Roadmap Workshop on Sustainable Manufacturing

The Sustainable Manufacturing Advances in Research and Technology Coordination Network (SMART CN) project seeks to build a roadmap as a foundation for sustainable manufacturing. To that end, a workshop was held at the Kingsgate Marriott Hotel in Cincinnati, OH, on August 15 and 16, 2013.

In 2011, a partnership of multiple universities, operating under a banner of CACHE Corporation, received a five-year grant from the National Science Foundation to establish the SMART Coordination Network. The premise of the project is that:

- The U.S. manufacturing sector is greatly challenged as global competition has moved away from large-scale cheap labor to advanced manufacturing techniques.
- Energy and environmental issues, such the availability and cost of petroleum and greenhouse gas constraints, heighten the pressures.
- In academia, issues such as engineering sustainability, advanced manufacturing theory, and alternative energy and biofuels have become active research areas.
- The awareness of related work and the coordination and collaboration of ongoing work is inadequate.

To bridge the gap between the academic knowledge discovery and industrial technology innovation for sustainable manufacturing, an interdisciplinary, international research coordination network has been created to promote SMART. SMART reflects the theme of the joint effort among a number of leading academic laboratories, centers, non-government organizations, and major manufacturing industries.

The goals of this project are to 1) conduct a comprehensive review of leading-edge research and technological development for sustainable manufacturing; 2) define a roadmap towards manufacturing sustainability and identify the bottlenecks in selected research areas via several workshops; 3) coordinate research through sharing of knowledge, resources, software, and results; 4) establish partnerships with industrial groups to expedite technology introduction; and 5) conduct education and outreach to a wide range of stakeholders.

The SMART CN collaboration is guided by a Principal Investigator (PI), four Co-PIs, and a Steering Committee selected from the leaders of the sustainable manufacturing academic community. The Steering Committee was selected with a strong emphasis on diversity of expertise and assuring broad coverage of the sustainable manufacturing domain. The committee is bolstered by collaboration with researchers from six other countries (Table 1).

The August workshop is an important milestone in bringing the community together to create a roadmap for sustainable manufacturing. By building on the foundation of knowledge from existing roadmaps, and by bringing experts from around the world together in intense exploration, key challenges will be defined, a common vision will be established, and goals for realizing the vision will be captured. These goals define the pathways for success in achieving a pervasive awareness and practice in support of energy efficiency and environmental responsibility in every aspect of manufacturing. After the workshop, a document will be produced and be made available to all participating organizations.

Table 1. The SMART CN Steering Committee and Collaborators Steering Committee Members		
Name	**Affiliation**	**Expertise**
Allen, David	University of Texas	Atmospheric chemistry, green engineering
Bakshi, Bhavik	Ohio State University	Industrial ecology, energy analysis, LCA
Davidson, Cliff (Co-PI)	Syracuse University	Aerosol physics, sustainable engineering
Eden, Mario (Co-PI)	Auburn University	Process and product design, biorefineries
Edgar, T. (Co-PI)	University of Texas	Process control, smart manufacturing, smart grids
El-Halwagi, Mahmoud (Co-PI)	Texas A&M University	Process and product design, process integration
English, Burton	University of Tennessee	Economics and policy, biomass and feedstocks
Fasenfest, David	Wayne State University	Sociology, labor and workforce development
Grossmann, Ignacio	Carnegie Mellon University	Enterprise-wide optimization, process/water/energy systems
High, Karen	Oklahoma State U.	Environmentally benign process design, K-12 outreach
Huang, Yinlun (PI)	Wayne State University	Engineering sustainability, multi-scale system integration
Jawahir, Ihrahim S.	U. Kentucky	Manufacturing process, computer integrated manufacturing
Maravelias, Christos	University of Wisconsin	Supply chain management, production scheduling
Ogden, Kim	University of Arizona	Feedstock, biofuel manufacturing, K-12 outreach
Rezac, Mary	Kansas State University	Sustainable bioenergy, biorefineries
Shadman, Farhang	University of Arizona	Environmentally benign semiconductor manufacturing
International Collaborators		
Gani, Rafiqul	Tech. University of Denmark, Denmark	Computer-aided design, process sustainability
Hertwich, Edgar	Norwegian University of Science & Tech., Norway	Energy systems, greenhouse gas analysis, risk analysis
Hu, Shanyin	Tsinghua University, China	Industrial ecology, industrial park evaluation
Jin, Qun	Waseda University, Japan	Computing sustainability, informatics& networking
Karimi, Iftekhar A.	National University of Singapore, Singapore	Production scheduling, biomass systems
Lee, Jay H.	KAIST, Korea	Process modeling and control, energy systems
Qian, Yu	South China University of Technology, China	Coal/biomass for energy production
Wozny, Gunter	Technical University of Berlin, Germany	Process systems science, thermodynamic analysis