DOE Advanced Manufacturing Office
Sustainable Manufacturing Workshop

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By: Dr. Nabil Nasr
Associate Provost for Academic Affairs &
Director, Golisano Institute for Sustainability
Rochester Institute of Technology
Sustainable Manufacturing

... is the economical creation of goods and services using technologies and processes that are non-polluting, conserve energy and natural resources, and are safe for employees, communities, and consumers.
Goal: Decoupling

Decoupling environmental degradation from economic growth

By 2050, humanity could devour 140 billion tons of minerals, ores, fossil fuels and biomass per year – 3X its current appetite – unless the economic growth rate is “decoupled” from the rate of natural resource consumption.

OECD’s Sustainable Manufacturing Toolkit

Sustainability components

Issue Areas

Indicators category

Environment

- Resource Productivity
  - Climate Change
  - By-products

Economy

- Financial performance
- Employees
- Social responsibility

Society

- Social responsibility

Critical Indicators

- Social responsibility
- Material use
- Water use
- Energy use
- GHGs
- Residuals

Internal Data Elements

- Costs
- Labor
- Social costs/benefit
Conceptual Relationship between Sustainable Manufacturing and Eco-Innovation*

Institutions

Organizations And Marketing Methods

Processes And Products

Eco-innovation Targets

System Level

Technological

Sustainable Manufacturing and Eco-Innovation

Pollution control

Cleaner production

Life-cycle Engineering

Eco-efficiency

Closed-loop production

Eco-innovation

*OECD, 2010
The Circular Economy is a New System Approach*

*Ellen MacArthur Foundation
Sustainable Manufacturing Innovative From the Inside Out*

Product Example

- 35% more visibility
- 50% less operator noise
- 35-70% lower undercarriage operating cost
- Up to 20% less fuel consumed per hour
- 60% fewer moving parts in the electric drive train
- 25% more material moved per gallon of fuel
- 50% better steering performance
- Less fluids used

*Caterpillar Inc.
Examples of European Initiatives

European Remanufacturing Network
Rемanufacturing allows companies to strategically position themselves close to their customers whilst delivering economic and environmental savings. ERN helps existing remanufacturers improve their operations and encourages new business to take up remanufacturing.
Prof. Nabil Nasr
Associate Provost for Academic Affairs
& Director, Golisano Institute for Sustainability (GIS)

Rochester Institute of Technology
Rochester, NY USA

Email: nasr@rit.edu
Phone: +1 585-475-5106

http://www.sustainability.rit.edu/