

## 2007 Funded Projects & Graduate Student Needs

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**Title: Decision support for Improved Financial and Environmental Performance of Product Leasing**

**Funding: NSF**

**Students needed: 1**

US businesses spent \$668 billion on acquiring productive assets in 2003. Of this sum, \$208 billion, or 31 percent, represents assets acquired through leasing. These numbers reflect a new awareness of companies that their primary business is selling *product services*, not the products themselves. In addition to the servicing and financial advantages of leasing, there have been recent claims that leasing is beneficial for the environment. The practice of leasing products, rather than selling them, is viewed by many as a strategy for increasing resource productivity, particularly by preventing waste generation and moving to a pattern of closed-loop materials use. This school of thought argues that by maintaining ownership of the product, the manufacturer can successfully put in place a product recovery strategy consisting of reuse, remanufacturing, and recycling. However, preliminary investigation shows that the environmental benefits of leasing are not clear cut. Furthermore, not all companies that lease their products engage in the same level of take-back and recovery activities. While a few companies are very sophisticated in this respect, others do not capitalize on the opportunity provided by end-of-lease ownership, even for comparable products. Clearly, a deeper, system-wide, life-cycle understanding of leasing is needed to achieve its full economic and environmental benefits. To this end, the research questions we will address include:

- What are the environmental issues, risk and opportunity areas of leasing for various end-of-life scenarios and product characteristics?
- What are the most appropriate integrated leasing and recovery options for various product and market characteristics?

In this task, the goal is to develop environmental performance models that can be connected to financial game theoretic and optimization models as modules to gain insight into the environmental performance of leased products for the given scenarios (sale, disposal, material recycling, remanufacture), product characteristics, and durability/life-spans. This project is in collaboration with Profs. Ferguson and Toktay in the College of Management.

**Title: Evaluation of Air and Steam Handling Strategies and Technologies in Automotive Manufacturing**

**Funding: Ford Motor Company**

**Students needed: 1**

With the help of Georgia Tech, Ford has recently started to evaluate new concepts for the generation, handling, and use of compressed air and steam in its plants and to develop a strategy for phasing out powerhouses and implementing new energy saving technologies.

In this project, the specific focus is to follow with prior work and evaluate whether the strategy developed for a specific Ford plant can be transferred and implemented in other Ford facilities. As part of this, a Triple Bottom Line business case in terms of financial, environmental and social benefits needs to be quantified.

The outcome will be reports and models that provide a) a direct assessment of potential savings of each strategy/technology and b) decision support in the selection of the most appropriate cleaning and air handling strategies/technologies. Specific deliverables are

- Centralized compressed air and steam elimination strategy elements
- Identification & evaluation of alternative technologies vs. compressed air and steam usage to achieve same desired process result
- Business cases for localized generation of compressed air and steam vs. reliance on centralized powerhouse supply where need cannot be eliminated
- Direct assessments of the potential savings of each technology/strategy will be provided to provide the decision support needed in the selection of the most appropriate methods

Part of the project will be a summer internship in Summer 2008 at Ford Motor Company.

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**Title: Design and Implementation of Sustainable Mobility Hub Networks**

**Funding: Ford Motor Company**

**Students needed: 1**

Based on the five mega trends that are expected to drastically affect mobility this century: congestions, urbanization, energy and the environment, social equity, and shifting demographics, Ford is evaluating new enterprise ideas that would gradually shift Ford's core competency from building vehicles to building ideas and integration for mobility. This will allow the company to: (1) enter new, untapped, profitable markets; (2) Achieve progress toward sustainability related goals (e.g., GHG emissions reduction) and (3) Minimize threats from new, low-cost manufacturers in the traditional market.

One option being considered is to develop a mobility hub network (or a network of hubs). In each hub, the user can choose from a variety of mobility options (e.g., train, bus, car, bike, moped, etc) which allow him to get from A to B. Although the basic concept is not new, most implementations have been ad-hoc at best. In this project, we seek to develop a structured engineering design approach to designing and implementing a sustainable mobility hub network for a given city. A first step would be to inventory the entire set of mobility options available (ranging from walking, biking, busing, driving, to train transport and beyond) as well as their different technical options (e.g., gasoline, ethanol, diesel or electric powered, small versus large size, etc.). Next would be to identify the user needs, requirements and design constraints, followed by the functions that each hub has to perform. Also included should be needs for shelter, safety, etc., that apply at each location.

Part of the project will be a summer internship in Summer 2008 at Ford Motor Company.

**Title: Environmental Sourcing and Manufacturing Index**

**Funding: Ford Motor Company**

**Students needed: 1**

Ford buys a wide range of parts and commodities from suppliers within the US, Canada, Mexico, and worldwide. Currently, the decision to source a part from a particular supplier is solely based on cost, quality, and technical factors. There are many others factors, however, that should be considered by a company trying to achieve a higher level of sustainability. In this project, triple bottom line analyses are taken into account to achieve a more thorough calculation for determining suppliers. Ford and Georgia Tech have successfully collaborated to create a method and a tool for analyzing packaging alternatives for a single part sourced from a low cost country to determine both the cost and the environmental footprint of the complete packaging solution. Using this knowledge, a study has also been performed to analyze Ford's various suppliers primarily from a location standpoint. This study has resulted in a preliminary version of an environmental sourcing tool that is currently being evaluated for patenting. The tool evaluates the impact of buying parts from different locations. One area still to be addressed is the environmental impact from the manufacturing stage and location. In this project, information from different sources should be gathered to develop a data/info-base with environmental-focused information on specific manufacturing operations (e.g., injection molding, sand-casting, die-casting, machining, milling, stamping, bending, etc.). This information is to be coupled with the existing logistics information and integrated in Ford internal-evaluation tools. The primary objective of this project is to develop an environment sourcing index to evaluate global sourcing decisions, and, specifically, to investigate the economics and the environmental impact of various supplier locations and manufacturing operations.

Part of the project will be a summer internship in Summer 2008 at Ford Motor Company.