NSF I/UCRC Site Proposal (Green Manufacturing)

Western Michigan University (WMU) and Michigan State University (MSU)

We propose to establish WMU as a Site of the existing ATTC IUCRC at MSU.

Goals/Objectives/Vision: To develop a framework by which design and manufacturing decisions can be evaluated with consideration of environmental and energy impact, and economic outcomes. The Site at WMU will develop a multidisciplinary team to determine how environmental and energy systems, and economic valuations can be integrated into enterprise decision making. The ultimate goal of environmental and energy conscious product design and manufacturing, is to deliver products that do not degrade the environment over their life, including eventual disposal. Alternatively, operations that yield no net environmental damage or a positive environmental balance are considered targets of opportunity.

Research Approach/Methods: The basic approach and analyses will involve considering the global environmental and energy aspects or impact of design, manufacturing and business decisions. Design methodologies and paradigms such as Eco-Innovation and Cradle-to-Cradle approaches will be fundamental to the Site’s research program. Eco-Innovation is the process of developing new products, processes or services which provide customer and business value but significantly decrease environmental impact (James, 1997). Eco-innovation is one of several creative approaches towards sustainable design and manufacturing that will be included in the Sites’s research portfolio. Cradle to Cradle analysis complements the eco innovation method to provide the framework by which design and manufacturing alternatives can be evaluated. The emphasis is not to merely reduce the environmental impact and energy consumption, but to eliminate them (McDonough, 2002).

Target Industry: Manufacturing companies that are concerned with environmental impacts and energy utilization. The Site will solicit participation from a cross section of manufacturing industries, including: industrial, commercial, and consumer products - including both durable and consumable goods, and businesses. The central research theme that will unite these organizations involves Green Manufacturing and eco-innovation and cradle-to-cradle analysis, which could potentially encompass nearly all products and related manufacturing activities.

Intellectual Merit: Design and manufacturing engineers need to be educated about the environmental and energy consequences of their decisions. Awareness can then be followed with specific analytical tools to quantitatively evaluate design and manufacturing decisions against an environmental-cost metric, such that environmental and energy cost effective solutions will be incorporated into the final design and production systems. The environmental and energy analysis must be done upfront or initially in a project to insure adequate treatment on an equal footing with other activities such as marketing and sales. This philosophy is fundamental and girded by the theme that technology can provide a high standard of living, concomitant with a clean environment and energy efficiency, and that in practice environmental stewardship can be good for business.

Broader Impacts: Continued viability of US manufacturers includes due consideration for environmental and energy impacts. It is now established in the U.S. culture that environmental stewardship and energy efficiency are good business practices that can strengthen a company’s bottom line, i.e. concern for the environment and energy resource utilization can result in both increased income and decreased cost of doing business (Jameson, 2001). Design and manufacturing with environment and energy criteria can produce win-win scenarios, i.e. reduced pollution and improved energy utilization, rather than added cost considerations and penalties.