

Sustainable Manufacturing

PRODUCTS ** PROCESSES ** SYSTEMS

Fall 2014

Volume 1,
Issue 2

Newsletter

Inside this issue

Item	Page
PRISM	2
Roadmapping Workshop	2
Newly Funded Projects	3
Awards and Honors	3
Patents Awarded	4
Papers Presented	4

Director's Message



At the Institute for Sustainable Manufacturing (ISM), we are continuing to make significant progress with our overall mission in **sustainable manufacturing, focusing on products, processes and systems** through **research, education and outreach programs**. Our research productivity has been phenomenal during the last fiscal year, with increased funding, publication record, graduate student productivity, industry outreach, etc. We are steadily moving towards targets exceeding last year's achievements.

Here are some highlights of our achievements:

- Organized and hosted the 4th International Forum on Sustainable Manufacturing
- Received NIST-AMTech funding for developing industry-led, shared vision research consortia in sustainable manufacturing – organized and hosted a national roadmapping workshop
- Launched an online Masters Program in Manufacturing Systems Engineering by significantly revising our current course offerings, and focusing on sustainable manufacturing
- Continued to expand international research collaboration with researchers from Australia, China, Finland, France, Germany, Italy, Lebanon, Malaysia, Norway, Slovenia, and United Kingdom.

4th International Forum on Sustainable Manufacturing – September 12, 2014

The 4th International Forum on Sustainable Manufacturing was successfully held at the University of Kentucky on September 12, 2014, with 114 total participants, including 77 from industry. Cutting-edge research initiatives to address major sustainable manufacturing challenges at the product, process, system and supply chain levels were presented by internationally recognized academic researchers and industry leaders. Professor Fazleena Badurdeen, ISM Faculty serving as the Forum Chair, along with her two co-chairs, Professors J. Seay and Haluk Karaca, both ISM Faculty Affiliates, organized and hosted this year's Forum.



From left to right: Ed Morris (America Makes), Dr. Alan Taub (ALMMII), Prof. Fazleena Badurdeen (UK-ISM) and Dr. Dean Bartles (DMDI), discussing the role of IMI's in promoting sustainable manufacturing.

A special feature at this year's event was a national-level panel discussion with the leaders of three Institutes for Manufacturing Innovation (IMI) on the role of IMI's in promoting sustainable manufacturing. Dr. Dean Bartles (Executive Director, DMDI - Digital Manufacturing and Design Innovation Institute), Dr. Alan Taub (Chief Technology Officer, ALMMII – American Lightweight Materials Manufacturing Innovation Institute) and Ed Morris (Director, America Makes – Additive Manufacturing Innovation Institute).

Also unique to this year's event was 'Emerging Researcher Presentations', funded through a grant by the National Science Foundation (NSF). Leading tenure-track Assistant Professors and Post-doctoral researchers, who are engaged in research in sustainable manufacturing and related areas from across the country, were provided travel support through the NSF grant to attend and share their work at the Forum.



Audience engaged in Q&A after presentations.



Attendees observing the research posters during a session break

Forum also included a research poster competition which helped provide exposure to even more research carried out in sustainable manufacturing across the United States.

Journals

ISM houses the editorial offices for two major international journals:

- International Journal of Sustainable Manufacturing
<http://www.inderscience.com/ijism>
- Journal of Machining Science and Technology
<http://www.tandfonline.com/toc/lmst20/current>



Details of our new projects, lab facilities, books, recent publications, patents, etc., can be found on our website: www.ism.uky.edu

PRISM: A New NIST-funded ISM Project Dedicated to Developing Research Consortia in Sustainable Manufacturing

PRISM is the Partnership for Research and Innovation in Sustainable Manufacturing. It is an emerging alliance of industry, government, and academia with the goal of defining and executing a pragmatic, business-driven agenda for achieving and maintaining sustainable manufacturing. The PRISM project is funded by the National Institute of Standard and Technology (NIST) Advanced Manufacturing Technology Consortia (AMTech) program.

Project Objectives

- **Develop multi-partner consortia** to create technology infrastructure and promote U.S. excellence in sustainable manufacturing

- **Identify and prioritize research projects** supporting long-term strategic industrial needs in sustainable manufacturing
- **Develop shared-vision roadmaps for technologies** that enable transformational innovations for next-generation manufacturing

Project Team

University of Kentucky

- I. S. Jawahir (PI),
 F. Badurdeen (Co-PI),
 K.E. Rouch (Co-PI),
 W. Li (Co-PI),
 E. Grulke (Co-PI),
 C. Smith (Project Manager), and
 B. Hogan (Graduate Student)



Integrated Manufacturing Technology Initiative
 (Richard Neal)

National Center for Manufacturing Sciences (Manish Mehta)

Gold 1 Enterprise (Tom Goldsby)

Industry Partners and Collaborator

Aerospace Industry

Automotive Industry

Consumer Products Industry

Automotive Manufacturing Technical Education Collaborative



Sustainable Manufacturing Roadmapping Workshop



ISM recently organized and hosted a two-day Sustainable Manufacturing Roadmapping Workshop in conjunction with the project partner, Integrated Manufacturing Technology Initiative (IMTI). This workshop was held at the historic Spindletop Hall of the University of Kentucky on November 12-14, 2014. The specific goals of this workshop are to:

- add to the collective knowledge and understanding regarding sustainable manufacturing,
- define an industry-led vision for the PRISM consortium,
- provide the foundation for a sustainable manufacturing technology roadmap to address business and technical issues,
- introduce and mature a business-driven approach for prioritizing sustainability investments, and
- begin the process of establishing a collaborative research agenda.

The workshop focused on products, processes and systems. A total of 44 participants from industry, academia, government organizations, including DoD, attended the workshop and were actively engaged in lively discussion. A comprehensive report is currently being prepared by IMTI, and will be available to all participants in January 2015.

Two additional segment-specific sustainable manufacturing workshops will be organized and hosted in 2015 by the National Center for Manufacturing Sciences (Ann Arbor, MI).



Richard Neal (IMTI) outlining the workshop format



Workshop opening session



A breakout discussion session



Reporting session



Final concluding session

New Funded Projects

Professor Y.M. Zhang (PI from ISM/ECE Department) received new research funding for his project on **Weld Pool Surface Shape Measurement and Process Control** from the Oak Ridge National Laboratory (\$90,000, Nov. 2014 – Oct. 2017).

Professors I.S. Jawahir (PI from ISM/ME Department) and D.A. Puleo (Co-PI from Biomedical Engineering Department) received new research funding for their research on **Investigation of Surface Integrity induced by Cryogenic Processing of Biomaterials for Improved Functional Performance** from the National Science Foundation (\$300,000, July 2014 – June 2017).

ISM researchers (PI: Professor I.S. Jawahir and Co-PIs: Professors F. Badurdeen, K.E. Rouch, W. Li and E. Grulke) received funding under the NIST Advanced Manufacturing Technology Consortia (NIST-AMTech) program for their project on **Partnership for Research and Innovation in Sustainable Manufacturing (PRISM): Product, Process and System Integration** (\$500,000, June 2014 – May 2016).

Professor Y.T. Chen received funding from the Ford University Research Program for a project on **Using Mixing Science to Improve Battery Quality** (\$120,000, August 2014 – July 2017).

Professor Y.T. Cheng is a Co-PI of a project team that recently secured funding from the National Science Foundation (EPSCoR Program for Research Infrastructure Improvement (RII) – Track 1) for a project on **Powering the Kentucky Bio-economy for a Sustainable Future** (\$20M, August 2014 – July 2019).

Professor F. Badurdeen (PI), K. E. Rouch, I. S. Jawahir, C. Goble, J. Baker, and G. Swan (Co-PIs) received an eLII grant from the University of Kentucky for developing an **Online Masters Program in Manufacturing Systems Engineering**, \$125,000 (co-funded by the UK College of Engineering with \$56,000, Feb. 2014 – Feb. 2016).

Professors F. Badurdeen (PI) and J. Seay (Co-PI) received a grant from the National Science Foundation to support the **Sustainable Manufacturing Forum** (\$25,000, May 2014 – April 2015).

Awards and Honors

Dr. Badurdeen Received 2014 IIE Excellence in the Teaching of Lean Concepts Award



Left to right: IIE President Dennis Oates, IIE Immediate Past President Dr. Kim LaScola Needy, Dr. Fazleena Badurdeen and IIE President-elect Dr. James E. Moore II.

ISM faculty, **Dr. Fazleena Badurdeen** received the 2014 IIE Excellence in the Teaching of Lean Concepts Award from the Institute of Industrial Engineers for her exceptionally outstanding contributions to teaching lean concepts and promoting lean education. She received this award at the Honors & Awards Banquet during the IIE Annual Conference & Expo held at the Palais des Congrès de Montréal, Canada on May 31 – June 3, 2014. The IIE Lean Teaching Award is given out annually to honor the services of a person/group of

people who have developed curriculum and disseminated courses in the subject area.

We're on the web!
www.ism.uky.edu

Dr. Jawahir Received 2014 Distinguished Visiting Fellowship from Royal Academy of Engineering

ISM Director, **Dr. I.S. Jawahir** received a 2014 Distinguished Visiting fellowship award from the Royal Academy of Engineering, United Kingdom in October 2014. Under this award, he will travel to United Kingdom in Spring 2015 twice, and will give lectures on *Cryogenic Processing of Materials for Improved Product/Process Sustainability* at the University of Birmingham, University of Nottingham and at Rolls-Royce PLC (Derby). He will also develop collaborative research opportunities for ISM with researchers from these universities.

Dr. Zhang Received A.F. Davis Silver Medal



Dr. YuMing Zhang received the A.F. Davis Silver Medal Award in Machine Design from the American Welding Society in Atlanta, GA on November 11, 2014 for his paper "Active droplet oscillation excited by optimized waveform"

Dr. Zhang receiving award from American Welding Society President Dean Wilson.

published in Welding Journal in year 2013. The AWS Awards are designed to recognize men and women in the industrial, education and research communities who have made distinctive contributions to advance the science, technology and application of welding and allied processes, including joining, brazing and soldering, cutting and thermal spraying.

Outstanding Staff of the Year

Charles Arvin, ISM Lab Manager, was chosen as one of fifty-six University of Kentucky staff members honored during the 2014 Outstanding Staff Awards sponsored by Staff Senate and the President's Office.



Congratulations to Charles!

New Patents Awarded

“Liquid-metal negative electrode for lithium-ion batteries,” Yang T. Cheng, Stephen J. Harris, Adam T. Timmons, US Patent 8,642,201 (February 4, 2014).

“Self healing lithium-ion battery negative electrodes, product including same, and methods of making and using same,” Yang T. Cheng, Stephen J. Harris, Adam T. Timmons, US Patent 8,658,295 (February 25, 2014).

“Self-healing and scratch resistant shape memory polymer system,” Xingcheng Xiao, Tao Xie, and Yang T. Cheng, US Patent 8,664,299 (March 4, 2014).

“Liquid metal electrodes for rechargeable batteries,” Rutooj D. Deshpande, Juchuan Li, Yang-Tse Cheng, US Patent 8,841,014 (September 23,

Keynote Papers Presented by ISM Faculty at International Conferences

Professor Y.M. Zhang presented a keynote paper on *Modeling of human welder response for robotic welding* at the **4th International Conference on Robotic Welding, Intelligence and Automation (RWIA '2014)** in Shanghai, P. R. China held on October 25-27, 2014.

Professor Yang-Tse Cheng presented a keynote paper on *Surface Engineering for Improving the Performance and Durability of Lithium Ion Batteries* at the **41st International Conferences on Metallurgical Coatings and Thin Films** held in San Diego, CA on April 29, 2014.

Professor Yang-Tse Cheng presented a keynote paper on *Understanding diffusion-induced stress and fracture for improving the performance and durability of lithium ion batteries* at the **2014 Battery Congress** held in Troy, MI on June 11, 2014.

Professor Yang-Tse Cheng presented a keynote paper on *Electrochemical Energy Storage: Challenges and Opportunities for Hybrid and Electric Vehicles at the Modern Engineering and Technology Seminar 2014 (METS 2014)* held in Taipei, Taiwan on November 10-12, 2014.

Professor I.S. Jawahir presented a plenary keynote paper on *Metrics-based Evaluation of Sustainable Manufacturing Processes* at the **3rd International Chemnitz Manufacturing Colloquium (ICMC 2014)** held in Chemnitz, Germany on April 8-9, 2014.

Professor I.S. Jawahir presented a keynote paper on *State-of-the-Art Research in Sustainable Cryogenic Machining for Automotive Applications* at the **International Workshop on Cryogenic Machining** held at Scania, Södertälje, Sweden on August 22, 2014.

Professor I.S. Jawahir presented a plenary keynote paper on *Global Sustainable Manufacturing: U.S. Perspective* at the **12th Global Conference on Sustainable Manufacturing (GCSM)** held in Johor Bahru, Malaysia on September 22-25, 2014.

Professor I.S. Jawahir presented a keynote paper on *Novel Processing Methods and Predictive Models for Enhanced Product Performance, Life and Sustainability at Component Level* at the **3rd International Conference on Through-life Engineering Service (TES)**, Cranfield, United Kingdom held on November 4-5, 2014.

Professor I.S. Jawahir presented a keynote paper on *Sustainable Machining: Developing Predictive Performance Models and Optimization Techniques for Improved Product/Process Performance* at the **17th International Conference on Advances in Materials and Processing Technologies (AMPT 2014)** held in Atlantis – The Palms, Dubai, UAE on November 17-20, 2014.



College of Engineering
University of Kentucky
414 CRMS Bldg
147 Graham Avenue
Lexington, KY 40506-0108, USA

Phone: 859-323-3238
Fax: 859-257-1071
Web: www.ism.uky.edu

ISM Faculty and Staff



F. Badurdeen Y.T. Cheng L. Holloway I.S. Jawahir W. Li D. Sekulic Y. Zhang C. Arvin H-M. Adkins

MS in Manufacturing Systems Engineering: An Online Program

The Department of Mechanical Engineering in conjunction with the ISM at the University of Kentucky will be offering a new online MS program from Spring 2015. This program is

- Internationally recognized, multi-disciplinary graduate program
- Conducted by world-renowned faculty with expertise in advanced and cutting-edge manufacturing research
- Two alternatives are offered to pursue: thesis or project options
- Offered entirely online, with courses starting Spring 2015
 - Asynchronous course delivery
 - Opportunity for same level of faculty-student & student-student interaction
 - In-state tuition with online courses

For more information:

Visit <http://www.engr.uky.edu/mfs/> or, email: manufacturing@uky.edu

