrants. Extra copies will be available for purchase.
GENERAL INFORMATION (Both Events)

Travel

Evanston is served by two major Chicago airports, O'Hare and Midway, which are about 15 miles and 23 miles away respectively. Cab, limousine and light rail service to Evanston is available from both airports. Cab companies based near Evanston which offer special flat rates to and from the airports are: Northside Cab (phone: 743-0066 at airport) and 303 Cab (phone: 763-0003 at airport). All the major cab rental companies also operate facilities at both O'Hare and Midway.

Northwestern University has negotiated a 7% reduced rate from any United Airlines published fare which is available if you make your flight reservations through American Express, our official travel service. Simply call American Express at 1-800-848-5010, Mention that you are attending the North American Manufacturing Research Conference (and/or Wu Symposium).

If traveling to Evanston by car, take the Dempster Street exit from either I-294 (Tri-State Tollway) or I-94 (Edens Expressway) and drive east into Evanston. Then take Chicago Avenue or Sheridan Road to reach the campus, or Chicago Avenue, Davis Street and Orrington Avenue to reach the Omni Orrington Hotel. A map is provided for your convenience.

Hotel

The Omni Orrington Hotel, 1710 Orrington Avenue, Evanston, IL 60201, has been designated as the Conference Hotel. A block of rooms has been reserved for conference. Rates are $80 single, $95 double, per night. Please make your reservation by calling 1-800-THE-OMNI (1-800-864-6664) or (708) 864-5700 prior to May 3, 1994. Mention that you are attending the North American Manufacturing Research Conference and/or the Wu Symposium.

Parking

The Omni Orrington Hotel will provide valet parking for its guests at $8 per day. Limited on-campus parking is also available at a cost of $2.00 per day. Please inquire about this at registration.

To Register

Fill out the attached registration form and:

MAIL to: Conference Registration, Center for Manufacturing Engineering, Northwestern University, 2145 Sheridan Road, Evanston, IL 60208-3111, USA

or FAX to: Conference Registration, Center for Manufacturing Engineering, FAX number (708) 491 - 4816

or PHONE: (708) 491 - 4814

Payment using a personal or corporate check is preferred but we will also be able to accept purchase orders, VISA or MasterCard.

Further Information and Messages

If you need further information, or wish to send a message to someone attending the Conference, you can:

PHONE: (708) 491 - 4814
FAX: (708) 491 - 4816
or E-MAIL: NAMRC@PLATO.NWU.EDU
TWENTY SECOND NORTH AMERICAN MANUFACTURING RESEARCH CONFERENCE

NAMRC XXII
May 25-27, 1994

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NAMRC XXII
TECHNICAL SESSIONS AND PROGRAM

TUESDAY, MAY 24
05:00 - 07:00  Registration and Reception
Orrington Hotel
Heritage Room

07:00 - 08:00  NAMRI/SME Board of Directors Dinner
Orrington Hotel
Mulford Room

08:00 - 12:00  NAMRI/SME Board of Directors Meeting
Orrington Hotel
Mulford Room

WEDNESDAY, MAY 25
07:30 - 08:30  Registration and Continental Breakfast
Norris Center
2nd Floor

08:30 - 10:00  Opening Ceremony
Norris Center
McCormick Auditorium
Opening Remarks  W. R. D. WILSON, Co-Chair
K. F. EHMANN, Co-Chair
Welcoming Remarks  C. W. KERN, Vice President Research
J. B. COHEN, Dean, McCormick School
Introductory Remarks  R. E. DeVUR, NAMRI/SME President

09:30 - 10:00  Keynote Address
Norris Center
McCormick Auditorium
Balancing Conflicting Demands
JAMES "JAY" WESLEY HOOK

About our Keynote Speaker: Jay Hook is currently a consultant to
MascoTech Inc. and a visiting Professor at the McCormick School. Prior to this he
was Group President at Masco Industries Inc. He has also worked for Rockwell
International, Chrysler, the Cincinnati Reds and New York Mets.

10:00 - 10:30  Coffee Break
Norris Center
2nd Floor

WEDNESDAY, MAY 25
10:30 - 12:00  Three Concurrent Technical Sessions
Norris Center, Rooms as noted

C1:  MACHINING INNOVATIONS - 1
Room: 1 RC
Co-Chairs: J. M. FILDIS, Basic Industry Research Laboratory
D. W. CHO, Polahrng Institute of Science & Technology
Development of a New Type of Magnetic Finishing Tool for Internal
Finishing of Tubing Using Rotating Magnetic Field, H. YAMAGUCHI and Y.
SHIMURA, University of Tohoku, Japan.
The Design of the Turn Milling Machine as a Function of the Process
Dynamics and Accuracy, J. KORCZ, M. POZACZUK and S. DOLNIK, Aleksand
Za Obdolovno Tehnika, Slovenia.
Titanium 1332F Using JAM - A Way to Achieve High Productivity of
Titanium Components for Transportation Products, R.R. UHRICK, F.C.
SCHENEN, JR. and M. CRISP, Cleveland State University, OH.

F1:  METAL FORMING - 1
Room: 2 A
Co-Chairs: B. HOWSER, Steel Technologies Inc.
R. R. SCHMIDT, University of Notre Dame
Expert System for Multi-stage Cold Forging Process Design, H. KIM, Korea
Advanced Institute of Science & Technology, Korea, S. YOON, Seoul National
University, Korea, and Y.T. IM, Korea Advanced Institute of Science &
Technology, Korea.
Preform Design in Forging Processes Using Nonlinear Finite Element
Method, Q. ZHAO, E. WRIGHT and H. GRANDHI, Wright State University, OH.
Development of a Practical Software Tool for the Design of Rolls for NNS
Profile Rolling, G. FISCHER and J.S. GUNDAKER, Ohio State University, OH.

S1:  PROCESS PLANNING - 1
Room: 2 G
Co-Chairs: J. L. MOU, National Institute of Standards and Technology
A. AGONI, Clemson University
ZHANG, Texas Tech University, TX, and S.R. RAY, National Institute of
Standards & Technology, MD.
An Integrated Approach of Revised Agglomerative Hierarchical Clustering
and Neural Networks to the Design of Self-Adaptive Part Family Formation
Systems, S.C. SHIH, Auburn University, AL, and J. HAM Pennsylvania State
University, PA.
Knowledge Based Generation CAPP Overcoming the Constraints of Part
Families, H.J. WARNECKE, H. DURR, A. WÄUER and H. MUTHSAM,
Universitaet Dettign, Germany.
WEDNESDAY, MAY 25

12:00 - 13:30 Lunch
Norris Center
Lewis Room

History of NAMRC
Professor WILLIAM B. RICE, Queen's University

13:30 - 15:10 Three Concurrent Technical Sessions
Norris Center, Rooms as noted

C2: MECHANICS OF CUTTING - 2
Room: 1 B/C
Co-Chairs: D. J. MASS, National Center for Manufacturing Sciences; W. EMERICH, University of Illinois at Urbana-Champaign
A New Approach for Shape-Form Characterization in Machining, J. REI and S. JAWAHER, University of Kentucky, KY.
Modelling Chip Formation Along the Tool-Chip Interface in Machining, X. U. National University of Singapore, Singapore.
Rotation of Shear Plane at Exit In Interrupted Cutting, Z.Y. WANG, State University of New York-Binghamton, NY; C. KAMAY, G. WU and Z.J. YUAN; Harbin Institute of Technology, China.
The Importance of Considering Size Effect Along the Cutting Edge in Predicting the Effective Lead Angle for Turning, W.J. ENDRES and D.J. WALDORF, University of Illinois at Urbana-Champaign, IL.

S2A: SYSTEM DESIGN - 1
Room: 2 A
Co-Chairs: R. N. JOHNSON, Basic Industry Research Laboratory; K. KIM, University of Illinois, Chicago.
Feature Sequencing in the Rapid Design System Using a Genetic Algorithm, S. LECLOAG and H. KASHYAP, Wright Laboratory (AFMC), OH; and C.L. PHILIP CHEN, Wright State University, OH.
A Symbolic and Computational Method for Design and Analysis of Bifurcating, Tristable-Type Transition Surfaces, A. VORUGANTI, Virginia Tech, VA; S.D. DIVEJNE, Indian Institute of Technology, India; and C.F. RINDELZER, Virginia Tech, VA.
Operation-Driven Manufacturing Cell Design Methodology: Its Premises and Applications, F. F. CHEN and S. R. SAGI, University of Southwestern Louisiana, LA.

WEDNESDAY, MAY 25

13:30 - 15:10 Three Concurrent Technical Sessions
(Continued)
Room: 2 G
Co-Chairs: J. W. GRANT, Ford Motor Company; P. M. FERRERA, University of Illinois at Urbana-Champaign
An Adaptive Prediction of Machining Accuracy in Tuming Operations, T. MATSUMURA, Tokyo Denki University, Japan; T. OSHIMA and T. SHIRAISHI, Tokyo Institute of Technology, Japan; and E. UEDA, Tokyo Denki University, Japan.
Error Link Metrology and Flexible Error Synthesis Model for Correcting Quasi-Static Machine Errors, G. H. LO, J.X. YUAN and J. NI, University of Michigan, MI.
Compensation Movements In 5-Axis Milling and Its Computational Solution in CAM and/or CNC System, G. YU, Swiss Federal Institute of Technology (ETH), Switzerland.

15:00 - 15:20 Coffee Break
Norris Center
2nd Floor

15:30 - 17:00 Three Concurrent Technical Sessions
Norris Center, Rooms as noted

C3A: MACHINING INNOVATIONS - 2
Room: 1 B/C
Co-Chairs: D. STEPHENSON, General Motors Corporation; J. SUTHERLAND, Michigan Technological University
Phase Electrochemical Machining (PECM) of Ti-6Al-4V Alloy, G. WEI, J. KOZAK and K.P. RAJURKAR, University of Nebraska-Lincoln, NE.
Hot Machining in Retrospect and Review, E.M. MELNIK, University of Iowa, IA.
THURSDAY, MAY 26

10:00 - 10:30 Coffee Break
Norris Center
2nd Floor

10:30 - 12:00 Three Concurrent Technical Sessions
Norris Center, rooms as noted

C5: CUTTING TOOLS AND TOOLING
Room: 1 B/C
Co-Chairs: R. C. REUTER, JR., Sandvik Naturali Laboratories
S. Y. LIANG, Georgia Institute of Technology
machining Performance of Thin Film Diamond Coated Inserts on 390AI, C.H. SHEN, General Motors Corporation.
Modeling of Thermal Behavior for Diamond Coated Alumina Tool Inserts, M. D. DEKES, Martin-Balewko, and D.R. DURHAM, University of Wmington, NE.
Weave of Diamond Tools in Ultra-Precision Machining of Cu-Copper, Z.Y. WANG and C. SAHAY, Binghamton University, NY.

C6: MILLING OPERATIONS
Room: 1 B/C
Co-Chairs: R. STANG, Marquette University
J. M. University of Michigan
Face Milling Process Modeling with Bearing Nonlinearity, Y.C. SHIN and A.J. WATERS, Purdue University, IN.
Geometrical Analysis of Flute Grinding and Application to End Mill, S.L. KO, Korea Tungsten Co., Korea.
The Effect of Identification of Chatter in the Audio Spectrum of Milling, S. SMITH and W.R. WYNKOCH, University of Florida, FL.

F5: DIE CASTING
Room: 2 A
Co-Chairs: L. G. HECTOR, Alcoa Laboratories
V. MALIN, Basic Industry Research Laboratory
Application of Dynamic Viscoelastic Finite Element Method to Shot-Peening Process, K. MORI and K. OKASAKA, Osaka University, Japan.
Numerical Simulation of Cavity Filling and Its Influence on Wear in Die Castings, K. VENKATESAN and R. SHIVPURI, Ohio State University, OH.
Minimization of Entrainment Gas Porosity in Aluminum Horizontal Cold Chamber Die Castings, J.R. BREVICK, Ohio State University, OH, C.J. ARMENIAISON, Fintex Corp, OH, and Y.L. CHU, Ohio State University, OH.

SS: QUALITY ASSURANCE
Room: 2 G
Co-Chairs: J. HU, University of Michigan
B. BAHM, Wichita State University
A Process Model-Based On-line-Off-line Methodology for Short Run Quality Control, M.R. DVIRIES, R.E. DEVOR and S.G. KAPOOR, University of Illinois at Urbana-Champaign, IL.
The Development of a Generic Total Productive Maintenance (TPM) System, M.L. PHILIPPT, J.E. MCCONKEY, C.M. VERSELL and T.A. GYAV, University of Illinois at Urbana-Champaign, IL.
Linear Function Modeling of Time Variant Quality Characteristics, S. VADBREDE, K. PHILIPPT, J. SUTHERLAND and W. OLSON, Michigan Technological University, MI.

THURSDAY, MAY 26

12:00 - 14:00 SME Awards Luncheon
Norris Center
Lewis Room

13:30 - 15:10 Three Concurrent Technical Sessions
Norris Center, rooms as noted

F6A: PRECISION ENGINEERING - 3:
Room: 2 G
Co-Chairs: M. MANI, North American Philips Corporation
S. S. KRIEWEK, University of Wisconsin - Madison
A Fractional Difference Equation Model for Polyenerg and Compostable Material Robotic Structure, M.J. POTVIN, J.C. PIEDBOUF and J. JESWIEC, Queen's University, Canada.
Minimization Pose Deviation of Industrial Robots by an Error Compensating Modelling and Simulation of the Kinematic Chain, S. THATER and A. BEHRENS, Mercedes Benz AG, Germany.
Compensation of Geometric and Quasi-Static Errors of a Multi-Axis Machine, S.M. WANG and K.P. EMMANN, Northwestern University, IL.
Automated Evaluation of Viscometric Errors of a Multi-Axis Machine, S.M. WANG and K.P. EMMANN, Northwestern University, IL.

F6B: SYSTEM SIMULATION
Room: 2 A
Co-Chairs: T. S. BAHM, Motorola
A. YAMAZAKI, University of California-Davis
An Integrated Approach to Simulation, Control and Real-Time Diagnostic of Manufacturing Systems Based on Adaptive Augmented Timed Petri Nets, O. MASON, Florida Atlantic University, FL.
An Activity Based Costing Interface to Manufacturing Simulation, M. KRISHNAMURTHY and R. JAYASANKAR, Northern Illinois University, IL, D.T. PHILLIPS, Texas A&M University, TX.
Testing the Variance Homogeneity of the Machine Vision System’s Gray Level Response, C.C. WANG, C.C. CHEN, Northeastern University, MA.
THURSDAY, MAY 26

15:30 - 17:00 Laboratory Tour
Technological Institute

17:30 - 19:00 Beach Party
Aquatics Center

19:00 - 20:00 NAMRI/SME Membership Meeting
Technological Institute Lecture Room M351

20:00 - 21:00 ASME Production / Manufacturing Division
Technological Institute Lecture Room M351

FRIDAY, MAY 27

07:30 - 08:30 Registration and Continental Breakfast
Norris Center 2nd Floor

08:30 - 10:00 Three Concurrent Technical Sessions
Norris Center, rooms as noted

C7A: FINISHING PROCESSES
Room: 2 A
Co-Chairs: N. SONTE, Pennsylvania State University
K. HYAMBAYE, University of Missouri - Rolla

Post-Finishing of Electrodischarge Machined Surfaces by Electrochemical Machining, A.S. KHARY and Z. SADOULAH, Sultan Qaboos University, Oman.

The Effect of Tool Wear on the Wavelength Structure of a Turned Surface Profile, J. AUNOLA, K. MOON, J. SUTHERLAND, Michigan Technological University, MI.

Wear Parameters for Description of Machined Surfaces, M. GUPTA and S. RAMAN, University of Oklahoma, OK.

C7B: PROCESS CONTROL AND DYNAMICS
Room: 2 G
Co-Chairs: J. RAJA, University of North Carolina - Charlotte
S. SHEU, Advantech Laboratories

Adaptive Control of EDM by On-Line Identifying Workpiece Height, H.M. WANG and K.P. RAJURKAR, University of Nebraska-Lincoln, NE.

Cylindrical Error Compensation in Diamond Turning via F-Integral Receptive Control, S.Y. LI, Changhua Institute of Technology, Taiwan, and C. J. LI, Presseylher Polycrystallo Institute, NY.

Influence of Process Parameters on Change in Dynamic Behavior of the Workpiece in Lathe Turning, K. KIM, Iowa State University, IA, and B.E. KLAMECK, University of Minnesota, MN.

S7: ASSEMBLY AUTOMATION
Room: 1 B/C
Co-Chairs: S. WANG, Cornell University
G. WIENS, Auburn University

Shape Recognition by ODS Approach, R. GUO, S.M. PANDIT, Michigan Technological University, MI.

A Flexible Robotic Assembly System for Automated Disk Drive Manufacturing, I. FUK and Y. ZHANG, National University of Singapore, Singapore.

New Development of an Evaluation System of Assembly Sequences Based on Ease of Assembly, B. JEONG and I. HAM, Pennsylvania State University, PA.
FRIDAY, MAY 27

10:00 - 10:30 Coffee Break
Norris Center
2nd Floor

10:30 - 12:00 Three Concurrent Technical Sessions
Norris Center, rooms as noted

C8: GRINDING
Room: 7 B/C
Co-Chairs: D.A. LUCCA, Oklahoma State University
M. FUGELSO, University of Minnesota - Duluth

Computer Simulation for Creep-Feed Form Grinding, N. CHIU and S. MALBAI, University of Massachusetts - Amherst, MA.

Computer Simulation of 2D Internal and External Cylindrical Grinding, Z. YAO and Y. LI, University of Connecticut, CT.


FR: SHEET FORMING
Room: 2 A
Co-Chairs: D. KORIEKWA, Los Alamos National Laboratory
D. LEE, Rensselaer Polytechnic Institute

Factors Affecting the Accuracy and Control of the Sheet Metal Forming Simulator, P.K. SAHA and W.R.D. WILSON, Northwestern University, IL.

On the Effects of Variable Shank Holder Force in Deep Drawing of Asymmetric Parts, Y. WANG and C.A. MAJESSI, Michigan Technological University, MI.

Tribio-characteristics of Galvanized Sheet Steel Evaluated by Strip-Ironing Type Tribometer, K. DOHDA, S. KASHWAYA, Z. WANG and M. NAOI, Gifu University, Japan.

SB: MACHINE AND PROCESS MONITORING
Room: 2 G
Co-Chairs: M. HASHISH, Flow Research, Inc.
A. S. C. BOSE, University of Texas Pan American

Dell State Monitoring During Multispindle Machining, A. SOKOLOWSKI and D.A. DORINFEI, University of California - Berkeley, CA.

Real-Time Monitoring of AWJ Nozzle Wear Using Artificial Neural Network, R. MOHAN, R. KOVACEVIC, and R. DAMARLA, University of Kentucky, KY.

Using Neural Network and Kinematics for Machine Tools Error Monitoring and Correction, J. MOU, University of Illinois - Chicago, IL.

FRIDAY, MAY 27

12:00 - 13:30 Buffet Luncheon
Joint with S.M. Wu Symposium
Orofino Hotel
Heritage

Adjournment

NAMRC XXII Registrants may attend the Friday afternoon plenary session and Friday afternoon concurrent paper presentation sessions without registering for the Wu Symposium. Wu Symposium Banquet tickets may be separately purchased. The Wu Symposium Proceedings is available to all Wu Symposium registrants. Extra copies will be available for purchase.
FIRST S. M. WU SYMPOSIUM ON MANUFACTURING SCIENCE
USA VENUE

May 27-28, 1994

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University of Illinois at Urbana-Champaign

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FIRST S.M. WU SYMPOSIUM
TECHNICAL SESSIONS AND PROGRAM

FRIDAY, MAY 27

10:00 - 17:00 On-Site Registration
Orvington Hotel

12:00 - 13:00 Lunch
(Joint with NAMRC XXII participants)

13:00 - 15:00 Opening Session
Grand Ballroom A & B

Welcome by:
R. E. (DICK) DeVOR
University of Illinois at Urbana-Champaign,

JUN NI
University of Michigan

Keynote 1:
A Professor's Professor
DONALD S. ERMER
University of Wisconsin - Madison

Keynote 2: An Extension of the Wu Philosophy in Manufacturing Engineering Education
TSONG-HOW CHANG
University of Wisconsin - Milwaukee

Keynote 3: Time Series, System Identification and DDS: Sam Wu's Contributions, Problems, and Contemporaries
WARREN R. DAVIES
Rensselaer Polytechnic Institute

Keynote 4: Industry-University Interaction: A Vision Fulfilled
DENNIS BRAY
Ingersoll Milling Machine Company
FRIDAY, MAY 27

15:30 - 17:00  Three Concurrent Technical Sessions
Ontario Hotel, rooms as noted

FA - I:  ON-LINE MONITORING AND CONTROL 1:  Grand C
PROCESS IMPROVEMENT

Co-Chairs: Y. PANDELIDIS, The Gillette Company
N. WEIL, National Center for Manufacturing Sciences

Intelligent System for Cutting Parameter Optimization and Design of
Cutting Process Monitoring Systems, A. SOKOLOWSKI, and D. A.
SPRUNGE, University of California - Berkeley.

A Model for Cutting Tool Load Simulation and Monitoring in Turning
Operation, J. E. STAHL, J. M. ZHOU, and M. ANDERSSON, Lund University.

Monitoring of the Abrasive Flow Machining Process Using Acoustic
Emission, R. E. WILLIAMS, and K. P. RAJURKAR, University of Nebraska-
Lincoln.

Surface Topography Control in Single-Point Cutting, C. WANG, M. S. HONG,
and K. F. EHLMANN, Northwestern University.

FA - II:  MEASUREMENT/ACCURACY 1:  Evans II
MACHINE-TOOL ERROR ANALYSIS

C. S. SHEN, General Motors Corporation

Quick Testing and Real-time Thermal Error Compensation of Thermally
Induced Errors for CNC Machine Tools, J. S. CHEN, and G. CHOU, National
Chung Cheng University.

Optimal Modeling of Thermal Error Components for Machine Tool Error

Geometric Error Analysis of a Multi-Axis Machine Tool Machining
Sculptured Surfaces, J. H. CHO, and K. KIM, University of Illinois - Chicago.

some Thoughts and New Developments on Precision Machining, K. K.
WANG, Cornell University.

FRIDAY, MAY 27

15:30 - 17:00  Three Concurrent Technical Sessions
(Continued)

MACHINING PROCESSES AND SYSTEMS 1:

FA - III:  MACHINING DYNAMICS  Multiford

Co-Chairs: F. NAASSIRPOUR, Learner, Inc.
D. STEPHENSON, General Motors Corporation

Design of Feedrate Profile for Constant Force Milling Involving Varying
Workpiece Geometry, Y. L. YAO, University of New South Wales, and X. D.
FANG, University of Wollongong.

Analysis of the Cutting Force System in Slot End Milling Operations, S. N.
MELKOTE, and W. J. ENDRES, University of Illinois at Urbana-Champaign.

Analysis of the Multi-Cut Beveling Operation, J. B. LIBRIZZI and J. A. RICE,
University of Illinois - Chicago.

Modelling and Monitoring Drill Bit Transverse Motions, S. A. BASILE, Johns
Hopkins University.

18:00 - 15:00  Social Hour (Cash Bar)

19:00 - 20:00  Banquet Dinner

20:00 - 22:00  Banquet "Sam Wu Roast"

D. A. DORNFIELD, Master of Ceremonies
Comments by Ph.D. students, colleagues, and friends of S. M. Wu
SATURDAY, MAY 28

07:15 - 08:00 Continental Breakfast Buffet  heritage

08:00 -10:00 Three Concurrent Technical Sessions  Orrington Hotel, rooms as noted

SM1-I: TOOLING AND TOOL DESIGN  Grand A
Co-Chairs: M. F. DeVRIES, University of Wisconsin - Madison
           M. FUJII, University of Minnesota - Duluth.
Tool Wear in Micro-Machining of GF-Copper with Diamond Tools, W. ZHYONG, State University of New York - Binghamton.
Development of Flexible Fixturing Technique in Manufacturing Industry, Y. RONG, S. Li, and Y. BAI, Southern Illinois University - Carbondale.
The Development of Continuum-Based Models of Machine-Tool Spindle Drive Shafts, G. JZHONG, HUST University of Technology, and B. H. WILSON, Northeastern University.
Further Improvement of Multifacet Drills, J. L. WANG, J. SHA, and J. NI, University of Michigan.

SM1-II: QUALITY DESIGN AND CONTROL 1:  Grand B
CONTEMPORARY CONCEPTS AND METHODS
Co-Chairs: T. N. GOH, National University of Singapore
           T. UNGPUAYKUL, Kimberly-Clark
Taguchi Approach for Reliability Engineering, M. S. PHADKE, Phadke & Associates.
DOE - A Tool for Product Evaluation, FARHAD TADAYON, Boeing Commercial Airplanes.
How to Reduce Tooling Cost - A Study of Tool Replacement Strategies Using Taguchi’s Quality Loss Function, R. DU, University of Windsor.

SATURDAY, MAY 28

08:00 -10:00 Three Concurrent Technical Sessions
(Continued)

SM1-III: MACHINING PROCESSES AND SYSTEMS 1:  Grand C
PROCESS IMPROVEMENT
Co-Chairs: P. BANYOPADHYAY, General Motors Corporation
           S. OWusu-Ofori, North Carolina A&T University
Influence of Cutting Conditions on Chatter Frequency of a Machining System, Z. L. ZHANG, and K. F. ESCHMANN, Northwestern University.
Machining Chatter Suppression by Means of Spindle Speed Variation, Part II: The experimental investigation, H. ZHANG, H. SHI, and J. NI, University of Michigan.
Application of Stochastic Geometry in Characterizing Random Phenomena in Material Removal Processes, P. R. SHRKEY, Z. J. PEI, and P. M. FERREIRA, University of Illinois at Urbana-Champaign.
Thermal Aspects, Material Considerations and Cooling Strategies in Cryogenic Machining, S. Y. RONG and Z. B. ZHAO, Wright State University.

10:00 - 10:30 Refreshment Break

10:30 - 12:00 Three Concurrent Technical Sessions  Orrington Hotel, rooms as noted

SM2 - I: ON-LINE MONITORING AND CONTROL:  Grand A
PROCESS IMPROVEMENT
Co-Chairs: W. A. KLINGE, Montronix, Inc.
           C. WU, Ford Motor Company
On-line Evaluating Dynamic Machining Performance for Different Cutting Tools in Finish-Machining, X. D. FANG, University of Wollongong, and Y. L. YAO, University of New South Wales.
Integrating Vibration and Vision System for Monitoring Cutting Process, SEHINAM BAHAR and SAEED MOTAVALLI, Wichita State University.
Characteristic Frequency Analysis for Tool Wear Monitoring, H. PAN, Y. CHEN, and E. DIAOY, University of Michigan - Dearborn.
SATURDAY, MAY 28

10:30 - 12:00 Three Concurrent Technical Sessions (Continued)

On Line Metal Reversing Process Control Using Neural Networks, N. TARABISHY, B. BOHR, and J. STECK, Wichita State University.

SM2 - II: MEASUREMENT/AccurACY 2:  CMM TECHNOLOGIES

Co-Chairs: D. CARLSON, Perceptron, Inc.
G. GAZDON, Easkyton-Keodai


Compensation of Measuring Machines in Real Time, J. A. BOSCH, Giddings & Lewis.


SM2 - III: MANUFACTURING PROCESSES 1:  MATHEMATICAL MODELING

Co-Chairs: W. R. DeVRIES, Rensselaer Polytechnic Institute
W. R. NELSON, Northwestern University

Modeling of Thin-Walled Tube Bending at Large Deformations, H. Z. LI, R. FAGERSON, and K. A. STELSON, University of Minnesota.

On the Plastic Deformation of a Tube During Bending, K. PAN and K. STELSON, University of Minnesota.


Crack-Tip Equation of Motion Due to Non-Uniform Residual Stresses in a Waveguid, C. K. FANG, E. KANATEV-SIBI, JR., and J. R. BABBERT, University of Michigan.

12:00 - 13:00 Lunch

Speaker: D. CARLSON, Perceptron, Inc.
Industry-University Collaborative Research Relations

13:00 - 15:00 Three Concurrent Technical Sessions

Orrington Hotel, rooms 44, 45

SAI - I: MANUFACTURING PROCESSES 2:  STATISTICAL MODELS/TIME SERIES

Co-Chairs: H. CHAO, Consolidated Paper Co.
B. DUN, Electric Power Research Institute

Precision Surface Characterization via 2-D Spectral Analysis, E. J. SALISBURY, K. S. MOON, and J. W. SUTHERLAND, Michigan Technological University.

Joe and Abuse of Linear Regression Analysis in Machine Vision System Calculations, S. J. DEUTSCH, and C. C. WANG, Northeastern University.


Extensions to Modeling Capabilities of Autoregressive-Moving Average Model Forms, S. I. DEUTSCH, Northeastern University.

Reliability Measure Estimation for Repairable Systems with Non-Constant Failure Rate, Y. CHEN, University of Michigan - Dearborn.

SA1 - II: CAD/GEOMETRIC MODELING

Co-Chairs: A. HUANG, Max Group Corporation
S. G. KAPLAN, University of Illinois at Urbana-Champaign

Blind Surface with the Flexibility Shape and GC Continuity for CAD/CAM, H. K. LEE, and J. E. YANG, Chon buk National University.


About the New Type of Metal-Cutting Tool Partial Motions in NC Machining of Sculptured Part Surfaces, S. P. NAZIETSLICHT, Drapetersheksh Industrial Institute, Ukraine.
SATURDAY, MAY 28

13:00 - 15:00 Three Concurrent Technical Sessions
(Continued)

SA1 - III: QUALITY DESIGN AND CONTROL 2:
TOLERANCES AND ASSEMBLY ISSUES
Co-Chairs: R. E. DeViSt, University of Illinois at Urbana-Champaign;
J. W. SUTHERLAND, Michigan Technological University

On the Use of Principal Components for Manufacturing Tolerance Design
and Control, T. G. CHOU, Marquardt Electronics, and T.H. CHANG, University
of Wisconsin-Milwaukee.

Variance Minimization in Selective Assembly, W. A. BERECZK, General
Electric Medical Systems, and T-H. CHANG, University of Wisconsin -
Milwaukee.

Process Navigator for Automobile Body Assembly Process, J. SHI, and S. J.
HU, University of Michigan.

Variation Stack-up for Deformable Sheet Metal Assembly - One
Dimensional Models, C. S. LIU, and S. J. HU, University of Michigan.

An Adaptive Assembly System for Automotive Applications, Z. J. PASIUK,
S. M. WU, and A. G. URSOV, University of Michigan.

15:00 - 15:30 Refreshment Break

15:30 - 17:00 Two Concurrent Technical Sessions
Omniagro Hotel, rooms as noted

SA2 - II: MANUFACTURING PROCESSES 3:
DESIGN AND ANALYSIS ISSUES
Co-Chairs: T. S. BASKIN, Motorola, Inc,
W. J. ZDEBICAK, Institute for Advanced Manufacturing Sciences

Optimization in Cutting, N. N. SMIRNOV, Volograd Construction Institute.

Concurrent Engineering and the Environment, S. VADREVUK, K. K. PHILLIPS,
J. W. SUTHERLAND, and W. W. OLSON, Michigan Technological University.

Adaptive Optimization of Face Milling Operations Using Neural Networks,
T. J. KO, and D. W. CHO, Pohang Institute of Science and Technology.

Micro-Tool Inspection by Following the Laser Beam Reflections and the
Abduction Induction Mechanism (AIM), I. N. TANSEL, M. TRUJILLO, and C.
LEVY, Florida International University, and B. HUMMEL and D. BOARD, DME
Corporation.

SATURDAY, MAY 28

15:30 - 17:00 Two Concurrent Technical Sessions
(Continued)

SA2 - II: ON-LINE MONITORING AND CONTROL 3:
CONTROLLER DESIGN AND ANALYSIS
Co-Chairs: C. H. SIKHO, Wisconsin, Inc
S. SPIREK, University of Wisconsin - Madison

Robust Control System for High Speed Motion Drives, R. D. HAYES, Y. C.
SHIN, and O.D.I. NOVOK, Purdue University.

Cutting Force Regulation by Using an Adaptive Servocontroller, J. KIM, and
T-Y. KIM, Seoul National University.

Gain Scheduling Conventional Controller Design for a Spindle Unit
Supported by Magnetic Bearings, J. KIM, and D. SHIN, Seoul National
University.

Hierarchical Direct Neural Network Learning Controller for Trajectory
Tracking of Robots, N. W. CHBAY, and C. J. LI, Columbia University.

Adjournment

Duplicate this form for additional registrations. Please print or type.

Dr. Mr. Ms. First Name ___________________________ Last Name ___________________________
Organization ___________________________
Address ___________________________
City ___________________________ State ___________________________ Postal Code ___________________________
Phone ___________________________ FAX ___________________________

Special Meal Requirements ___________________________


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<th>Amount</th>
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<tr>
<td>$315</td>
<td>Full registration postmarked, faxed or phoned on or before May 13.</td>
</tr>
<tr>
<td>$340</td>
<td>Full registration after May 13.</td>
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<tr>
<td>$75</td>
<td>Student or retiree registration.</td>
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Above registrations include all NAMRC meals and one copy of Transactions.

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<td>$185</td>
<td>One day registration for (give day), includes meal for day and one copy of Transactions.</td>
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<td>$17</td>
<td>Guest lunch ticket for Wednesday May 25.</td>
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<td>$55</td>
<td>Guest banquet ticket for Wednesday May 25.</td>
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<tr>
<td>$17</td>
<td>Guest lunch ticket for Thursday May 26.</td>
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<td>$25</td>
<td>Guest beach party ticket for Thursday May 25.</td>
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<td>$20</td>
<td>Guest lunch ticket for Friday May 27.</td>
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<tr>
<td>$70</td>
<td>Accompanying person program</td>
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<td>$70</td>
<td>Accompanying person name(s)</td>
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Note: The NAMRC lunch on Friday May 27 will be held jointly with the Wu Symposium. Registrants of either NAMRC or the Wu Symposium may attend NAMRC, registers may also attend the sessions of the Wu Symposium to be held on the afternoon of Friday May 27, at no additional charge, and/or purchase a ticket to the Wu Symposium Banquet to be held on the evening of Friday May 27.


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<td>$150</td>
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<td>$50</td>
<td>Student or retiree registration.</td>
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Above registrations include all Symposium meals and one copy of Proceedings.

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<td>$10</td>
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<td>$70</td>
<td>Accompanying person name(s)</td>
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TOTAL PAYMENT (U. S. Dollars)

Check enclosed (preferred) ___________ Will pay at conference ___________
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