



The Business Case for Sustainability at Cummins Inc.

THE BUSINESS CASE FOR SUSTAINABILITY AT CUMMINS INC.

A project submitted in partial fulfillment of the requirements for the degree of Master of Science, School of Natural Resources and Environment at the University of Michigan.
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ABSTRACT

This report presents the business case for why Cummins Inc., a 10-billion-dollar diesel engine and power company, should adopt a sustainability strategy, and provides suggestions for how the company can incorporate the concept of sustainability into its existing processes. The *Four-Question Sustainability Framework*, a tool created specifically for this project, is used throughout the report.

The five reasons *why* Cummins should adopt a sustainability strategy are:

- Sustainability is part of Cummins' *history*.
- Sustainability is in line with Cummins' *vision, mission, and values*.
- A sustainability strategy will help Cummins address *macro-environmental trends*.
- A sustainability strategy will enable Cummins to reap *financial benefits*.
- A sustainability strategy is necessary for Cummins to remain *competitive*.

We present a case study of Fleetguard's creation of the Mach filter to demonstrate how the interplay of these factors influenced a Cummins business unit to pursue a new product linked to sustainability.

To explain *how* Cummins can integrate a sustainability strategy, we develop a sustainability vision statement for Cummins. We then draw upon the Four-Question Sustainability Framework to systematically analyze existing processes and suggest enhancements for how the company can become more sustainable. We recommend implementing these changes through four main channels: overall company objectives, planning processes, operational practices, and financial analyses.

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TABLE OF CONTENTS

Executive Summary	vii
Cummins Background	x
I. Introduction	1
Purpose.....	2
Defining Sustainability	2
Approach.....	5
II. Sustainability & Cummins Philosophy	13
Sustainability is a Part of Cummins’ History	14
Vision, Mission, & Values.....	16
Cummins’ Values Driving Business Decisions	19
III. Financial Benefits of Sustainability	27
Overview.....	28
Macro-environmental Pressures.....	28
Business Drivers	30
Risk Management	31
Business Growth.....	33
Operational Efficiency	34
Customer Demands.....	35
Brand Equity	36
Human Capital	38
Shareholder Response.....	39
Summary	40
IV. Competitive Analysis	43
Overview.....	44
Competitive Analysis Summary	48
Conclusion	54
V. Case Study: The Fleetguard Mach Filter	55
Overview.....	56
Fleetguard Inc. Background.....	57
Factors Driving the Mach Filter.....	58
Development of the Mach Filter.....	60
Supporting a Sustainability Strategy.....	64
Life-cycle analysis	64
Financial Analysis.....	70
Summary	76
VI. Risks of a Sustainability Strategy	79
VII. Recommendations: Integrating Sustainability Throughout Cummins	83
Overview.....	84
Envisioning a Sustainable Cummins	85
The Goal Tree	88
Strategic Planning Process.....	90
Technology Planning Process.....	90
Operational Practices	90

Financial Analyses	92
IX. Conclusion	97
Appendix	103
Appendix I: The Natural Step	104
Appendix II: Competitive Analysis	107

EXECUTIVE SUMMARY

The purpose of this report is to explain the many reasons Cummins should adopt a sustainability strategy and to suggest how the company can incorporate the concept of sustainability into its existing processes. The *Four-Question Sustainability Framework*,¹ a tool created specifically for this project,² is used throughout the report.

The first half of the report builds a case for why a sustainability strategy makes sense for Cummins, and presents the following overarching reasons:

- Sustainability is part of Cummins' *history*.
- Sustainability is in line with Cummins' *vision, mission, and values*.
- A sustainability strategy will help Cummins address *macro-environmental trends*.
- A sustainability strategy will enable Cummins to reap *financial benefits*.
- A sustainability strategy is necessary for Cummins to remain *competitive*.

These arguments are further illustrated in a case study examining the development of the Mach filter in Cummins' Fleetguard business. In order to understand the potential drawbacks of a sustainability strategy, we also discuss the related risks. The final section of the report focuses on how a sustainability strategy can be implemented throughout Cummins.

WHY CUMMINS SHOULD ADOPT A SUSTAINABILITY STRATEGY

Sustainability has been part of Cummins' history. The concept of sustainability has been integral to the company since its inception. The former CEO J. Irwin Miller consistently recommended "patient capital,"³ or investments with a long-term perspective, in order to ensure the long-term health of the company. In addition, Mr. Miller realized that focusing on the impacts of the company's products on the environment was both a business opportunity and a social requirement, and that prioritizing people and the community was an integral part of the company's success. By further integrating environmental and social issues into its product consideration and long term business strategy, Cummins will both remain true to its history and ensure that the company will have the technologies and products that future consumers will demand.

¹ The four questions which comprise the Sustainability Framework are:

1. What materials does Cummins use to build its products and facilities?
2. What are the impacts of Cummins' design and manufacturing processes?
3. What are the impacts of Cummins' products when in use?
4. What actions is Cummins taking to address social issues throughout the value chain?

² This Framework was created specifically for Cummins, though it is based on the Natural Step approach to addressing sustainability concerns in companies, communities, and governments, established by Dr. Karl-Henrik Robèrt. See page 6 for further details.

³ Cruikshank, Jeffrey L. and David B. Sicilia. *The Engine That Could: Seventy-Five Years of Values-Driven Change at Cummins Engine Company.* (Boston: Harvard Business School Press, 1997). Pg. 4

Sustainability is in line with Cummins' vision, mission, and values. The concept of sustainability is already aligned with Cummins' vision, mission, and values. The company's vision to "improve people's lives by unleashing the power of Cummins" hints at the broad array of benefits the company hopes to deliver through its products. Cummins articulates its social and environmental goals more explicitly in its mission statements. In "demand[ing] that everything we do leads to a cleaner, healthier, and safer environment" and by setting the goal to "creating wealth for all stakeholders," Cummins underscores its emphasis on fostering growth and creating wealth in a sustainable, socially responsible fashion. Thus, adopting a sustainability strategy will both enhance and directly support the company's vision, mission, and values.

A sustainability strategy will help Cummins address macro-environmental trends. Cummins is currently devising the Strategic Planning Process (SPP), a framework used to determine the company's annual competitive strategy and five- to ten-year strategic plan. The first stage in this process is to identify major macro-environmental trends. As evident from the most recent SPP analysis of these trends, environmental and social issues⁴ are gaining visibility and predominance. Embracing a sustainability strategy will increase attention to and monitoring of these macro-economic trends. This will enable Cummins to formulate strategic responses to more effectively address the threats and opportunities these changes pose to the business.

A sustainability strategy will enable Cummins to reap financial benefits. As a business, Cummins continually faces day-to-day pressures to reduce costs and grow revenue. Pursuing a sustainability strategy can help Cummins achieve this by providing potential financial benefits in seven key areas: risk management, business growth, operational efficiency, meeting customer needs, brand equity, human capital, and shareholder response.

A sustainability strategy is necessary for Cummins to remain competitive. Some of Cummins' rivals have already recognized the business case for sustainability within their own organizations and are in the process of reshaping their business models and product offerings to reflect this new approach. While this industry shift has come to the foreground only in the past decade, the progression among industry peers in sustainability, particularly original equipment manufacturers (OEMs), has been rapid. As many of these OEM companies are both competitors and customers of Cummins, the company is obligated to understand this industry shift in order to service its customers' changing needs and avoid being left behind.

Fleetguard Case Study: Sustainability has benefited Cummins in the past. Examining the development of the Mach filter in the Fleetguard business gives insight into how a sustainability-focused strategy may benefit the company. This project included many approaches that are often linked to sustainability, such as innovation, engaging multiple stakeholders, considering environmental impacts, and long-term thinking. The Mach filter brought about many benefits to the company that may not have been anticipated in the

⁴ For a more detailed list of the environmental and social issues highlighted in the recent SPP review, please refer to page 28.

original financial projections, including product differentiation, savings from operational efficiency, and reduced regulatory risks.

There are risks to a sustainability strategy. It would be unwise to advocate a sustainability strategy without recognizing the potential risks. Because sustainability requires taking a long-term perspective, there is a risk that the current assessment of future trends may be incorrect. There are also various risks to being a first-mover. To minimize the impact of these risks, it is necessary to take a proactive and integrated approach to implementing this strategy.

HOW CUMMINS SHOULD IMPLEMENT A SUSTAINABILITY STRATEGY

To explain *how* a sustainability strategy can be integrated into Cummins, we develop a sustainability vision statement. This vision statement is necessary to establish an overarching goal for the company and to ensure that employees have a context in which to process proposed changes.

We then draw upon the Four-Question Sustainability Framework to systematically analyze existing processes and suggest enhancements for how the company can become more sustainable. We recommend four ways in which Cummins can incorporate sustainability into its existing processes:

- ***Corporate Objectives.*** Communicate a stronger link between the concept of sustainability, the company vision, mission, and values, and the employee performance evaluation process (through the Goal Tree).
- ***Planning Processes.*** Change existing planning processes, such as the Strategic Planning Process and Technology Planning Process, to better reflect sustainability goals.
- ***Operational Practices.*** Adapt material sourcing and manufacturing practices to better address sustainability concerns.
- ***Financial Analysis Methods.*** Use additional financial analyses to measure the monetary value of engaging in a sustainability strategy.

By following these suggestions, Cummins can ensure the success of its business, the global society, and the environment for both the short term and the long term.

CUMMINS BACKGROUND⁵

As stated in its Annual Report, Cummins Inc. is a “corporation of complementary business units that design, manufacture, distribute and service engines and related technologies, including fuel systems, controls, air handling, filtration, emission solutions and electrical power generation systems.” Major competitors include Caterpillar and integrated OEMs such as Ford, GM, and Chrysler.

History. The company was founded in 1919 by Clessie Cummins, a chauffeur for Indiana banker W. G. Irwin. Mr. Cummins believed the diesel engine had a great deal of potential for commercial transport because of its improved fuel economy and engine durability. W. G. Irwin's grandnephew, J. Irwin Miller, assumed leadership of the company in 1934, and three years later the company turned its first profit. Following the increased demand for diesel cargo trucks due to World War II, the company's sales rose dramatically, and by 1956 sales had surpassed \$100 million. The company continued to grow, and by 1967 Cummins comprised approximately half of the U.S. heavy-duty diesel engine market. At the same time, this increase in demand and robust sales in the '50s and '60s prompted Cummins to expand internationally. The company opened its first overseas plant in Scotland in 1956, and by 1970 it had created a sales and service network of 2,500 dealers in 98 countries, a strong international presence which surpassed that of most other U.S. multinationals. Cummins began to expand its product line with the introduction of midrange engines (via joint venture) in the early 1980s.

Cummins currently services the pickup, light commercial truck, medium- and heavy-duty engine markets, as well as producing other related power technologies such as fuel systems, controls, air handling, filtration, Emission Solutions and electrical power generation systems. Cummins headquarters are in Columbus, Indiana, but currently more than 51% of Cummins' sales come from foreign markets including Asia, Australia, Latin America, Canada, Africa, and the Middle East. Cummins services customers in over 160 countries and territories through its international dealerships and distributorships, and the company has been operating in the Chinese and Indian markets for over 30 and 45 years, respectively.

Company Structure. Cummins has four complementary operating segments: the Engine Business, the Power Generation Business, the Distribution Business, and the Components Business. The Engine Business is the largest of the four segments, designing and manufacturing both diesel and natural gas-powered engines for on-highway and off-highway

⁵ All information in this section was gathered from the following four sources unless indicated otherwise: Cummins Inc., Cummins Inc. 2004 Annual Report, (Columbus, IN: 2004) 1, 18 Dec. 2005 <<http://library.corporate-ir.net/library/11/112/112916/items/146778/Cummins%202004%20Annual%20Report.pdf>>. Cummins, Inc., “South Pacific Homepage: About Us,” 2 Mar 2006 <<http://www.cumminsengine.com.au/au/pages/en/aboutus/cumminshistory.html>>. “Cummins, Inc.: History,” Hoovers Online, 5 Mar 2006 <<http://0-premium.hoovers.com.lib.bus.umich.edu/subscribe/co/history.xhtml?ID=10423>>. United States Securities and Exchange Commission, Cummins Inc.: Form 10K, 2005, (Washington, D.C.: 2006) 10.

applications. The company's engine product line encompasses recreational vehicles, buses, and light-, medium-, and heavy-duty trucks. It also includes industrial and heavy-duty off-road applications for agriculture, construction, mining, recreational and commercial marine, oil and gas, power generation, rail and government equipment. The Engine Business Unit has seen a 113% expansion in sales over the past four years, and it accounted for 56% of Cummins sales in 2005.

The Power Generation Business provides distributed power generation sets for standby and continuous use as well as auxiliary generation units for mobile applications. Sales in the Power Generation segment have grown 41% over the past four years, and power generation sales comprised 17% of the company total in 2005.

The Distribution Business is a retailer of Cummins-branded products as well as a provider of maintenance and engineering services. Distributorships are spread globally, with presence in key geographic areas such as Asia, Australia, Europe, Africa, the Middle East and Latin America. Cummins' global distribution network is currently expanding, and the International Distribution Business has experienced a growth in sales of 111% over the past four years. The International Distribution Business was responsible for 10% of sales in 2005.

The Components Business encompasses Fleetguard filtration systems, Nelson acoustic exhaust and silencing systems and Emission Solutions aftertreatment systems, as well as Holset turbochargers. This area of the business has been growing rapidly, as evidenced by a sales growth rate of 124% over the past 4 years. The components business was responsible for 17% of sales in 2005.

Financial Performance. Under the guidance of Tim Solso, who assumed the Chairmanship and CEO position in 2000, Cummins has seen its revenues grow 49%⁶ over the last 6 years to \$9,918 million in 2005. The company currently has a gross profit margin of 25.01% and a net profit margin of 5.55%. 2005 return on assets was 8%, and invested capital was 17.9%. Cummins' financial performance has been very strong in recent years, with a three-year revenue growth of 20.6% (compared with a 3.1% growth for the industry⁷, and a 9.6% growth for the market⁸), as well as a three-year net income growth of 115.8% (compared with a 35% industry and 69.1% market growth).⁹ Additionally, the company's total compounded five-year return to shareholders vastly exceeded both the S&P and Dow Jones averages.

⁶ Revenues in December 1999 were recorded as \$6,639 million. "Cummins, Inc.: Annual Financials," Hoovers Online, 5 Mar 2006 <<http://0-premium.hoovers.com.lib.bus.umich.edu/subscribe/co/fin/annual.xhtml?ID=10423>>.

⁷ "Industry" refers to automotive parts manufacturing industry.

⁸ "Market" refers to public companies trading on the New York Stock Exchange, the American Stock Exchange, and the NASDAQ National Market.

⁹ Cummins' closest competitor, Caterpillar, experienced a 22.8% revenue growth and a 55.9% net income rise during the same period. "Cummins, Inc.: Competitive Landscape," Hoovers Online, 5 Mar 2006 <<http://0-premium.hoovers.com.lib.bus.umich.edu/subscribe/co/fin/landscape.xhtml?ID=10423&Menu=>>>.

Corporate Social Responsibility. Cummins' business ethic has always included a significant social commitment. In 1919, the company was founded with the stated mission of "provid[ing] employment for the young men of the community."¹⁰

Diversity has historically been one of Cummins' strengths. The company has several programs in place to promote diversity initiatives and address diversity issues, should they arise. All employees are expected to pass a comprehensive diversity training program, and additional follow-up training is required for career advancement. Diversity issues are overseen by the Chairman's Diversity Council, maintained at the grassroots level by Local Diversity Councils (LDCs), and audited for company policy compliance by regular reviews.

Cummins has been recognized for its significant social responsibility commitments; for example, after being ranked within Business Ethics' top 100 Companies for the preceding five years, Cummins was named top corporate citizen in the company's ranking for 2005. Fortune Magazine noted Cummins in its ranking of '50 Best Places to Work for Minorities' twice in the last three years,¹¹ and Diversity, Inc. Magazine named the company the best place for Asian-Americans to work. Cummins sees this as a source of strength and continues to build on its record of diversity.

¹⁰ Tracy Souza, Director of the Cummins Foundation, personal interview, 4 Jan 2006.

¹¹ Cummins, Inc. "Who We Are: Diversity," 11 Mar 2006
<http://www.cummins.com/na/pages/en/whoweare/diversity.cfm>

I. INTRODUCTION

PURPOSE

The purpose of this project is to explore sustainability and how sustainable principles and approaches can strengthen Cummins' business in both the short and long term. The goals of this project are twofold:

1. To explain how integrating sustainability throughout Cummins can lead to both short- and long-term success for the company.
2. To provide suggestions for how to incorporate sustainability into strategies and decision-making processes to strengthen Cummins' business.

The Business Case for Sustainability at Cummins provides a foundation of ideas and analyses on which Cummins can start to integrate sustainability throughout the fabric of the company as it strives to deliver long-term value and success.

DEFINING SUSTAINABILITY

Why investigate the business case for sustainability? Businesses have recently become interested in sustainability and how the concept can lead to improvements in the bottom line. Many theories support the business case for sustainability, because it forces companies to consider long-term pressures and complexities in the business environment. Others counter, however, that pursuing sustainability-based objectives distracts companies from focusing on the bottom line. While there is currently no clear-cut answer as to whether the pursuit of sustainability leads to profitability for companies in general,¹² there is enough evidence to indicate that sustainability could be beneficial to Cummins' business in particular. Hence, this report explores the business case for sustainability at Cummins.

What is sustainability? To some, sustainability is about being environmentally friendly; to others, it signifies having a robust business strategy. Still others see sustainability as a set of values that address the long-term needs of society. The term has been used in a wide variety of situations and often has different meanings depending on the context. In order to determine the Business Case for Sustainability at Cummins, it is first necessary to clarify the definition of sustainability that will be used throughout this report. The following definition was developed through an exploration of the topic literature and has been adapted to meet Cummins' needs.

Definition of Sustainability for Cummins. In the simplest of terms, sustainability is meeting today's needs without compromising the future. For Cummins, this means ensuring the success of its business, the global society, and environment for both the short and long term. Sustainability encompasses the following subcategories:

¹² Margolis, Joshua and James Walsh. People and Profits? The Search for a Link Between a Company's Social and Financial Performance. (New Jersey: Lawrence Erlbaum Associates, 2001) 13.

- *The Environment*: Meeting today’s resource needs without compromising natural resource availability in the future. This includes consideration of which natural resources are used by Cummins (e.g. metals, fuels, and water), how efficiently they are used, and whether they are discarded or recycled at the end of their useful life.
- *Global Society*: Making people’s lives better by providing needed products and services in a way that promotes well-being around the world. These people include employees, customers, suppliers, shareholders, and communities who are impacted directly or indirectly by Cummins’ actions, both today and in the future.
- *Business Prosperity*: Meeting today’s business goals without compromising the success of the company in the future. This refers to the ability of Cummins to generate consistent, continuing returns into the indefinite future.

As the term *sustainability* is used throughout this report, it will refer to this tripartite definition, which focuses on a business’s ability to find opportunity and value by incorporating social, environmental, and economic issues into its decision-making process.

SUSTAINABILITY: A DEFINITION THAT HAS EVOLVED OVER TIME

The term “sustainability” is still fairly new, and as such its definition is continually being refined. The following provides a brief history of the concept’s evolution, and the various people and organizations who have contributed to the current understanding of the term.

Brundtland Commission. In defining and characterizing the concept of sustainability for practical application in a business setting, one of the most commonly used definitions stems from the work of the United Nations World Commission on Environment and Development (known as The Brundtland Commission). In a 1987 document titled *Our Common Future*, the Commission wrote that sustainable development can be defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”¹³ The definition of sustainability used in this report is primarily based on the Brundtland definition.

Johannesburg Summit. Since the development of the Brundtland definition, the UN has further expanded upon the meaning of sustainable development. In 2002, the United Nations organized the World Summit on Sustainable Development in Johannesburg to develop more concrete steps toward global sustainability. The resulting Johannesburg Plan of Implementation document highlighted not only the environmental but also the social and economic components of sustainability:

[T]he integration of the three components of sustainable development — economic development, social development and environmental protection — [are] interdependent and mutually reinforcing pillars. Poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing

¹³ United Nations, World Commission on Environment and Development, *Our Common Future* (New York: 1987). 54.

the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development.¹⁴

Millennium Ecosystem Assessment. While the Johannesburg Summit clarified the goals of sustainable development, the Millennium Assessment proved the value of a manner of development that simultaneously utilizes and protects human and natural resources. In 2000, United Nations Secretary General Kofi Annan launched the four-year investigative Millennium Ecosystem Assessment, which brought together various governments, businesses, institutions, and non-governmental organizations (NGOs) from around the world to understand how changes in the ecosystem may impact human wellbeing and to define a scientific basis on which necessary actions can be planned. The research and analysis took place between June 2001 and March 2005.¹⁵ The Millennium Ecosystem Assessment also highlighted the concept of *ecosystem services*, a core concept of sustainability which is based on the idea that people depend on the benefits provided by a healthy ecosystem:

An ecosystem is a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit... Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling. The human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services.¹⁶

The concept of ecosystem services might seem far removed from the responsibilities of the business community. However, the types of products companies make and how they are produced has a direct impact on the ecosystem services on which humanity depends for its own survival.

The Living Planet Report. Sustainability is also based on the idea that humans are using up our natural resources, and hence depleting the net availability of ecosystem services, faster than they can be replenished. To understand how we have systematically altered the ecosystem structures and functions that provide life-supporting services and resources humans need to survive, in 2004 the World Wildlife Fund published the *Living Planet Report*, on the state of the world's ecosystems. This report demonstrates that humans are consuming over 20% more natural resources than the Earth can produce, causing rapid declines in wild animal populations, depleting groundwater, collapsing fisheries and causing CO₂ to accumulate in the atmosphere.¹⁷

¹⁴ United Nations, Department of Economic and Social Affairs, Johannesburg Plan of Implementation. (New York: United Nations 2002) 2.

¹⁵ Millennium Ecosystem Assessment, "About the Millennium Ecosystem Assessment." 17 Feb 2006. <<http://www.millenniumassessment.org/en/about.overview.aspx>>.

¹⁶ Millennium Ecosystem Assessment, Ecosystems and Human Well-being: Opportunities and Challenges for Business and Industry (District of Columbia: World Resources Institute, 2005) 3.

¹⁷ World Wildlife Fund, Living Planet Report 2004 (Gland: World Wildlife Fund for Nature, 2004) 1.

Though the majority of the conversation surrounding the definition of sustainability over the past three decades emphasized the importance of social and environmental issues, in the past decade leading thinkers have increasingly been exploring what the concept means for business.

In Earth's Company. As highlighted in the Johannesburg Plan, business is inextricably involved in the concept of sustainable development and intimately affected by the depletion of ecosystem services. However, it was not until Carl Frankel's book *In Earth's Company*, published in 1998, that a roadmap for sustainable development through business was first explored. Carl Frankel wrote that sustainability is characterized by harmonizing the relationship between economics, environment and social equity. As Frankel observed, "growth is to be pursued in a manner consistent with long-term environmental protection and social fairness."¹⁸ This harmonizing of economics, environment and social equity was translated into the language of business as "the triple bottom line," and it inspired many companies, including Cummins, to begin reporting on these three indicators.

Even as sustainability definitions have evolved over the years, they consistently recognize the relationship between human activities and the natural environment, and they focus on ensuring long-term success in both. Today, the term *sustainability* seeks to harmonize the competing needs of the environment, society, and business.

APPROACH

The purpose of this report is to demonstrate that there are multiple reasons Cummins should adopt a sustainability strategy, and to provide suggestions for how the company can incorporate the concept of sustainability into its existing processes. The *Four-Question Sustainability Framework*, a tool created specifically for this project, is used throughout the report.

The first half of the report explains why a sustainability strategy makes sense for Cummins and presents the following overarching reasons:

- Sustainability has been part of Cummins' ***history***.
- Sustainability is in line with Cummins' ***vision, mission, and values***.
- A sustainability strategy will help Cummins address ***macro-environmental trends***.
- A sustainability strategy will enable Cummins to reap ***financial benefits***.
- A sustainability strategy is necessary for Cummins to remain ***competitive***.

These arguments are further illustrated in a case study examining the development of the Mach filter in Cummins' Fleetguard business. In order to understand the potential drawbacks associated with adopting a sustainability strategy, we also discuss the related risks. The final

¹⁸ Carl Frankel, *In Earth's Company: Business, Environment, and the Challenge of Sustainability*. (Stony Creek: New Society Publishers, 1998).

section of the report focuses on how a sustainability strategy can be implemented throughout Cummins.

ANALYSIS FRAMEWORK

For the purpose of this project, we developed the Four-Question Sustainability Framework, based on the Natural Step approach to addressing sustainability concerns in companies, communities, and governments. (See *Appendix I* for a detailed description of the Natural Step.) This framework is used in the report to evaluate how sustainable Cummins is today, compare Cummins with industry peers, and envision what a more sustainable Cummins might look like in the future.

The Four-Question Sustainability Framework. The Four-Question Sustainability Framework translates key elements of the Natural Step approach into a format that is specific and relevant to Cummins employees. It asks the following questions:

1. What materials does Cummins use to build its products and facilities?
2. What are the impacts of Cummins' manufacturing processes?
3. What are the impacts of Cummins' products when in use?
4. What actions is Cummins taking to address social issues throughout the value chain?

The following explanations show the relevance of the Four Questions from a sustainability perspective, and explain what a sustainable response to the questions would be.

1. What materials does Cummins use to build its products and facilities?

Cummins' products and facilities can be built from renewable or non-renewable materials. Renewable materials, such as wood and paper products and bio-based polymers, can be regenerated through natural processes. Stocks of renewable resources are neither fixed nor finite, and renewable materials can be carefully managed so that their use does not deplete the overall stock of natural resources available. Non-renewable materials, such as primary metals and plastics (non-renewable organics) either draw down the fixed amount of natural resources available or cannot be broken down at the end of their useful lives through natural processes.

To illustrate the impact of using non-renewable materials, consider the primary metals and mining industries. According to the U.S. Environmental Protection Agency, these two industry sectors accounted for 42 % of the total 2.17 million metric tons of toxic releases in 2002.¹⁹ In addition, mines, including coal but excluding oil and natural gas, occupy 0.26 percent of the land area in the U.S. Sixty percent of this land area is used for excavation, and the rest for disposal of overburden and other mining wastes – which account for 40 % of the total solid wastes in the U.S.²⁰

¹⁹ University of Michigan's Center for Sustainable Systems, "U.S. Material Use" August 2005. <http://css.snre.umich.edu/css_doc/CSS05-18.pdf>

²⁰ *Ibid.*

From a sustainability perspective, companies that reduce, reuse, recycle and remanufacture help decrease the amount of raw materials extracted and reduce the negative impacts of the extraction process. In addition, companies that use renewable materials create products made with fewer toxics and take steps to increase energy efficiency and reduce the company's overall environmental impacts.

2. What are the impacts of Cummins' manufacturing processes?

The operation of company facilities has impacts on the surrounding populations and environments in a variety of ways. Emissions to air result in both human health degradation (e.g., via asthma) and habitat destruction (e.g., via acid rain). Rising industrial solid waste creates increasing demand for landfill space, and with it, the threat of local contamination and bioaccumulation of toxins. Water source contamination and overdraw of reservoirs threatens the long-term health and prosperity of local animal and human populations, which depend on these resources for survival. Below is a breakdown of impact area by type.

Air: By far the largest share of company impacts on biodiversity, ecosystem services and human health stem from the fuels employed to power facilities and their resultant emissions. Most of Cummins' plants are powered by coal and natural gas. Use of these non-renewable fuel sources results in emissions such as carbon dioxide (CO₂), nitrogen oxides, sulfur dioxide, volatile organic compounds, particulate matter and mercury. These pollutants contribute to global climate change, acid rain, smog, and adverse human health effects.²¹

Not only does the use of these non-renewable fuels result in harmful environmental impacts, but the growing world demand for energy threatens their long-term viability. Currently, the U.S. is the largest energy consumer in the world, using 24% of the world's energy though accounting for less than 5% of world population and 29% of global GDP.²² Global economic growth is pushing up petroleum demand, and oil production is expected to peak in 2037.²³ These statistics all indicate that, at the current rate of use, the world is likely to experience increasing fuel prices and energy shortages in the future as traditional energy sources are depleted. Petroleum supply may be subjected to even earlier constriction because of regional political instability (such as in the Niger Delta region and Venezuela) and terrorism concerns.

Using renewable fuels such as biodiesel and wind to power a company's products and manufacturing facilities both lessens the company's total environmental impact and ensures a reliable, domestic source of fuel over the long term.

²¹ University of Michigan's Center for Sustainable Systems, "U.S. Energy System" August 2005.
<http://css.snre.umich.edu/css_doc/CSS03-11.pdf>

²² To compare, Germany has 1.4% of the world's population, uses 3.6% of its energy and accounts for 7% of its GDP, while China has a fifth of the world's population, consumes 10% of its energy and accounts for 3.7% of its GDP. University of Michigan's Center for Sustainable Systems, "U.S. Energy System" August 2005.
<http://css.snre.umich.edu/css_doc/CSS03-11.pdf>

²³ Assuming the stated oil reserves of 3 trillion barrels and a production growth rate of 2% to meet increased demand. University of Michigan's Center for Sustainable Systems, "U.S. Energy System" August 2005.
<http://css.snre.umich.edu/css_doc/CSS03-11.pdf>

Land. Nearly one ton of waste materials is landfilled each year in the U.S.²⁴ Each person throws away about 4.5 pounds of trash per day, the majority of which goes to solid waste landfills.²⁵ According to the EPA, American industrial facilities generate and dispose of 7.6 billion tons of industrial solid waste per year.²⁶ Hazardous waste comprises a smaller fraction of the 7.6 billion, though disposal options are more limited for this type of material. Contamination from hazardous waste disposal can have strong impacts on human and animal health. One notable example is dioxin contamination, primarily caused by airborne emissions from solid waste incineration. Dioxin can be found throughout the world in all media, including air, water, soil, and food – particularly in dairy products, meat, fish and shellfish. Dioxin contamination harms the human immune system, developing nervous systems, and endocrine and reproductive functions.²⁷ Contamination from chemicals and wastes such as dioxin can affect human and animal reproductive systems and overall health. Because chemicals like dioxins often cannot be broken down by metabolic processes, these substances tend to bioaccumulate as they move up the food chain.

Companies can minimize their impact on soils and terrestrial ecosystems by eliminating prohibited and restricted materials from their products and manufacturing processes, as well as decreasing their overall industrial waste. Such actions would simultaneously reduce the tightening demand for landfill spaces as well as remove the likelihood of contamination of human populations and natural environments from these toxic substances.

Water. Water use in facility operations is another way in which companies can adversely affect the environment. Water use worldwide is rising commensurate with population increases and economic expansion, and if it continues at the current rate, humans will use over 90% of all available fresh water by 2025, leaving only 10% for use by other living beings.²⁸ Worldwide, industry currently accounts for 22% of total water use, though in developing countries, this percentage averages closer to 59%.²⁹

Industrial use can degrade water sources in two ways: by consumptively overdrawing from the water basin, and by contaminating the water source through industrial pollution. Consumptive water use refers to the practice of withdrawing water from a source while returning less than the initial withdrawal to the basin, due to either evaporation during use or incorporation of the water into the product.³⁰ A larger impact from industrial production is the discharge of pollutants into water basins. Yearly, approximately 300-500 million tons of

²⁴ Oregon Department of Environmental Quality, “Land Quality: Solid Waste,” 11 Mar 2006 <www.deq.state.or.us/wmc/solwaste/crwr/edpro2.html>.

²⁵ *Ibid.*

²⁶ Most of these wastes exit in the form of waste waters. United States Environmental Protection Agency, “Industrial Waste Management: Frequent Questions” <www.epa.gov/epaoswer/non-hw/indus/d/questions.htm>

²⁷ World Health Organization, Fact Sheet N.225 (Geneva: World Health Organization 1999). 1

²⁸ UNESCO. “2003 International Year of Freshwater” 7 April 2005.

<<http://www.wateryear2003.org/en/ev.php>
URL_ID=4109&URL_DO=DO_TOPIC&URL_SECTION=201.html>

²⁹ *Ibid.*

³⁰ The majority of consumptive water loss occurs in the agricultural sector as a result of evaporation during irrigation. University of Michigan’s Center for Sustainable Systems, “U.S. Water Supply and Distribution” August 2005. <http://css.snre.umich.edu/css_doc/CSS05-17.pdf>

heavy metals, solvents, toxic sludge, and other wastes are discharged to water sources each year from industry, with over 80% of this hazardous waste being produced in the United States and other industrial countries.³¹ Such discharges contaminate human drinking water, impact fish populations by inhibiting their ability to reproduce,³² and render these populations unfit for both human and animal consumption due to the increasing bioaccumulation of these toxins (such as mercury) in fish stocks.

Companies can minimize their impact on water basins through a variety of methods, including rainwater capture/storage and closed-loop water recycling programs in their facilities. Such technologies are sustainable as they reduce, reuse, and recycle the water employed in the plant, and thus inhibit toxic contaminants from reaching outside water sources.

While the above categories describe product and facility impact on the three mediums (air, land, and water) separately, company impacts should also be considered in concert, as the simultaneous degradation of all three environments does the most harm to global biodiversity. A sustainable company, therefore, would attempt to reduce its impacts in all three mediums simultaneously, with the expectation that this would lead to the greatest gains toward ecosystem recovery.

3. What are the impacts of Cummins' products when in use?

The environment can be impacted by Cummins not only through its facilities, but also through its products, many of which run on diesel fuel. Key impacts include damage to ***air, water, and land***, as discussed in the previous question. Developing products that minimize raw material input, incorporate biosafe and recycled material content, run on renewable fuels, and limit land and water use lowers company impact on the natural environment and enables human and animal systems to flourish by decreasing the company's demand on the ecosystem services on which we depend for life.

Design for Environment. Proactively designing products that address sustainability concerns requires systematic examination of the life-cycle impacts of a product. Many companies have integrated these concerns into their product design process through Design for Environment. Design for Environment (DfE) is the umbrella term for a product engineering process that attempts to maximize pollution prevention and resource conservation through product design.³³ This process is closely linked to Life Cycle Analysis (LCA), which examines the total sum environmental impact a product has on the environment from the beginning to the end of its useful life (cradle to grave), and in so doing

³¹ UNESCO. "2003 International Year of Freshwater" 7 April 2005.
<http://www.wateryear2003.org/en/ev.phpURL_ID=1607&URL_DO=DO_TOPIC&URL_SECTION=201.html>

³² These fish populations are already unstable due to overfishing. According to the World Wildlife Fund, freshwater species have decreased by about 50% between 1970 and 2000, while marine species have fallen by 30%. World Wildlife Fund, *Living Planet Report 2004* (Gland: World Wildlife Fund for Nature, 2004) 8.

³³ Sustainability Knowledge Network, "Definition - Life Cycle Analysis (LCA)," 10 Feb 2006
<<http://avel.library.uq.edu.au/green/lca.html>>.

identifies areas in which the product can improve its resource-use efficiency.³⁴ DfE encompasses many sub-processes, such as:³⁵

- design for recycling
- design for disassembly
- design for energy efficiency
- design for remanufacture
- design for disposability
- design to minimize use of hazardous materials

Each of these processes contributes in different measure to minimizing material and energy consumption, maximizing the opportunities for reuse and recycling, meeting cost and performance objectives, and reducing pollution and waste throughout the life cycle.³⁶

Companies employing DfE techniques create more resource-efficient products, and when products are designed to use fewer resources and more eco-friendly materials, these products can be both cheaper over their life cycle and safer for the environment.

4. What actions is Cummins taking to address social issues throughout the value chain?

In an increasingly globalized world, companies are moving to new and disparate locations to access competitive work forces and untapped markets. Some of these regions are struggling with various problems which both affect and are affected by company actions. According to the World Health Organization, as of 2002, 1.1 billion people (or 17% of the global population) lacked access to improved water sources, and 2.6 billion people did not have access to basic rudimentary sanitation – basic requisites for the avoidance of water-borne disease and the betterment of basic primary health. Over half of these people lived in China and India, though sub-Saharan Africa trails these countries even further, as the region's overall population coverage is only 42% water access and 36% sanitation coverage.³⁷ Education rates in the developing world are still quite low, with one in four adults in the developing world (or 872 million people) illiterate.³⁸ These trends, instead of improving, are worsening. “During the 1990s, 21 countries experienced declines in their rankings in the Human Development Index, an aggregate measure of economic well-being, health, and education; 14 of them were in sub-Saharan Africa.”³⁹ Inequality is pervasive, with income

³⁴ *Ibid.*

³⁵ International Institute for Sustainable Development, “Design for Environment” 2006.

<http://www.bsdglobal.com/tools/bt_dfe.asp>

³⁶ Sustainability Knowledge Network, “Definition - Life Cycle Analysis (LCA),” 10 Feb 2006

<<http://avel.library.uq.edu.au/green/lca.html>>.

³⁷ World Health Organization, “Water, sanitation and hygiene links to health” (Geneva: World Health Organization 2004). <www.who.int/water_sanitation_health/publications/facts2004/en/index.html>

³⁸ Improving literacy rates is imperative as it has been correlated with the spillover effects of improving health and reducing the rate of infection in diseases such as HIV. United Nations Millennium Campaign, “Voices Against Poverty” 2004. <www.millenniumcampaign.org/goals_education>

³⁹ Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Synthesis* (District of Columbia: World Resources Institute, 2005) 16.

inequality increasing in counties that account for more than 80% of the population. Such inequality impedes the ability of economic growth in such countries to alleviate poverty.⁴⁰

These problems of extreme income inequality and lack of access to health care, education, and community development exist in the U.S. as well. One in eight Americans does not have access to basic health care, according to the National Association of Community Health Centers,⁴¹ and poverty rates are up to 12.7% (2004), according to the U.S. Census Bureau.⁴² These issues are important not just from a social justice perspective, but also because their presence acts as a drag on economic development and business growth. Issues such as diversity in its workforce and education in its communities are concerns Cummins has already begun to tackle both abroad and at home, and the company has been recognized by organizations such as Business Ethics for these efforts. However, the magnitude of these social ills is still vast, and companies such as Cummins will have to be increasingly involved in their communities and attentive to these issues in order to minimize the impact of these problems on company business and operations.

These and other challenges threaten the fabric of a society and the capability of its citizens to work at their highest potential. A sustainable company would actively address social issues that affect its value chain, both improving the communities in which it operates and minimizing the impact of these social issues on the company's bottom line. By addressing these issues in the work place, the company ensures that it has a healthier and more productive work force, which also contributes to bottom-line performance.

In conclusion, the Four-Question Sustainability Framework captures the major ways in which the company interacts with society and the environment. By considering these questions, the company can define for itself its vision of a sustainable company, as well as evaluate how close it is to meeting its sustainability goals.

⁴⁰ United Nations Development Program. "Human Development Report 2005" 25.
<http://hdr.undp.org/reports/global/2005/pdf/hdr05_summary.pdf>

⁴¹ National Association of Community Health Centers, "36 Million Americans Lack Access to Healthcare" 23 March 2004. <<http://www.nachc.com/press/march23.asp>>

⁴² U.S. Census Bureau, "Income Stable, Poverty Rate Increases, Percentage of Americans Without Health Insurance Unchanged" 30 August 2005.
<www.census.gov/PressRelease/www/releases/archives/income_wealth/005647.html>

II. SUSTAINABILITY & CUMMINS PHILOSOPHY

SUSTAINABILITY IS A PART OF CUMMINS' HISTORY

The word “sustainability” might be new to Cummins, but the concept has been with the company since it was founded in 1919. In the paragraphs below, words from J. Irwin Miller and other company leaders demonstrate how economic, environmental and social concerns have heavily influenced the company’s decision-making over time. Exploring how leaders have publicly addressed business success, the environment and global society as well as shaped corporate strategy around these concerns clearly reveals that creating a comprehensive sustainability strategy is in keeping with the company’s history.

Business Success. As previously discussed, sustainability involves addressing today’s economic needs without compromising the economic needs of the future. However, some within Cummins might argue that the company must attend to today’s economic concerns before focusing on the concerns of its unknown future. After all, stock analysts are preoccupied with the company’s quarterly performance, and Wall Street penalizes the firm when it does not generate positive short-term returns. However, as Jeffery L. Cruikshank and David B. Sicilia state in their book, *The Engine that Could*, Cummins consistently has favored long-term investments over short-term returns: “As Irwin Miller, Henry Schacht and Jim Henderson⁴³ regularly stated, ‘Cummins doesn’t take the long view solely (or even primarily) out of a sense of altruism. Instead, the company believes that the judicious sacrifice of short-term rewards will yield higher total returns in the long run’.”⁴⁴

Often, sustainability-related investments have longer payback periods but higher potential for long-term economic returns than their non-sustainable counterparts⁴⁵. Because of this, the idea that Cummins should invest in projects that may not have an immediate payback but instead have high potential for long-term economic returns⁴⁶ is in keeping with Mr. Miller’s concept of “patient capital.”⁴⁷ This tradition, which has been part of the company since its inception, supports a sustainability-focused strategy.

The Environment. An integral component of sustainability involves meeting today’s resource needs without compromising natural resource availability for the future. One way that a company can address resource needs is to go beyond simply complying with

⁴³ “From its earliest days, Cummins has had the benefit of two strong figures at the helm: Clessie Cummins and W.G. Miller through the early 1930’s; J. Irwin Miller and his two presidents...in the 1950’s and 1960’s; and Henry Schacht and Jim Henderson in the 1970’s through the mid-1990s.” Jeffrey L. Cruikshank and David B. Sicilia, *The Engine That Could* (Boston: Harvard Business School Press, 1997) 488.

⁴⁴ *Ibid*, 502.

⁴⁵ This is the case with green building, where upfront costs can be higher, but maintenance costs are significantly lower, leading to an overall cost savings for the company.

⁴⁶ For example, a biomass gasification power generation unit used to electrify rural India

⁴⁷ The tradition of “patient capital” dates back to the company’s founding by the Sweeny-Miller family, which infused money into the business continuously for twenty years before they made a profit. Jeffrey L. Cruikshank and David B. Sicilia, *The Engine That Could* (Boston: Harvard Business School Press, 1997) 4. When asked if the company still talks about “patient capital,” the Vice President of Marketing and Environmental Policy said, “Yes, all the time.” Tina Vujovich, Marketing and Environmental Policy, personal interview, 9 Dec. 2005.

environmental regulatory requirements and take action to mitigate specific environmental concerns. Some Cummins employees might argue that the company cannot go beyond current environmental regulation, because its customers do not care about the environment. These employees feel that customers care primarily about reliability, durability and fuel efficiency; in this view, focusing on emissions controls beyond regulation only makes products more expensive and less attractive. To respond to this, it is worthwhile to investigate Cummins' stance on legally prescribed emission limits at the time the federal government started regulating Cummins' products.

At the 1969 shareholders' meeting, Chairman J. Irwin Miller announced "that the company foresaw no difficulties in living within these prescribed limits, and even saw the possibility of 'additional profitable business for the company' in the new regulations."⁴⁸ In addition, shortly after the regulations went into effect, the vice chairman, Dick Stoner, was quoted as saying:

[T]he company's goal was to produce engines that were "socially acceptable." Cummins would do so, Stoner said, "not waiting for an adjustment in the federal requirements or incentives, but in an attempt to fulfill our responsibility to improve the quality of our environment." ...Cummins was committed...to increasing dramatically the 'sociability' of its engines.⁴⁹

Today, Irwin Miller's concept of "sociability" can still be found in the Technology Planning Process, one of the very influential processes directing the design of Cummins' products.⁵⁰ This indicates that the company continues to believe that it must be focused on the environmental impact of its products beyond what regulation requires. In addition, the creation of the Emission Solutions business is a recent demonstration of Miller's belief that significant business opportunities can emerge as a result of regulation. Thus, a sustainability strategy is one way to ensure the institutionalization of the historical beliefs that regulation presents business opportunities and that the company has an obligation to focus on "sociability."

Global Society. Focusing on global society from a sustainability perspective is about making lives better by providing needed products and services while promoting well-being around the world. It is rare to find someone within Cummins who would argue that social concerns are not an integral part of the company's operations, and that the company should not address these issues. This is because J. Irwin Miller took such a proactive approach in involving the company in the community. In 1950 he urged the company to begin "allocating 5 percent of its pretax domestic profits to charitable causes"⁵¹ when the Fortune 500 average was only 1.3 percent.⁵² Also during that time, the Cummins Engine Foundation started providing financial

⁴⁸ Jeffrey L. Cruikshank and David B. Sicilia, The Engine That Could (Boston: Harvard Business School Press, 1997) 295.

⁴⁹ *Ibid.*

⁵⁰ Discussed in Section VII, Technology Planning Process.

⁵¹ Jeffrey L. Cruikshank and David B. Sicilia, The Engine That Could (Boston: Harvard Business School Press, 1997) 4.

⁵² *Ibid.*, 320.

support for young architects working on public buildings, especially schools.⁵³ In the late 1970s, the company began to codify ethical norms for the company. One of the norms it adopted was the Irwin Miller Transparency Test: “If you were willing to explain to the local minister what you were doing, then it passed the transparency test.”⁵⁴ In a revised form, this test is still used throughout the company under Tim Solso’s leadership; today, the test is to determine whether you’d want to read about your activities on the front page of the newspaper.

Tim Solso’s recent focus on defining the company’s vision, mission, and values continues to instill the principles that Mr. Miller infused into the company. Mr. Solso’s focus on diversity has been one of the hallmarks of his leadership. At Cummins, people believe that diversity is critical to the success of its business because, according to Mr. Solso, “embracing the diverse perspectives of all people to benefit from the many and varied talents they bring to business opportunities helps us deliver the best products and services at the lowest total cost to customers around the world.”⁵⁵

Sustainability. Thus, Cummins historically has believed that prioritizing people and the community is an integral part of the company’s success, and that focusing on the impacts of the company’s products on the environment is both a business opportunity and a social requirement, and that long-term thinking should be prioritized over short-term results. But what does this mean with regard to the company’s profitability?

In the introduction to the 2005 Sustainability Report, Tim Solso states, “...being a socially responsible company is not only the right thing to do, but is good business. What is good for the world also is good for Cummins and all our stakeholders. The concept of sustainability is important to Cummins and the nearly 30,000 employees who work hard every day to deliver on our vision and mission.”⁵⁶

VISION, MISSION, & VALUES

In 2000 Tim Solso, along with other company executives, focused on re-defining the company’s vision, mission, and values and infusing them throughout the company. To understand how the concept of sustainability is already a part of the company’s fabric, it is important to see how each component of sustainability (business success, the environment, and global society) is integrated into the company’s vision, mission, and values, listed below:

⁵³ Jeffrey L. Cruikshank and David B. Sicilia, *The Engine That Could* (Boston: Harvard Business School Press, 1997) 320.

⁵⁴ *Ibid*, 327.

⁵⁵ Cummins Inc., *Business Case for Diversity*, 20 Feb. 2005 <http://www.cummins.com/na/pdf/en/whoweare/Business_Case_for_Diversity.pdf>.

⁵⁶ Cummins Inc., *Cummins Sustainability Report 2005*, (Columbus, IN: 2005) 1, 20 Jan. 2006 <<http://www.cummins.com/cmi/attachments/public/About%20Cummins/Sustainability%20Report/SustainabilityReport2005FINALWEBVERSION.pdf>>.

VISION

Making people's lives better by unleashing the Power of Cummins.

MISSION

- Motivating people to act like owners working together.
- Exceeding customer expectation by always being first to market with the best products.
- Partnering with our customers to make sure they succeed.
- Demanding that everything we do leads to a cleaner, healthier, safer environment.
- Creating wealth for all stakeholders.

VALUES

- *Integrity.* Strive to do what is right and to do what we say we will do.
- *Innovation.* Apply the creative ingenuity necessary to make us better, faster, first.
- *Delivering Superior Results.* Exceed expectations, consistency.
- *Corporate Responsibility.* Serve and improve the communities in which we live.
- *Diversity.* Embrace the diverse perspectives of all people and honor both with dignity and respect.
- *Global Involvement.* Seek a world view and act without boundaries.

The Vision & Sustainability. The company's vision, *Making people's lives better by unleashing the Power of Cummins*, encompasses more than providing people with a product and generating profit for the company—it is about improving people's lives. The company website explains this vision and the underlying social commitment it represents by stating,

The Company takes pride in manufacturing engines, generators, filters and related products that serve the varied needs of its customers worldwide. To do that, Cummins unleashes the power of its employees: Their energy and commitment make it possible for the Company to maintain a leadership position in the markets it serves.

Cummins also recognizes that with its role as a corporate leader comes a responsibility to help improve the communities in which employees work and live. It is a responsibility the Company brings to life through its actions and the activities of its employees.⁵⁷

⁵⁷ Cummins United States and Canada: Mission/Vision, 25 August 2005, Cummins Inc. website, 16 Oct. 2005 <<http://www.cummins.com/cmi/content.jsp?siteId=1&langId=1033&menuId=1&overviewId=2&menuIndex=1>>.

Thus the company's mission is focused on integrating the economic success of the company with making people's lives better.

The Mission & Sustainability. The mission, which expands on the vision by detailing the five ways in which the mission will be accomplished, states that the company demands *that everything we do leads to a cleaner, healthier, safer environment*. This statement, combined with Cummins' mission to *improve people's lives*, is an explicit indication of the company's commitment to environmental and social issues as part of the company's success. In addition, the company states that it is focused on *creating wealth for all stakeholders*—a statement that, like the vision, goes beyond discussing the impact of the company on the lives of its customers. In so doing, this goal commits the company to generating positive rewards not just for shareholders, but for global society as well. This statement represents the notion of sustainability, as it ensures a positive impact on the company's profits, the environment and global society.

The Values & Sustainability. The company's values support the mission, and they too integrate economic, environmental and social concerns. By consistently *delivering superior results*, the values help ensure the company's long-term economic success. At the same time, the values highlight the company's commitment to *corporate responsibility, diversity and global involvement*. Corporate responsibility means focusing on both environmental issues and the global society. Diversity and global involvement also support improving the well-being of society. A sustainability strategy would strengthen the link among the economic, social and environmental goals already inherent in the company's vision, mission, and values. It would enable the company to deliver a coherent message to its employees to help them further understand how to unleash the power of Cummins to make people's lives better.

The next section highlights the ways in which individuals in the company rely on the company's vision, mission, and values to make decisions that ensure business success, promote environmental integrity, and have a positive impact on society at large. These stories demonstrate that many of the company's employees have already internalized the notion of sustainability and use it to influence their business decisions. Creating a sustainability strategy will further encourage the type of decision-making highlighted below.

CUMMINS' VALUES DRIVING BUSINESS DECISIONS

Cummins is a brand recognized for its dependability; Cummins employees know that working at Cummins means “we do what we say we will do,” particularly with regard to the customer. This strong, clear performance ethic has infused the company culture to such an extent that Cummins employees in virtually every functional area bring these values of commitment and dependability to their work. Likewise, the sentence “It’s the right thing to do” is a common mantra among employees. This saying signifies the integrity employees bring to their work, their rationale for going above and beyond regulations, and their justification for going the extra mile in caring for employees and stakeholders.

Some decisions at Cummins, such as those described in the sections below, are made primarily on integrity grounds, yet it is important to recognize the added business value these decisions contribute. Cummins possesses a rare and valuable internal compass. Its philosophy of decision-making both demonstrates its concern with environmental and social issues and makes good business sense. The stories below highlight only a few of the examples of how Cummins is already choosing to “do the right thing,” and how such choices are bringing value to Cummins in the short and long term.

SITE MANAGEMENT: LEADING IN ENVIRONMENTAL RESPONSIBILITY

Increasing product distribution is a key element of Cummins’ worldwide business. Consider the Cummins worldwide distributor business division: the division is currently in a period of rapid growth, with sales having grown 28% in 2004.⁵⁸ The distribution business involves frequent property acquisitions and distributor business ownership transfers, business decisions which can have significant environmental and liability implications. However, Cummins has found a way to handle the property transfers successfully while demonstrating environmental leadership through its Environmental Assessment of Distributor Transfers (EADT) program. The EADT program is a subset of Cummins’ Environmental Risk Management initiatives, which comprehensively address environmental compliance and potential pollution liability exposures. The EADT program requires both an environmental analysis and a contract with the distributor in which the business declares its commitment to clean up the site from existing environmental damage before any sale is complete. By putting a strong environmental assessment program in place as a requirement of sale, Cummins has shown that caring for the environment is something the company values.

The EADT program is no exception; in fact, Cummins has a strong and continuing history of going beyond environmental regulatory requirements.⁵⁹ Started in the early 1990s, the EADT program originated in response to a wave of new federal legislation regulating

⁵⁸ Cummins Inc., *Cummins Inc. 2004 Annual Report*, (Columbus, IN: 2004) 17, 18 Dec. 2005 <<http://library.corporate-ir.net/library/11/112/112916/items/146778/Cummins%202004%20Annual%20Report.pdf>>.

⁵⁹ For example, Cummins was the first in the industry to hire someone to work on environmental protection in distribution. Frank Reindl, Director of Worldwide Strategy, Distribution, personal interview, 4 Nov. 2005.

underground storage tanks.⁶⁰ This legislation, passed in 1988 but phased in over the following decade,⁶¹ required the evaluation, monitoring, and (if necessary) removal of underground storage tanks from industrial facilities.⁶² Any company not in compliance would be liable for environmental damages caused by leaking underground storage tanks. Although the legislation passed would affect only one portion of Cummins' distributorships, all relevant company entities agreed that this new legislation posed both a risk and an opportunity for Cummins. Of course, the company wanted to be sure there was no chance that its sites would be found out of compliance. But the legislation also provided an opportunity for the company to be proactive, to do the right thing, and to jumpstart a broader program requiring a full environmental assessment and the implementation of pollution-prevention measures of any company distribution site as a standard practice.

In 1993, the Head of the Distribution Business Unit took advantage of this opportunity and developed the EADT program that is in place today, a program that represents a fundamental tool in the overall Environmental Resource Management process. Currently, an environmental audit starts as soon as Cummins begins negotiating with any prospective distributorship. In Phase I, the company conducts a study of all properties involved.⁶³ Phase I activities are all related to pollution liability concerns; thus any below-ground storage tanks or conveyance structures (for example, oil/water separators, floor drains, trench drains, and waste water treatment systems) are explored to determine the nature of the flows and how they are treated. Although Cummins employs the ASTM E1527 2004 Standard⁶⁴ as a basis for its Phase I studies, follow-on invasive investigations comprehensively target vessels and structures Cummins knows are vulnerable due to the operational demands of the distributorship. Phase II involves the testing of the mapped wastewater holding structures, conveyances and drainage systems, and an assessment of potential sensitive receptors, including an understanding of local water supplies. In addition, Cummins evaluates regulatory compliance status and provides operational recommendations to minimize environmental hazards. In Phase III, infrastructure is installed as a precaution against any environmental hazards. Specifically, Cummins has designed wastewater systems that employ secondary steel liners and monitoring systems that result in dual containment of wastewater below ground where this is necessary, with its treatment via above ground systems. As an extension of this process, Cummins is currently designing a safety and environmental management system which is tailored to fit distributorship operations in order

⁶⁰ James E. Hairston and Leigh Stribling, "Underground Storage Tanks (USTs) And NPS Pollution Regulating USTs," Alabama Cooperative and Extension System, [Agriculture and Natural Resources, Water Quality 4.8.2](http://www.aces.edu/pubs/docs/A/ANR-0790/WQ4.8.2.pdf), (June 1995): 1, 2 Jan. 2006 <<http://www.aces.edu/pubs/docs/A/ANR-0790/WQ4.8.2.pdf>>.

⁶¹ United States Senate, "Chafee Storage Tank Bill Approved by Senate Environment Committee: Bill Designed to Prevent MBTE Contamination of Groundwater," 24 Feb 2004, Press Release, 29 Dec 2005 <<http://chafee.senate.gov/releases/02240301.htm>>.

⁶² The regulations required leak detection, corrosion protection and overflow protection. As a result, most operators found that it was expedient/cost effective to replace tank systems completely.

⁶³ This involved properties that are owned, leased, developed, and undeveloped.

⁶⁴ Cummins performs the audit in compliance with ASTM standards (which ask for professional inquiry to areas of potential concern), as well as conducting a compliance review. ASTM is an organization which provides "an open forum for the development of high quality, market-relevant international standards around the globe." For more information, see ASTM Standards Worldwide homepage. ASTM Standards Worldwide, 1 Jan 2006, <<http://www.astm.org/cgi-bin/SoftCart.exe/index.shtml?E+mystore>>.

to better support the work done in Phase III of the EADT. A template of this environmental management system will be available to all distributorships.

When interviewed, a Manager in the Environmental Affairs division of the Distribution Business explained that, though the initial motivation for the creation of the EADTs came from due diligence work, the program was expanded to its present thoroughness because it was “the right thing to do.”⁶⁵ Although the company has incurred financial costs by going beyond regulatory requirements in site assessments and clean-ups,⁶⁶ implementing EADTs has brought tangible and intangible benefits to Cummins. For example, the company now has neither environmental remediation concerns nor worries about legal risk upon resale as the distributorship has already taken the necessary legal precautions up front. Also, the imposition of program itself has caused very little business risk: though not all distributorships wanted to perform EADTs, Cummins has never lost a contract as a result of the program. Finally, the EADTs have become a matter of employee pride within the Distribution Business. As the Manager in Environmental Affairs stated proudly, Cummins is peerless when it comes to pollution abatement and prevention at service operations like its distributorships.⁶⁷

Across interviews with Cummins employees,⁶⁸ the message was the same: Cummins created the EADT because it was the right thing to do – simply the cost of doing business the right way. According to a Manager within the Distribution Business Unit, though many companies do similar Phase I, II, and III environmental assessments on real estate transactions, their motivation is primarily to protect themselves from future environmental liability claims, and hence, only the minimum action is taken to avoid legal penalties.⁶⁹ However, the depth and breadth of Cummins’ assessment and mitigation activities is far above and beyond the typical. The EADT is proof, therefore, that there are times when, even though it may cost the company more to preserve and protect the environment, Cummins values this choice, and the company will choose “the right thing to do.”

FACILITIES: RAISING THE BAR WITH INTERNATIONAL STANDARDS

The design and operation of new manufacturing facilities present a great opportunity for companies to reduce their environmental footprint while also increasing efficiency and controlling costs. Although new manufacturing plants are not being built at a rapid pace in the U.S. at this time, Cummins has recently undergone a period of great growth and expansion in the Asia-Pacific regions of India and China. Certain Business Units are working on acquiring and expanding facilities in these regions, and the Engine Business Unit (EBU) has been developing set of standards that incorporate greener building standards into new construction in areas such as building materials, lighting, electrical equipment, and

⁶⁵ Alan Resnik, Manager, Environmental Affairs, Distribution, personal interview, 9 Jan. 2006.

⁶⁶ The financial costs to these site assessments and clean-ups are typically about \$35,000 and \$100,000, respectively, which is an additional cost on \$70-80 million dollar businesses.

⁶⁷ Alan Resnik, Manager, Environmental Affairs, Distribution, personal interview, 9 Jan. 2006.

⁶⁸ Interviews with Alan Resnik, Manager, Environmental Affairs, Distribution (personal interview, 9 Jan. 2006), and Rich Freeland, Director of Distribution (personal interview, 17 Nov. 2005).

⁶⁹ Alan Resnik, Manager, Environmental Affairs, Distribution, personal interview, 9 Jan. 2006.

chillers.⁷⁰ These standards are an example of how Cummins is taking sustainability concerns into account in its facilities management and construction.

In general, Cummins prefers to occupy already-developed land and existing facilities to support new operations rather than developing undeveloped land. Although this approach carries with it potential environmental liabilities associated with a site's historical legacy, it is, nevertheless, Cummins' preference. The involvement of a wide range of Cummins representatives ensures that due diligence is attended to as part of the effort to expand the company's operations in the most environmentally responsible manner.⁷¹

Recognizing the growth in new construction activities in the Engine Business, the informal process of incorporating greener building standards began in September 2005 as a first step towards more environmentally friendly manufacturing facilities. The Director of Engine Business Facilities led the process and drew much of his inspiration from construction literature, conferences, and discussions with peers. He took seriously the company's mission to "unleash the power of Cummins by demanding that everything we do leads to a cleaner, healthier, safer environment," and saw this action as a way that his division could be more tightly aligned with the company's values. To him, environmentally sensitive manufacturing facilities were a logical outgrowth of Cummins' innovation in clean engine technology, and consistent with its past performance as an industry leader in emissions reduction.

Engine Business Facilities contracted two consultants to review the proposed company building guidelines, revise and tighten wording, and increase the specifications and requirements for energy efficiency within the Engine Business Unit's (EBU) facilities codes. Specifically, the new building design criteria advised the investigation (and implementation, where feasible) of water-efficient plumbing fixtures, building envelope systems to meet or exceed energy efficiency outlined in ASHRAE 90.1⁷² or local energy code, day lighting, and use of renewable energy sources such as solar or wind and/or purchase of energy from utilities utilizing such renewable sources, among others.⁷³ Although the consultant review process was finished in November 2005, the Director of Engine Business Facilities will incorporate additional construction guidelines for environment that are being developed internally at the company. These will formalize standards for fluid piping and containment and other pollution prevention measures. These standards will be tightened systematically across Cummins as the company moves towards a more formal position on green building standards world-wide and sets long-term corporate environmental targets. Hence, though currently contained within the Engine Business Unit, this greening of facilities has the potential to expand to other business units within the company.

One example is the recently constructed EBU facility in China, which has employed more stringent pretreatment standards, building insulation, lighting, and fire protection than local

⁷⁰ Frank Clark, Director of EBU Facilities, personal interview, 27 Oct. 2005.

⁷¹ Alan Resnik, Manager, Environmental Affairs, Distribution, personal interview, 16 Feb. 2006.

⁷² ASHRAE is an organization whose goal is to "advance the arts and sciences of heating, ventilation, air conditioning and refrigeration." For more information, see ASHRAE homepage. ASHRAE, 6 Feb. 2006. <<http://www.ashrae.org/>>.

⁷³ Cummins, Inc., "Engine Business Unit: General Facility Design Criteria," Cummins Internal Document, Nov 2005.

regulations suggest. Such “building beyond the code” is consistent across Cummins’ facilities in developing markets, such as India and China. For the Facilities leadership, this was an ethical choice – Cummins needed to do the right thing and reduce its global environmental footprint. In his own words, the EBU Facilities Director mentioned that the impetus behind the creation of the green building report came “more from a feeling of responsibility.”⁷⁴ The additional requirements included in the new codes will go far to encourage use of recycled materials and increase energy efficiency, among other things.

These improvements were not limited to strictly environmental issues but also included social elements. Some facilities have incorporated child-care spaces into their building plans, and many plants have space for exercise rooms, equipment, lockers and showers. One specific example of how Cummins is addressing social concerns through facilities design is its choice to include disability accommodations in their construction of new facilities in China. While the ADA (Americans with Disabilities Act) requirements are very well defined in the US, China does not require accommodations for the disabled. Yet, when building all-new facilities in China, Cummins has chosen to make them ADA compliant through such modifications as parking design, second floor access, rest rooms, and curb cuts, to name a few. The Director of Engine Business Facilities explicitly stated that Cummins looks at this issue through a long-term perspective, with an awareness that Chinese legislation will eventually require such accommodations. Yet Cummins included these changes in the building architecture not so much because they saw legislation looming, but because they were committed to “building it right the first time.” In the words of the EBU Facilities Director, “we don’t consciously sit around and think because it’s a little more costly, should we do it, or not... it just gets back to the right thing to do.”

EMPLOYEE RELATIONS & COMMUNITY SERVICE: A SYMBIOTIC RELATIONSHIP

Cummins’ commitment to philanthropy and volunteerism is rooted in the company’s history and is integral to its identity. As described by the Executive Director of Corporate Social Responsibility, the company was founded in 1919 as “a way to provide employment for the young men of the community” and did not earn its first year of profit until 1938.⁷⁵ This philosophy of community engagement, instilled by the founding family, has been one of the main attractions for several of Cummins’ key leaders over the past 50 years. The Cummins Foundation, created in 1954, began Community Involvement Teams (CITs) in 2000 as a way to engage employees in the work of the Foundation and to organize their already existing volunteer activities, which up to the present had been managed through informal or project-related committees. The program grew out of grassroots organizing on the part of employees and was structured to ensure consistency across the diverse and decentralized Cummins businesses. The goal of the CITs, as articulated by headquarters, is to help people overcome their barriers. The CIT program helps coordinate employees to work on projects such as the housing partnership initiative. Projects range from the creation of a college for women engineers in India, to a program in Minneapolis which focused on preserving Native

⁷⁴ Frank Clark, Director of Facilities, personal interview, 27 Oct. 2005.

⁷⁵ Tracy Souza, Director of the Cummins Foundation, personal interview, 4 Jan. 2006.

American traditional family networks, to an African American dance troupe in Memphis which helped locals form a stronger bond with their heritage.

The decentralized structure of the CITs has many positive consequences. Local teams are proactive in identifying their community issues and creating innovative solutions tailored to their local needs. Examples of various projects include watershed cleanup days and elementary school construction. Projects are designed by the team members (most CIT groups meet monthly over lunch) and may obtain some funds from the local Cummins facility to recruit volunteers and/or market projects. CITs also may recommend projects to the Foundation for grants. Quantification of the project's costs is not generally performed, but estimates show the financial outlay of the program to be minimal, and though the Foundation has not yet tried to quantify the impact on employee attitudes, general feedback gives the impression that these programs build inter-employee teamwork and increase loyalty to the company.

One example of a successful, long-running CIT program is a community engagement project at the Cummins Sao Paulo plant in Brazil which, over the past 15 years, has helped construct an elementary school, a health clinic, and a community center.⁷⁶ In Brazil, schooling is free, but school districts often lack teachers and materials. In partnership with the local government, Cummins Sao Paulo decided to build an elementary school, equip the classrooms, and underwrite the salaries of the new teachers. As the teams became more integrated into the community through the school, they noticed that health issues were also a large problem within the community. Over a multi-year period, the CITs gradually built a two-story medical center, equipped with medical supplies and a dentist's chair.⁷⁷ Currently, the Sao Paulo CIT is constructing a local community center where the neighborhood can gather for events, job training, and skills teaching.

The idea for the community center came from cross-CIT sharing of best practices at the company's first world-wide Cummins Foundation conference two years ago.⁷⁸ Noting the success of these cross-team interactions, the Cummins Foundation hopes to repeat the world-wide conference again this year. The company also shares best practices through a Lotus notes database, where people can post projects and download information about their projects.

On a more global scale, Cummins recently spearheaded the "Every Employee Every Community" program to celebrate being #1 in Ethics magazine. The Every Employee Every Community (EE/EC) program was a joint initiative championed by the CEO, the full Foundation Board, and the Director of the Foundation. All employees were given a half day off to do a community service project of their choosing. Each office/plant organized the

⁷⁶ The Sao Paulo plant lies in the middle of a large, middle-income neighborhood and was suffering a great deal of vandalism. As a response to crime, plant workers reached out to the local community leaders, who suggested that the plant do more to integrate itself into the neighborhood. From this recommendation grew the idea to build up local education infrastructure.

⁷⁷ Again, local government was consulted and integrated into the process.

⁷⁸ During this conference, the Brazil team met with a team from Mexico in 2004 and learned of their efforts to foster local cottage industries through the building of a vocational training program and sewing center. The Brazil program hopes to have its sewing center operational within the community center operational by fall of 2006.

program to work with its schedule, and activities included building houses and trails, picking up trash, gardening, and painting in the community. Cummins is currently considering whether to make EE/EC an annual program.

Although Cummins gets recognition for its community involvement, it feels “a good natured, constructive tension” between pursuing work in the community and publicizing its volunteer work through the Corporate Communications department.⁷⁹ As the Director of the Foundation described, there is value in publicizing company activities in the local papers, as it stimulates other companies in the community to follow suit. In this way, the Foundation has worked to strategically highlight good causes in the public eye. It has also spoken about this community work during its college recruiting visits, as it hopes to attract like-minded employees.

However, there is definitely a strong resistance within the company to publicizing volunteer work in external corporate messaging, as Cummins’ founder Mr. Miller used to warn against the “using charity dollars to buy image.” Cummins does not want stakeholders to perceive the company as pursuing these initiatives to enhance its image. Regardless, though Cummins chose to promote “Every Employee Every Community” because it was “the right thing to do,” it also had the positive business effect of increasing employee interactions and teamwork as well as local visibility, through both the local press and on-the-ground interactions.

THE RESULT: STRONG VALUES DELIVER BUSINESS VALUE

The three stories highlighted above are only a small sampling of the numerous activities that regularly take place at Cummins in which employees make decisions based on “the right thing to do.” Cummins’ reputation as a great company to work for and an ethical, socially responsible company has only grown as a result. In interviews, employees consistently highlight Cummins’ values as one of the top reasons they work at the company.

This goodwill and strong reputation result from the company culture, one in which the “right thing to do” motivates action. This strong moral compass has led Cummins to implement simultaneously both ethical and strategically wise business decisions. Additionally, the green building and ADA modifications made to facilities in China both act as an effective risk mitigation technique regarding future changes in regulation as well as improve the corporate brand in the public’s mind. This all helps to project an image of Cummins as a company that works to address the needs of all stakeholders.

As shown above, Cummins’ decision to be a “right thing to do” company is consistent with both social and environmental concerns and good business sense. By making some choices based on these criteria in the present, Cummins is ensuring the creation of value that will endure throughout both the short and long term. Implementing a proactive and integrated sustainability strategy can only enhance the company’s current progress.

⁷⁹ Tracy Souza, Director of the Cummins Foundation, personal interview, 4 Jan. 2006.

III. FINANCIAL BENEFITS OF SUSTAINABILITY

OVERVIEW

For purposes of confidentiality, Cummins' financial data have been removed from the public version of this report.

While it is clear that the concept of sustainability is consistent with Cummins' values and the company's history, the key question still remains: *Does sustainability make good business sense?* Every business decision requires balancing multiple factors impacting the company and finding a solution that maximizes the overall benefit. These factors can be categorized into macro-environmental trends and day-to-day business pressures.

In this section, we analyze the factors impacting Cummins' decisions by examining the larger macro-environmental context in which the company operates, as well as the immediate business-level pressures it faces. The macro-environment in which Cummins operates includes geopolitical, demographic, technological, and regulatory trends. The day-to-day business pressures that the company faces include effective business growth, operational efficiency, risk management and development of human capital, to name a few. By understanding both the macro-environmental trends and the day-to-day pressures that Cummins faces, we demonstrate how incorporating a sustainability business strategy can help the company address these challenges.

MACRO-ENVIRONMENTAL PRESSURES

The major macro-environmental pressures impacting Cummins business and their connection to sustainability concerns are outlined below.⁸⁰

NATURAL RESOURCE CONSTRAINTS & CLIMATE CHANGE

Current trends indicate that world natural resource availability will be constrained in the near future due to rapidly industrializing countries increasing their demand for natural resources and developing countries continuing to use natural resources at their current or increased rate. In addition, as countries develop and continue to increase their manufacturing and energy use, the amount of emissions and industrial waste produced will result in an increased concern for the impact of this growth on the environment. Specifically, this may lead to increased pressure by governments and by the public to reduce CO₂ and other emissions as climate change becomes a larger issue. Energy and water may also become more costly as the demand for both continues to grow as a result of limited supply.

⁸⁰ The macro-environmental pressures discussed in this section are based on: Cummins Inc., "Strategic Planning Process Baseline Document," Cummins Internal Document, Jan 2006.

Relevance to Cummins. Cummins must be aware of these threats, because these environmental constraints have a significant impact on the cost of doing business and define the regulatory setting in which Cummins operates. To date, Cummins has concentrated on improving its fuel economy due to these pressures. By increasing its focus on sustainability, Cummins can further reduce its impact on the environment, positioning itself to compete in a resource-constrained world.

GLOBALIZATION

In the last two decades, business has become more global, with emphasis on the growing economies of China and India. As these developing countries further industrialize and Cummins continues to be a large player in these markets, Cummins must consider a wide range of potential concerns. These include complying with government regulations and meeting the needs and expectations of the people affected by its business. As business operations start to span multiple countries, the need for global standards becomes a prominent issue as well. Globalization may also lead to different lifestyles and transportation needs that may impact the power and engine business markets.

Relevance to Cummins. A company focus on sustainability would make people consider the long-term impacts of their decisions, and encourage employees to become [even] more sensitive to different cultures and perspectives. This thinking can help Cummins be better prepared to meet the needs of the business landscape as it becomes more global.

DEMOGRAPHIC SHIFTS

Urbanization is increasing around the world, and this trend will impact the energy and transportation demands of the future. It may lead to increased public transportation systems as densely populated cities reach their capacities to support personal vehicles. Growing populations may lead to increased demand for clean air and water in these locations as they become more congested. People's need for energy may change as well. An increased aging population in Japan and Europe may also lead to changes in Cummins' markets. All of these factors greatly affect the makeup of Cummins' stakeholders.

Relevance to Cummins. Sustainability requires considering the needs of people around the world, and this perspective can also lead to better understanding of demographic shifts and their potential impact on Cummins' business. These demographic trends give insight to the changing needs of customers, employees, and other stakeholders.

TECHNOLOGICAL CHANGE

Technology may be one of the trends whose impact on Cummins' future is most difficult to predict. Most obviously relevant is the evolution of engines and power-related technologies that are core to Cummins' current business, but technological development may have a

significant indirect effect as well. Technology can be adopted by society in unexpected ways, rapidly changing systems or making previously standard services obsolete. For example, as more information becomes available instantly via the Internet, the nature of products that require delivery may change, thus transforming the freight industry. The best way to be prepared for technological change is to be flexible and innovative.

Relevance to Cummins. Sustainability can help develop a culture at Cummins in which people look ahead to the upcoming needs of global society and the future state of the environment. The proactive search for potential problems can lead to innovation and discovery of solutions that meet people's future needs. This perspective also gives the company flexibility, as the employees will not likely be shocked by changes, having already considered them.

CONCLUSION

Thus, macro-environmental pressures such as environmental constraints, globalization, demographic shifts, and technological change significantly impact Cummins' business. A sustainability strategy can help address these threats by developing employees who are proactive in thinking about these issues. Integrating sustainability throughout Cummins is a way of understanding society's long-term needs and how the relationships between industry and the macro-environment may impact Cummins' business. It also encourages innovation and flexibility, two qualities necessary to build a company that can adapt to the future.

If Cummins does not adopt a sustainability-focused strategy to deal with these threats, the company runs the risk of being less prepared for the changes in regulation, now occurring in other countries, which could impact the business. In addition, the company will not be as flexible in responding to the impacts of globalization on transportation needs and could be unprepared for the impact of a disruptive technology on the business. The goal of a sustainability strategy is to ensure that the company is flexible and able to react nimbly to changes in macro-environmental trends, particularly when the future is very uncertain.

Cummins is currently implementing a new Strategic Planning Process (SPP) to research these trends. The company will then identify the factors which have a higher potential to impact the business and do further analysis in a "Deep Dive." This process will help Cummins become more aware of macro-environmental factors and enable the company to develop a more robust approach to sustainability.

BUSINESS DRIVERS

While increasing pressures from macro-economic trends such as globalization, technological change, and increasing environmental pressures are impacting the business, companies still need to make day-to-day decisions focused on increasing the company's revenues and decreasing costs. Success depends on maximizing value to shareholders by increasing profitability in both the near and long term.

The following is a list of business drivers that enable the company to focus directly on profitability and the associated revenues and costs, in a competitive environment:

Business Driver	Effect on Profitability
Risk Management	↓ Costs
Business Growth	↑ Revenues
Operational Efficiency	↓ Costs
Customer Demands	↑ Revenues
Brand Equity	↑ Revenues
Human Capital	↑ Revenues, ↓ Costs
Shareholder Response	Final arbiter of profitability

As we examine each of these business drivers, we demonstrate its relevance to the company’s profitability. We find that these drivers are in line with sustainability, and we provide examples of how other companies have responded to these drivers in a more sustainable way. We also demonstrate that Cummins has already initiated activities in this vein with the goal of improving its bottom line. We propose that a sustainability strategy will strengthen each of these factors, resulting in a stronger response to the business demands Cummins faces each day.

RISK MANAGEMENT

Risk management is the process of assessing potential business threats and implementing practices in order to avoid the negative impacts these risks may have on the company in the future. By proactively managing these threats, companies can avoid costs associated with various risks, such as lawsuits or IT infrastructure failure, and maintain their ability to operate.

Risk management requires understanding the changing environment in which Cummins operates and the potential issues that may pressure its business decisions. Recently, environmental problems have led to increasingly stringent regulations directly affecting Cummins, its suppliers, its customers, and other stakeholders. Examples of such regulation are the end-of-life vehicle legislation (ELV) in Europe and the 2007 and 2010 U.S. EPA heavy-duty emissions standards. Social issues are also leading to increased labor standards and potential for interest groups to demand a certain level of working conditions. A sustainability strategy can help prepare Cummins to address the threats that may impact the business in the future.

Example: Starbucks mitigates risks through sourcing policy. As a rapidly growing global corporation with impact in many areas, Starbucks was at risk of being a target of social and

environmental campaigns. It was scrutinized by non-governmental organizations (NGOs) for its suppliers' working conditions, the company's waste generation levels, and the impact of its business on local communities. In order to avoid the risks associated with a broad campaign against the company, Starbucks proactively established a sourcing policy that took into consideration "energy and water conservation, pesticide use, biodiversity, and safe and fair working conditions." Furthermore, suppliers were evaluated by a third party.⁸¹ By proactively addressing potential environmental and social risks, Starbucks has been able to avoid major negative campaigns that could hurt its business.

RISK MANAGEMENT DRIVING SUSTAINABILITY AT CUMMINS

Product safety. Cummins has instituted an annual meeting of various stakeholders to assess Cummins' top risks. One of these risks is product safety, or the safety of consumers who use Cummins' products. Safety is an important aspect of sustainability, as it encompasses the health and just treatment of people. Product safety impacts Cummins' business because it is essential to have a reputation for safety in order to be competitive. Currently, Cummins is conducting a Six Sigma project to incorporate safety considerations during the research and engineering phase of the design process as well as in the Value Package Introduction (VPI) process. This method will be implemented internationally in order to ensure that safe conditions are met for all of Cummins' global markets. Thus, by addressing the safety needs of the customer, Cummins is also reducing the risk of an accident harming its reputation.

Beyond compliance. With expansion into new markets, Cummins has been investing in new plants and facilities as well as upgrading existing ones. As teams design and refurbish facilities, the company has gone beyond what is legally required in terms of disposing of hazardous waste, discharging water and producing emissions from its facilities. The Director of Facilities for the Engine Business stated that the company does this because it is concerned that the laws will change, both within and outside of the U.S., and because Cummins will be held accountable in the future for its current actions⁸². By incorporating features in facility design that go beyond compliance, the company is ensuring more stable earnings over time and is proactively preventing future liabilities.

Risk management reduces potential costs. These examples demonstrate that Cummins feels pressure to mitigate social and environmental risks to ensure the business's overall success. In the last year, Cummins has implemented a comprehensive Risk Assessment process to identify and monitor the top business risks to the company; a review of this list indicates that over half of the top risks are linked to sustainability. According to the Vice President of Corporate Quality and Chief Risk Officer, the purpose of this program is to prevent potential crises, such as closing a plant or dealing with government issues, which could cost the company millions of dollars⁸³. By integrating a sustainability framework into the Risk

⁸¹ Article 13, "CSR Best Practice: Starbucks," 2002, 21 Feb. 2006, <http://www.article13.com/A13_ContentList.asp?strAction=GetPublication&PNID=194>

⁸² Frank Clark, Director of EBU Facilities, personal interview, 26 Oct. 2005.

⁸³ Mark Gerstle, Vice President of Corporate Quality and Chief Risk Officer, personal interview, 23 Feb. 2006.

Assessment process, the company will be better able to identify potential threats and take actions to minimize them.

BUSINESS GROWTH

Business growth is a critical component of increasing a company's value and maximizing returns to shareholders. In order to do so, businesses must find new markets and opportunities that lead to new sources of revenue.

Business growth often results from innovation and new partnerships. Sustainability can be a source of innovation, as it forces companies to consider potential future problems and address needs that have not yet been met by industry. These social and environmental problems may become business opportunities which can be addressed profitably. Also, engaging with a wide variety of stakeholders can lead to potential partnerships and new channels for growth.

Example: General Electric adopts environmental strategy. In May 2005, General Electric (GE) announced that it would pursue "Ecomagination," a new strategy whereby GE would invest more heavily in the development of environmental technology solutions. GE plans to double its R&D investment in clean technologies to \$1.5 billion per year and double its revenues from greener products from 2004 to 2010.⁸⁴ GE has recognized the potential of environmental leadership as a source of innovation and business growth.

BUSINESS GROWTH DRIVING SUSTAINABILITY AT CUMMINS

Emission Solutions. Emission Solutions emerged from a business challenge. Cummins had successfully reduced emissions in diesel engines as much as possible with the current technology. However, because of ever-stricter emissions regulations, the company needed to create new technology to reduce emissions even further. By integrating technology from catalyst suppliers and its own capabilities in controls and exhaust integration, it successfully created products that reduced emissions on its own engines and on its competitors' as well. With these products, Cummins launched the business now known as Emission Solutions. Emission Solutions is core to Cummins' profitability and offers a good example of a successful business based on the need to address environmental impacts. (*Numbers removed for confidentiality.*)

Rural electrification in India. With the Power Generation business unit's entry into rural electrification in India, Cummins expanded into yet another new market with a sustainability-oriented strategy. This research initiative provides distributed power in India through power generation units that run off biomass gasification rather than diesel fuel. This effort takes

⁸⁴ Jeffrey Immelt and Jonathan Lash, "The Courage to Develop Clean Energy," The Washington Post, 21 May 2005, 21 Feb. 2006, <<http://www.washingtonpost.com/wp-dyn/content/article/2005/05/20/AR2005052001332.html>>.

advantage of Cummins' strength in power generation. At the same time, it addresses unmet human needs by providing access to power, and it harnesses a renewable fuel resource by using biomass instead of fossil fuels. While the viability of this business is still being tested, Cummins has made a strategic decision to support the initiative, because company leadership believes that it will open new markets to the company in years to come.⁸⁵

Business growth leads to increased revenues. Both the creation of the Emission Solutions business and the initiation of the rural electrification project in India demonstrate that Cummins has identified growth opportunities that incorporate sustainability objectives. By creating processes that ensure sustainability goals are part of every business strategy, Cummins will be better positioned to take advantage of new market opportunities, thereby increasing company revenue and improving people's lives.

OPERATIONAL EFFICIENCY

Businesses that are intent on minimizing expenses to increase profits focus on operational efficiencies to take waste out of the manufacturing and distribution systems. Shortening lead times and reducing production costs through operational efficiency can improve competitiveness in the marketplace.

Developing more sustainable operations that minimize waste and energy consumption often leads to increased efficiency. These savings can be achieved by reducing input material, energy use, and water use, and by recycling or reusing materials. In some cases, these efficiencies lead to additional indirect benefits; for example, reducing waste can lead to further efficiencies by eliminating the need for certain waste treatment processes. These improvements reduce Cummins' impact on the environment while reducing costs and are in line with sustainability objectives.

Example: Dow Chemical benefits from closed-loop system. Dow Chemical participates in two industrial parks, ValuePark in Leipzig and Kalundborg Industrial Park, industrial systems in which waste from one plant is used as input material for another. Dow expects a 30-40% return on its investment through savings in waste, material, labor, and environmental costs.⁸⁶ Dow and the other companies participating in the system have found a way not only to make their operations more efficient, but also to turn their waste into a source of revenue.

OPERATIONAL EFFICIENCY DRIVING SUSTAINABILITY AT CUMMINS

Six Sigma. While some employees may believe that environmental initiatives add costs instead of creating opportunities for cost savings, Cummins has already demonstrated through numerous Six Sigma projects that reducing energy use, waste production, and water use is central to being a low-cost producer. Being a low-cost producer involves not wasting

⁸⁵ Pat Ward, Vice President - Engine Business Controller, personal interview, 17 Nov. 2005.

⁸⁶ World Wildlife Fund, To Whose Profit? Building a Business Case for Sustainability, 2001.

raw materials and creating a more efficient company. These concepts are inextricably linked with sustainability, because they reduce natural resource use and focus on efficiency, thus ensuring the short- and long-term success of the company's business, the global society, and ecosystems. Analysis of Cummins' Six Sigma projects suggests that the company has achieved significant savings as a result of environmental initiatives. (*Numbers removed for confidentiality.*)

Analysis Led Design. In an attempt to reduce lead times, Cummins developed Analysis Led Design (ALD), an alternative to building out product prototypes, in which computer models are used to analyze and test designs. This was driven by the desire to improve operational efficiency and save costs. For example, according to one of the lead engineers in Fleetguard, using ALD instead of a physical prototype in design can save Cummins up to \$0.5 million on a project⁸⁷. However, ALD has also resulted in considerable reduction of material and energy use as well as waste. By eliminating some physical prototypes and replacing them with computer simulation, Cummins saved costs and reduced its environmental impact—two critical components of a sustainability strategy.

Operational efficiency leads to cost savings. Six Sigma and Analysis Led Design are two examples of Cummins processes that save costs while also reducing the company's environmental impact. A sustainability strategy would further incorporate environmental cost-savings opportunities into these processes as well as others within the company.

CUSTOMER DEMANDS

The job of any business is to meet the demands of its customers and to satisfy their needs so that they become returning clients. Customers' demands continuously change based on a variety of factors, including the economy, the political environment, and fads. Companies must be attentive to possible changes in customer demand so that they can adapt their offerings and continue to bring in revenue.

As various pressures in the business environment have been shifting, customers' preferences may start to lean towards products that take sustainability needs into account. These trends--including increasing environmental regulation, rising gas prices, increased pollution, and concerns about toxic materials in water--may cause customers to demand more environmentally friendly products and socially responsible operations. By preparing to develop products that take sustainability concerns into account, Cummins will be better suited meet these potential demands.

Example: Wal-Mart increases organic business. In June of 2005, Wal-Mart's CEO, F. Lee Scott, announced that it would be increasing its organic food supply because it is "the fastest growing category in all of food, and at Wal-Mart."⁸⁸ Wal-Mart continuously monitors

⁸⁷ Greg Hoverson, Fleetguard Manager Advanced Product Development, personal interview, 27 Jan. 2006.

⁸⁸ Organic Consumers Association, "Wal-Mart Plans to Move More Aggressively into Organics, Now Its Fastest Growing Category," Jun. 2005, 22 Feb. 2006, <<http://www.organicconsumers.org/organic/walmart.cfm>>.

its customers' needs because this information is critical for its profitability. In this example, customer demand for organic food has made the company adapt its business to provide a more sustainable product.

CUSTOMER DEMANDS DRIVING SUSTAINABILITY AT CUMMINS

ELV compliance. Three of Cummins' major customers, Chrysler, Ford Brazil, and Volvo Trucks, requested that engines meet Europe's end-of-life vehicle (ELV) requirements, which include the elimination of cadmium, mercury, and hexavalent chrome from the products. While these regulations are in effect only in Europe, these companies decided to standardize these requirements globally. They also asked Cummins to provide reporting regarding compliance with these regulations. Cummins decided to adopt these practices because it was in line with Cummins' operations (they already had eliminated the use of cadmium) and to answer to their largest business client, Chrysler.⁸⁹ In meeting these needs, Cummins is also improving the sustainability of its products by reducing its use of toxic materials. (*Numbers removed for confidentiality.*)

Fuel economy. Cummins is under constant pressure from customers to improve fuel economy. In many cases, their clients' costs are dependant on the fuel economy of the engine, so this factor can determine whether or not the product is purchased. At the same time, improving fuel economy leads to reduced emissions and extraction of resources for fuel, two key areas that address environmental concerns. For decades, Cummins has been striving to improve the fuel economy of its engines, thereby making some environmental gains as well.

Meeting customer demands increases revenue. In both of these cases, Cummins made its products more environmentally friendly because of its customers' demands. In the ELV example, environmental trends and globalization led to these companies' requests for ELV-compliant products outside of Europe. In the case of improving fuel economy, product efficiency was in line with reducing environmental impact. By integrating sustainability throughout the company, employees will become more aware of long-term needs of customers and will be better prepare to adapt products accordingly.

BRAND EQUITY

Brand equity enables businesses to enter new markets with less resistance and helps to build the trust of existing customers and increase customer retention. A strong brand also helps attract and retain employees, as people are drawn to work for companies with powerful and well-respected brands. All of these factors lead to increased revenues and long-term profitability for the company.

⁸⁹ Ian Brook, Director – Independent Evaluation, personal interview, 22 Feb. 2006.

A commitment to sustainability can improve Cummins' reputation. First, it communicates the message that Cummins will always be able to meet the required emissions standards and therefore creates a sense of reliability. Also, as sustainability becomes more popular, customers who wish to be associated with this image may prefer to purchase from a company that is dedicated to sustainability. Building a reputation for having environmentally and socially responsible products may also be a source of differentiation and help secure loyal customers.

Example: Toyota's eco-friendly brand. Since the release of the Prius hybrid, Toyota has been branding itself as a leader in environmental initiatives and has perhaps been benefiting from this image. According to Intrabrand, a company that measures brands of global corporations every year for *BusinessWeek*, Toyota was ranked in 2005 as the #9 top brand in the world, at a value of \$24.8 billion. Toyota has consistently been increasing its brand equity over the past 3 years (10% increase in 2005, 9% in 2004, 7% in 2003)⁹⁰. While this increase in brand equity results from many factors including perceived quality, safety, and comfort, it is worth noting that a part of its current image includes environmental responsibility. Toyota has invested in making make eco-friendliness a mainstream concept, not just a brand targeted at environmentalists.

BRAND EQUITY DRIVING SUSTAINABILITY AT CUMMINS

Dependability. Cummins' marketing campaign is based on dependability. A core message of this brand is, "We do what we say we will do"; this message is strengthened by Cummins' ethical reputation. Cummins' brand is also supported by its mission, which includes, "Demanding that everything we do leads to a cleaner, healthier, safer environment." For the past several decades, Cummins's brand has been based on its commitment to providing cleaner engines and improving fuel economy, leading to the strong, trusted brand the company has today. Cummins understands that having a trustworthy brand is crucial to having a sustainable business.⁹¹ (*Numbers removed for confidentiality.*)

Dow Jones Sustainability Index. In 2005, Cummins decided to aim for inclusion on the Dow Jones Sustainability Index (DJSI). At that time, Caterpillar had been on the DJSI for four years. In fact, with three of Cummins' industry peers – Caterpillar, DaimlerChrysler, and Ford – on the index, being on the DJSI was no longer a statement of leadership in sustainability, but rather a necessity to prevent being perceived as a laggard. Cummins has always prided itself on its social responsibility, and joining the DJSI was a move that supported its ethical reputation.

Brand equity leads to increased revenue. As Cummins moves forward to further develop its branding strategy, the incorporation of social and environmental responsibility will be essential in strengthening its image of dependability. Integrating sustainability throughout the company will ensure that these concepts will be communicated through everything the company does, both internally and externally.

⁹⁰ Interbrand, "Best Global Brands 2005," 22 Feb. 2006, <http://www.interbrand.com/best_brands_2005.asp>.

⁹¹ Tom Kieffer, Executive Director, Marketing, personal interview, 22 Feb. 2006.

HUMAN CAPITAL

Human Capital. The success of every business depends on its ability to make the best use of its employees. The ability to attract the right talent, motivate employees to be productive, and utilize their skills to deliver the most value is essential to the company's survival. Investing in employee development and motivation is crucial to the bottom line, as productivity is a driver of increased revenue (employees deliver value) as well as reduced costs (fewer employees are required to produce results).

In order for Cummins to be successful in both employee recruitment and retention, it is helpful to have a culture in which people feel that their work is meaningful. One of sustainability's objectives is to improve the state of the world, from both an environmental and social perspective, and this sense of "making the world better" can be a strong source of attraction and motivation. People who can align their work objectives with their personal values will be more motivated and productive, leading to better contributions to Cummins' business. A key motivator for Cummins' employees is its ethical culture, and increased sustainability initiatives may lead to more effective recruiting and increased productivity.

Example: Novo Nordisk reduces employee turnover. Novo Nordisk, a pharmaceutical company, implemented a program called "Values in Action" to align the company's processes with the goals of sustainable development. Through this program, the company developed a system in which it set targets and metrics and monitored its progress in bioethics⁹². After establishing this program, Novo Nordisk saw its staff turnover rates drop to 5%, whereas the industry average was about 10%.⁹³

HUMAN CAPITAL DRIVING SUSTAINABILITY AT CUMMINS

Diversity initiatives. At Cummins, diversity is an essential part of the culture as well as the business. All employees receive mandatory training on diversity issues, and those who wish to move on to leadership positions must participate in a second training program on diversity. Cummins has created 48 Local Diversity Councils (LDCs) to address diversity in recruiting and workplace culture in the communities where the company operates. Cummins has recognized the link between diversity and business success and lists the following advantages that diversity provides:

- New markets and new businesses
- Customer requirements
- Changing demographics
- Competitive performance
- Attracting and retaining the best people
- Doing the right thing⁹⁴

⁹² "Company Statements on Sustainable Development," 22 Feb. 2006, <<http://www.biothinking.com/applysd/statements.htm>>.

⁹³ *Ibid.*

⁹⁴ Cummins Inc., Cummins Sustainability Report 2005, (Columbus, IN: 2005).

By recognizing these benefits, Cummins has made the business case for diversity and why it should be integrated throughout the business.

Community Involvement Teams (CIT). Cummins has a robust community service program in which employees from various positions in the company participate in volunteer activities. These groups are responsible for finding local needs and coming up with creative solutions for how Cummins can support the community. According to the Director of Corporate Social Responsibility,⁹⁵ not only do CITs help the local community and strengthen Cummins' relationship with its stakeholders, but employees benefit as well. They gain important leadership skills including management, problem solving, and empathy, which can be applied back into the business setting. These projects also give employees a sense of meaning and engagement in their jobs. This source of inspiration may lead to a more motivated and educated group of employees. Cummins can also use these examples to improve its reputation and attract employees whose values are in line with these initiatives.

Building human capital leads to increased revenues as well as cost savings. Supporting community needs around the world is core to sustainability, and integrating initiatives such as diversity training and Community Involvement Teams helps to create an environment that embraces strong social values. Cummins has already recognized the benefits of these initiatives for its employees and the business overall. Integrating a sustainability focus throughout the company will ensure that these values and benefits reach every employee.

SHAREHOLDER RESPONSE

Companies must respond to shareholder demands in order to continue as a business. They are legally required to meet the demands of the shareholders and maximize the return on their investments. As owners of the company, their interests can drive the direction of the business, and as such, their feedback is essential in the strategic process.

When shareholders bring up environmental and social concerns involving the business, it is easier for companies to respond if they have already established a set of objectives dealing with sustainability. Cummins' shareholders have expressed concerns regarding Cummins' ability to meet environmental regulations. In fact, in 2003 a shareholder group requested that Cummins create a sustainability report and address the impact of the company's products and manufacturing processes on the environment. In response, Cummins agreed to publish an annual sustainability report.⁹⁶ Integrating sustainability into strategy helps to address shareholder concerns by assuring that Cummins is proactively looking for ways to reduce emissions and that management is looking into issues that may arise in the future.

⁹⁵ Tracy Souza, Director of the Cummins Foundation, personal interview, 18 Nov. 2005.

⁹⁶ Interfaith Center on Corporate Responsibility, 22 Feb. 2006,

<http://www.iccr.org/shareholder/proxy_book03/environment/climaterisk_oxy.htm>

Example: Ford shareholder resolutions. In 2005, Ford faced shareholder resolutions requesting that the company address greenhouse gas emissions in its automobiles. Ford has since increased its investment in cleaner technology solutions in the design of its vehicles. Ford has announced that it will increase its hybrid production capacity ten times and develop a program to offset greenhouse gases when manufacturing hybrids⁹⁷.

SHAREHOLDER RESPONSE DRIVING SUSTAINABILITY AT CUMMINS

Investor presentations. Every year, Cummins conducts road tours during which company representatives present themselves to investors and analysts. In these speeches, Tim Solso is sure to discuss successes that are not necessarily financially tangible, such as Cummins joining the Dow Jones Sustainability Index and being ranked number one in *Ethics* magazine in 2005. One purpose of these presentations is to show investors that Cummins' management is highly capable and designed to be effective in the long run. According to the Director of Investor Relations, the topics of ethics and environmental responsibility are included in these presentations because they are indicators that management is considering the future and addressing various issues impacting the company.

Emissions concerns. Among the top five shareholders' greatest concerns is Cummins' ability to meet emissions standards⁹⁸. Because of this, the company has taken precautions to ensure that it has a solid set of responses to address these concerns. For example, Cummins has made it a priority to release a new engine in 2007 that will meet the new emissions without reducing fuel economy. Cummins has also been researching alternative fuels and technologies to improve emissions so that it will be ready if the market starts adopting a new technology. The pressure from investors to address emissions is pushing Cummins to implement environmental solutions.

Shareholder concerns link to company profitability. Shareholders are strict arbiters who are primarily concerned with the company's profitability. Both the investor presentations and emissions concerns examples illustrate that these investors are concerned with environmental and social issues because they impact Cummins' long-term profitability. By pursuing sustainability, a concept which aligns environmental, social, and economic objectives, Cummins can become a company that better addresses the needs of its shareholders.

SUMMARY

As the business environment becomes more global and increasingly complex, it becomes crucial for a company to understand the macro-environmental trends in which it operates and how these pressures impact day-to-day business decisions. By increasing their focus on sustainability, Cummins' employees and managers will become more aware of key trends

⁹⁷ Ford Motor Company, [Sustainability Report 2005](http://www.ford.com/en/company/about/sustainability/report/overviewAddendum.htm), 22 Feb. 2006, <<http://www.ford.com/en/company/about/sustainability/report/overviewAddendum.htm>>

⁹⁸ Dean Cantrell, Director of Investor Relations, personal interview, 18 Nov. 2005.

such as globalization, urbanization, and resource scarcity, and will help shape strategy that ensures Cummins' success in the future.

Focusing on sustainability is also an effective way for employees to address the key business factors which drive profitability by increasing revenues and decreasing costs. In fact, Cummins has already started to address its business demands through initiatives that are in line with sustainability. To date, most examples have been based on solving isolated business problems, but there are also indicators that Cummins starting to take a more proactive and integrated approach.

IV. COMPETITIVE ANALYSIS

OVERVIEW

Cummins is not alone in critically evaluating the business case for sustainability. Just as the macro-economic trends and the seven business drivers are pushing Cummins to take social and environmental issues more seriously and integrate them into the company's business strategy, industry peers are also incorporating these issues into their own strategies. In some cases, these competitors are aggressively promoting themselves as "sustainable companies." For example, one of Cummins' key competitors, Caterpillar, was listed as a member of the Dow Jones Sustainability Index ("a global index tracking the financial performance of the leading sustainability-driven companies worldwide"⁹⁹) for four years before Cummins was added to the Index in 2005.¹⁰⁰

To determine where different companies stand with regard to incorporating sustainability into their business strategies, we compared Cummins to four of its industry peers: Caterpillar (CAT), DaimlerChrysler, Ford, and General Motors (GM). Each company's performance was evaluated and ranked using the approach described below.

RESEARCH METHODOLOGY

To ascertain the company's performance with regard to sustainability, each company's published reports were thoroughly analyzed¹⁰¹. In addition, company websites were scoured for relevant information, and follow-up phone interviews were conducted with company employees when additional information was needed. Unless otherwise noted in this report, all information cited can be found either in the company's published reports or on its website.

APPLYING THE FOUR-QUESTION SUSTAINABILITY FRAMEWORK

After compiling information about each company's current sustainability activities, we used the Four-Question Sustainability Framework to examine how Cummins and its industry peers have integrated sustainability into their strategy and operations.

The Four-Question Sustainability Framework asks:

1. What materials does Cummins use to build its products and facilities?

⁹⁹ Dow Jones Sustainability Index website, 23 Feb. 2006 <<http://www.sustainability-indexes.com/>>.

¹⁰⁰ Caterpillar's website says it has been listed for 5 consecutive years. Caterpillar worldwide website, "Corporate Responsibility," 20 Dec. 2005 <<http://www.cat.com/cda/layout?m=38044&x=7>>. Cummins was listed for the first time in 2005. Cummins, Inc., "Cummins Selected for Dow Jones Sustainability World Index," 8 Sept. 2005, press release, 20 Dec. 2005 <<http://www.cummins.com/cmi/content.jsp?siteId=1&langId=1033&menuId=4&overviewId=15&dataId=671&menuIndex=0>>.

¹⁰¹ Almost every company (with the exception of Caterpillar) produces at least one sustainability, corporate social responsibility, or environmental report. These reports provided the bulk of the information included here.

2. What are the impacts of Cummins' manufacturing processes?
3. What are the impacts of Cummins' products when in use?
4. What action is the company taking to address social issues throughout the value chain?

EVALUATING SUSTAINABILITY

In the evaluation, companies that had a systemic and proactive approach to incorporating sustainability into their business strategy ranked higher than those that did not. In addition, six factors were taken into consideration when evaluating Cummins and its peers. These factors are:

1. Evidence of Integrated Processes vs. Individual Examples. Integrated processes addressing sustainability are better than individual examples because they show that the company has made an ongoing commitment to implement sustainable practices. Since company-wide processes tend to have more long-term impacts than one-time projects and may grow into systems that are replicated across products and locations, companies that had integrated processes were given higher rankings than those that did not.

Companies could present both integrated processes and individual examples. For instance, Ford's plant in Lima, Peru, the sole Ford facility that employs geothermal technology for ambient and machine cooling, was not as compelling as the company's fumes-to-fuel initiative.¹⁰² The fumes-to-fuel initiative was rated more highly in the evaluation process than the geothermal example, since the geothermal example only reduced emissions at one plant, whereas the fumes-to-fuel initiative is in the process of becoming a standard procedure company-wide and hence will have a tenfold impact in the reduction of emissions.

2. Presence of Measurable Targets vs. Vague Statements. Measurable targets are preferred to vague statements because they increase the accountability of a company to fulfill its objectives and represent the company's level of commitment. By setting sustainability-related targets and benchmarking progress towards these objectives internally as well as in published reports and other media, a company adds external incentives to deliver on its goals. Thus, companies that had measurable targets were rated higher than those that made vague statements.

For example, GM was rated higher than Cummins in this category, because GM has set specific company targets for reducing facilities emissions and wastes, measuring and reporting steady progress towards these goals, while Cummins has not.

3. Examples of Exceeding Regulation vs. Compliance. Meeting stringent regulations is among the minimum requirements for a company to be considered a good corporate citizen. Companies were ranked higher when they demonstrated evidence of going beyond regulation to reduce their environmental impact and improve their social impact.

¹⁰² The fumes-to-fuel initiative is a process in which VOC emissions are captured from the paint process, detoxified, and used to create energy.

For example, DaimlerChrysler and GM were ranked higher than the other companies with regard to incorporating design for environment (DfE) because of their use of Life-Cycle Analysis (a voluntary ISO program)¹⁰³ to influence business decision-making.

4. Use of Renewable Energy Technologies vs. Non-renewable Energy Technologies.

Renewable technologies are more environmentally friendly, as they are either carbon-free (e.g., hydrogen) or carbon neutral (e.g., 100% biodiesel).¹⁰⁴ These carbon-free and carbon-neutral technologies emit less carbon dioxide than “cleaner carbon” technologies. Because carbon dioxide is a greenhouse gas, emitting less of this compound reduces a company’s potential impact on global warming. Companies were ranked higher if they had made a commitment to transition from non-renewable energy technologies to renewable ones.

5. Use of Bio-based Materials vs. Petroleum-based Materials.

Bio-based materials are preferable to petroleum-based materials, because bio-based materials can be broken down by the natural environment after their useful life. Petroleum-based materials are made from non-renewable organic materials that use up natural resources stock and cannot always be broken down by the natural environment in generational timeframes; thus, they create disposal problems. Companies that incorporated bio-based materials into the design of their products were ranked higher than those that did not.

6. Construction from Recycled Content vs. Design for Future Recycling/Remanufacturing.

Creating a product with recycled content is better than designing a product for future recycling, because the former reduces the total amount of material and energy used to make the product. Design for future recycling still requires the input of virgin material and results in the environmental impacts associated with that resource extraction. Additionally, even if an object is designed for future recycling, it may not be recycled at the end of its useful life. Companies that were increasing recycled content in their products were ranked higher than those that were designing for future recycling.

¹⁰³ Life-Cycle Analysis is a voluntary international standard. See ISO 14040 standards for more information. ISO 14040 Information Zone, 15 Feb. 2006, <<http://www.iso-14001.org.uk/iso-14040.htm>>.

¹⁰⁴ Fuels such as biofuels are considered “carbon-neutral,” because the carbon in the fuel was recently extracted from the atmospheric carbon dioxide to grow the plants required to make the biofuel. Hence, burning a carbon-neutral fuel does not result in a net increase of CO₂ in the Earth’s atmosphere because this is a closed-loop system.

THE RANKING SYSTEM

The ranking system, based on the preferences outlined above, gives priority to companies with a more proactive and integrated approach to incorporating social and environmental concerns into their business strategy.¹⁰⁵ The ranking system is based on the three-point scale described below:

√+	<p>Companies receive this rating if they have company-wide systems focused on addressing environmental and/or social issues. In addition, these companies have established goals and interim targets, and consistently measure their progress toward their goals. Companies that receive a √+ typically exhibit the majority of the preferred characteristics outlined in the <i>evaluating sustainability</i> section above.</p> <p>For example, a company receiving this grade might have:</p> <ul style="list-style-type: none"> • a comprehensive plan to reduce all greenhouse gas emissions • a company-wide process for increasing recycled content in vehicles
√	<p>Companies receive this rating if they have systems to integrate sustainability concerns into a single product line or manufacturing process. Companies that receive a √ typically exhibit some of the preferred characteristics outlined in the <i>evaluating sustainability</i> section above.</p> <p>For example:</p> <ul style="list-style-type: none"> • Ford’s fumes-to-fuel initiative which converts escaping emissions into fuel to create electricity • Daimler Chrysler’s use of coconut fiber in seats for the three-door Mercedes-Benz A-Class models
√-	<p>Companies receive this rating if they have “one time” examples of social and environmental initiatives in a single manufacturing facility or product. Companies that receive a √- rarely exhibit the preferred characteristics described in the <i>evaluating sustainability</i> section above.</p> <p>For example, a company receiving this grade might have:</p> <ul style="list-style-type: none"> • windmills powering one plant in the United Kingdom • one type of recycled coolant available to customers

¹⁰⁵ See page 81 for a discussion about taking a proactive and integrated approach when implementing a sustainability strategy.

COMPETITIVE ANALYSIS SUMMARY

The analysis presented below is based upon the team’s own research and observations, and does not reflect the views or opinions of Cummins in any way.

The table below provides a visual representation of how the different companies compare across the Four-Question Sustainability Framework.

		CMI	CAT	DC	FORD	GM
1	What materials does Cummins use to build its products ¹⁰⁶ ?	√	√	√ -	√ +	√
2	What are the impacts of Cummins’ manufacturing processes?	√	√	√	√ +	√ +
3	What are the impacts of Cummins’ products when in use?	√	√ -	√	√ +	√ +
4	What action is Cummins taking to address social issues throughout the value chain?	√ +	√ -	√	√ +	√ +

A summary of the reasoning behind the table is presented below. For detailed information supporting the summary information, please refer to *Appendix II*.

1. WHAT MATERIALS DOES CUMMINS USE TO BUILD ITS PRODUCTS?

Highest-rated companies have set measurable goals and targets to shift the company’s current materials sourcing to renewable, non-petroleum based materials. These companies are making progress towards those goals by creating programs that increased the use of recycled content and/or incorporating bio-based materials.

Cummins: √

Cummins ReCon business recaptures some of the materials from the company’s product and reconfigures/recycles them. However, there is no evidence indicating that the company is looking to increase recycled content in its new engine product line. In addition, no evidence was located which showed processes in place which systematically seek to replace virgin materials with recycled or biodegradable inputs.

Caterpillar: √

Caterpillar’s remanufacturing business ensures the recycling of some of its products. However, the company’s discussion of recycled and recyclable materials is limited to its remanufacturing business and does not address using recycled material in new products. No

¹⁰⁶ Because no companies reported the types of materials they use in building their facilities, this part of the Four Questions framework was not included in the competitive analysis.

evidence indicated that the company is looking to increase recycled content into its first fit product line, and no evidence suggested that it is attempting to increase the content of bio-based materials, as appropriate. No goals have been set regarding material content.

DaimlerChrysler: √ -

DaimlerChrysler's recycling and remanufacturing initiatives appear to be limited to its regional workshop waste disposal recycling program in Europe. This program does not appear to extend across the company. The company's use of coconut fiber material in its cars is an example of individual changes made within particular car models, yet these changes do not appear to be part of a larger program driving the replacement of non-renewable materials in cars across the company. Though the company has stated the goal of replacing current materials with recycled resources, no number targets or processes associated with this statement were found.

Ford: √ +

Ford has created company-wide systems which substitute certain targeted materials with recycled content (such as recycled polypropylene containers). In addition, it is conducting research (known as the Piquette Project) on how to create a fully recyclable car in the near future. These two examples show that Ford is both currently extending its systems to increase the recycled content in its vehicles, and taking this action as a part of a larger strategy to create a fully recyclable vehicle (itself made with a high degree of recycled content) in the near future.

GM: √

GM has information systems in place to facilitate recycling by external parties and to show that the company has been making improvements on individual recycling products. Additionally, the company has financial incentive programs for resource managers to reduce waste during manufacturing and increase recycling of these materials, which suggests that some processes address materials concerns company-wide. However, these processes do not appear to be part of a larger strategy to increase recycled content in GM's products, because the company has set no published targets for incorporating greater recycled or bio-based content into its vehicles.

2. WHAT ARE THE IMPACTS OF CUMMINS MANUFACTURING PROCESSES?

Highest-rated companies are systematically working towards reducing the environmental impact of their facilities when in operation. These companies have measurable targets and goals to reduce emissions and wastes in a variety of areas. In addition, these companies are innovating, replicating and spreading systems to reduce the environmental impacts of their facilities across the company.

Cummins: √

Cummins is monitoring its energy use and other emissions data, but it has attempted neither to make year-over-year comparisons, nor to set goals for future reductions. However, Cummins does appear to be attempting to establish a baseline for its greenhouse gas

emissions and has indicated its intention to set up systems for monitoring and reduction in the near future. The company's incorporation of recycled coolants shows progress in the area of recycling policies. However, Cummins has no comprehensive approach to incorporate additional recycled materials in its facilities' operations.

Caterpillar: √

Caterpillar has set goals to improve energy efficiency and decrease greenhouse gas emissions through the EPA Climate Leaders Program. However, no evidence was found showing a company-wide system in place to meet these targets, and the company does not have a sustainability report (or a similar document) in which it regularly publicizes progress on these metrics. No commitments have been made to source electricity from renewable sources. Caterpillar has shown individual examples of recycling in plant processes (such as paint recycling), but no evidence of a systematic process in place to address recycling in plants.

DaimlerChrysler: √

DaimlerChrysler has systems in place to reduce energy and emissions use at its individual plants, but it is unclear on how stringent the goals are and the extent to which this system is followed outside of Europe. DaimlerChrysler states that it pursues energy efficiency and cuts carbon dioxide emissions by using lower carbon content fuels wherever possible, but no greenhouse gas targets appear to have been established. Certain emissions levels are monitored and reported at the company level, but no targets have been set.

Ford: √+

Ford has many individual examples of constructing green buildings, sourcing green power, and reducing emissions at its facilities. There is also evidence to suggest that Ford has implemented information systems to facilitate recycling by external parties, and leadership committees to promote recycling internally. The company has multiple examples of systemic programs to promote internal recycling which either have been or will soon be implemented company-wide. The company has also set some important energy targets and shown progress toward these goals. Ford acknowledges climate change and the increasing presence of greenhouse gases in the atmosphere, and it has created structural entities within the company to address these issues.

GM: √+

GM has set company targets for reducing facilities emissions and wastes, and has measured steady progress towards these goals. Additionally, GM's "Cost Council Initiatives" program has created a company-wide system to monitor progress and share best practices related to facilities, including those associated with environmental issues. However, there has been no mention of any systemic program to transition the company to renewable energy. GM has set carbon dioxide reduction targets for its facilities, and the company is measuring and reporting its progress year over year.

3. WHAT ARE THE IMPACTS OF CUMMINS PRODUCTS WHEN IN USE?

Highest-rated companies are systematically working towards reducing the environmental impact of their product when in operation and are building products that emit little to no emissions. They are also incorporating design for environment (DfE) principles into all of their product innovations. These companies work to reduce the overall product's life cycle impact, designing products for both minimization of resource use and environmental impact when in use, as well as for future recycling and remanufacturing at end-of-life. To determine how to reduce their lifecycle impacts, highest-ranked companies use Life-Cycle Assessment (LCA) techniques.¹⁰⁷

Cummins: ✓

Cummins has design for remanufacture criteria in place, but does not appear to have any design processes which incorporate Life-Cycle Assessment (LCA) and DfE. The processes Cummins currently has, such as Analysis-Led Design, touch only one part of the design process, and do not substantially change the life cycle impact of the designed product.

Cummins developed new technologies such as the ComfortGuard system and its Fleetguard filters to lessen its product emissions. Additionally, the company has commercialized renewable technologies such as fuel cells and landfill gas generators in its power generation division, as well as natural gas and hybrid bus products in its Engine Business Unit. However, Cummins has made no public commitments to moving towards renewable fuel-powered engines or power generation units.

Caterpillar: ✓ -

Caterpillar currently designs for remanufacture but does not have a comprehensive design for environment process. Though design for remanufacturing is an important part of the design for environment process, it is only one small subset of this criterion. Design for remanufacturing does not take into account the potential harmful life cycle impacts of sourcing or employing the materials that comprise the engine, nor does it favor the design of cleaner, renewable fuel-powered engines. Additionally, design for remanufacture does not guarantee that the engine itself will be remanufactured at the end of its useful life, and thus any environmental benefit from this design process may be lost.

Caterpillar's current business is primarily grounded in diesel technology, with some entrance into the compressed natural gas (CNG) market. Caterpillar has shown individual examples of partnerships to facilitate its development of stationary fuel cell technology, and the company has developed two stationary fuel cell power generation plants, but it has no plans for large-scale production. Company comments on this topic indicate that Caterpillar is exploring biofuel and hydrogen technologies through research and development activities, but it is not evident that the company has any plans to commercialize this technology in the near future.

¹⁰⁷ ISO 14040 is a voluntary program that provides international standards on conducting Life-Cycle Analysis. ISO 14040 Information Zone, 15 Feb. 2006, <<http://www.iso-14001.org.uk/iso-14040.htm>>.

DaimlerChrysler: √

DaimlerChrysler has processes and structures in place at the corporate level to ensure DfE and LCA on all products. Whether these design criteria are being rigorously adhered to and extended to the Chrysler division is unclear.

With regard to reducing emissions, DaimlerChrysler has entered into multiple research partnerships to develop biofuels in various regional markets. The company has made inroads in developing both hybrid and hydrogen technologies across product models, with a primary emphasis in the hydrogen bus market. Like Ford and GM, however, DaimlerChrysler does not have any specific targets set for transitioning their full product line to these new technologies in the future.

Ford: √ +

While Ford has created a new type of vehicle which incorporates cradle to cradle design,¹⁰⁸ it has only applied this design principle to one concept vehicle. The recently leaked news of the Piquette Project to create hybrid, recyclable cars indicates that Ford might be shifting towards greater use of DfE, but no evidence demonstrated current systematic employment of techniques such as Life-Cycle Assessment (LCA) or design for remanufacturing across all product line design processes.

Ford has also entered into research partnerships to develop biofuels and has joint ventures to set up alternative fuel filling stations in various regional markets. The company is currently offering and developing a wide range of products designed for alternative and renewable fuels. In addition, Ford is making significant strides toward investing in and producing more vehicles powered by renewable fuels such as hydrogen. Like others in the industry, it has also made general statements about its commitments to alternative-fuel vehicles, since they see this technology as critical to the future success of the company. Although Ford has no established goals and targets, they appear to be much more proactive than their industry peers in this area and thus receive a √ +.

GM: √ +

GM appears to have design systems in place to promote DfE and to incorporate LCA in vehicle design across the company. It is unclear how strictly these processes are adhered to or how comprehensively they are implemented across the different vehicles lines.

Like Ford, GM is also offering and developing a wide range of products designed for alternative and renewable fuels, and it has made significant commitments to make fuel cells one of its vehicle technologies of the future. GM's grade reflects the same characteristics listed in Ford's evaluation.

¹⁰⁸ In cradle to cradle design, products are engineered to employ materials that can be continuously reused and recycled, with a neutral or positive impact on the environment. For further elaboration, please see the McDonough Braungart Design Chemistry, LLC website. MBDC, 22 Jan. 2006 <<http://www.mbdc.com/>>.

4. WHAT ACTION IS THE COMPANY TAKING TO ADDRESS SOCIAL ISSUES THROUGHOUT THE VALUE CHAIN?

Highest-rated companies are systematically incorporating social concerns across the value chain and strategically investing in programs that address social concerns, as they see these areas as growing value for themselves. This means systematically working to improve the company's record on diversity, human rights, and its relations with and presence in the community.

Cummins: √+

Cummins has a strong diversity program, upon which the company puts great emphasis. It has systems in place to deal with human rights concerns in the supply chain. Cummins' volunteerism program (through the Community Involvement Teams mentioned on page 23) is a longstanding, well-used program that has the support of top management.

Caterpillar: √-

Caterpillar has shown individual examples of programs to address social issues in the value chain, such as the Destination Technology program and efforts to increase purchasing from woman and minority-owned suppliers. However, there are no goals associated with growing the number of these programs or expanding their depth.

DaimlerChrysler: √

DaimlerChrysler's Global Diversity council was newly formed in 2005. Though the diversity guidelines are said to have been in place since 1998, there are no details as to how rigorously diversity principles are applied within the company. The company is expanding its AIDS education campaigns (first started in South Africa) to a few other at-risk countries where the company operates. It has set up five vocational training programs to build capacity in the communities where it works. Though these programs are examples of systems the company has in place to address social concerns, they do not appear to be part of a larger corporate strategy.

Ford: √+

Ford has substantial systems in place to ensure diversity in the workforce, and it is an industry leader in promoting human rights through the value chain. The company has also made significant investments in its supply chain work force through both health and education programs. Lastly, its volunteer corps offers employees a way to participate in the community.

GM: √+

GM has systems in place to ensure diversity in the workplace. It has a human rights commitment, though the self-monitoring of suppliers does not necessarily ensure compliance. The company has made investments in the community through education programs, and GM's Volunteer PLUS International program offers employees a way to participate in the community.

CONCLUSION

While Cummins outperforms Caterpillar in two aspects of the Four-Question Sustainability Framework (impacts of the companies' products when in use and how the companies address social issues across the value chain), Cummins lags behind DaimlerChrysler in integrating design for environment criteria, and Ford and General Motors in integrating sustainability initiatives throughout the company. To ensure that Cummins remains ahead of Caterpillar and moves closer to the environmental performance of DaimlerChrysler and the integration of sustainability at Ford and General Motors, Cummins should implement a comprehensive sustainability strategy.

Section VII of this report provides concrete recommendations to help Cummins become a more sustainable company, both to stay ahead of Caterpillar and to be more aligned with DaimlerChrysler, Ford, and General Motors. Based on the analysis above, Cummins should particularly focus on rethinking the types of materials used in its products and reducing the impacts of its products and facilities. These changes could be addressed through a design process focused on sustainability issues. *Section VII* explains how the Technology Planning Process as well as other company-wide processes can be enhanced to help incorporate sustainability into Cummins' business strategy.

V. CASE STUDY: THE FLEETGUARD MACH FILTER

OVERVIEW

For purposes of confidentiality, Cummins' financial data have been removed from the public version of this report.

Sections II-IV of this report have been dedicated to demonstrating the numerous reasons Cummins should consider adopting a sustainability strategy, including its relevance to the company's history; connection to the company's vision, mission, and values; links to macro-economic trends; potential influence on key business drivers; and effect on the competitive landscape. Taken separately, each reason can be justified. However, in a rapidly changing and highly competitive business world, the specific reasons for incorporating sustainability by addressing social and environmental issues blend and act together in ways that may be illustrated best by a concrete example.

The Cummins Fleetguard Mach filter program is an example of how addressing social and environmental issues can simultaneously result in financial benefits. The Value Package Introduction (VPI) process charter for the Mach program includes specific objectives such as "25% cost reduction," "meeting all filtration application requirements," "green/incinerable design," and "design for use with complete product line."¹⁰⁹ Although sustainability is not explicitly mentioned, the Mach charter integrates social, environmental, and economic objectives in a way that captures the essence of a sustainability-minded product development strategy. In adhering to the charter objectives throughout the product development and manufacturing design process, the Mach program has been successful in delivering the joint social-environmental-economic benefits that are the hallmark of a sustainable business strategy.

Throughout this section, we look at different aspects of the Mach filter program and establish the links to a sustainable business strategy. We begin by telling the story of the Mach filter in the first half of this section. Initially we demonstrate how the company's values supported the development of a filter with sustainability-related attributes through a discussion of the history of the Fleetguard business unit. Then, by examining the factors that influenced the Mach program, we show how macro-economic trends, competition, and customer demands played a role in the creation of the new product. An analysis of the design and development of the Mach filter illustrates the process tools that Fleetguard used to incorporate sustainability-related concerns.

In the second half of this section, we present two analyses that show specifically how the Mach filter supports a sustainable business strategy. We performed a life-cycle analysis of the Mach filter and its steel predecessor to provide data comparing the environmental performance of the two products. A financial analysis highlights the recognized program savings as well as other economic benefits not included in the original analysis.

¹⁰⁹ Fleetguard Inc., "Next Generation Low Cost Filtration Charter," Fleetguard Internal Document, 28 May 2003.

In summary, the analysis of the Mach filter program shows that when executed well, sustainability can bring about business advantages that may not be recognized by current processes and analysis methods.

FLEETGUARD INC. BACKGROUND

Filters are used to clean and condition the fluids within engine systems, such as oil, fuel, coolant, and lubricant. Filtration is vitally important to maintaining a diesel engine's high performance. When contaminants enter the engine's fluid systems, the power, efficiency, fuel economy, and overall engine life are negatively impacted. Although engines seem to be sealed and well-shielded from the outside environment, contaminants can still be introduced into an engine's fluid systems from several sources. Some of these sources include the engine block itself (contributing metal and core sand particles), oxidized oil (contributing sludge and soot), fuel (contributing water and unwanted chemicals), and harsh dirty or dusty surroundings (contributing water and exterior dirt). Diesel engine filters must be designed to capture this wide variety of contaminants efficiently and over a long service interval, so the equipment owner does not have to change filters continually to maintain performance. Cummins' Fleetguard Inc. business designs, manufactures, and distributes filters for diesel engine applications.

Fleetguard Inc. (hereafter referred to as Fleetguard) is a wholly owned subsidiary of Cummins and an integral part of Cummins' Components Business Group. Fleetguard's primary focus is on the design and manufacture of products for the filtration, emissions, and noise-silencing markets. Fleetguard products are found on heavy-, medium- and light-duty trucks as well as industrial equipment for construction, mining, agriculture and marine and power generation applications.

Fleetguard began in 1958 as the Seymour Filter Company, located in Seymour, Indiana, with two employees and a single filter production line. The filters manufactured by Seymour at that time were specifically developed to meet the high performance requirements of the Cummins diesel engine. Seymour recognized a growing market demand for high-quality filtration products and expanded rapidly to take advantage of this opportunity. The company became a full subsidiary of Cummins under the name of Fleetguard in the 1970s.

Currently, Fleetguard has 23 production plants in nine countries, 16 distribution centers, and three joint ventures. The company has grown to become the world's leading supplier of filtration and exhaust systems for heavy-duty diesel engines, with over 6,000 employees around the world.¹¹⁰ Far beyond the initial single-filter production line, Fleetguard and its associated brands provide an array of products and services that includes emission aftertreatment, air intake and filtration, exhaust systems and accessories, fluid filtration, centrifugal filtration, and associated service parts and maintenance kits.¹¹¹

¹¹⁰ About Fleetguard, Fleetguard Inc. website, 13 December 2005, <http://www.fleetguard.com/fleet/en/about_fleetguard/index.jsp>.

¹¹¹ Fleetguard Inc. Fact Sheet, Fleetguard Inc. website, 3 January 2006, <http://www.fleetguard.com/fleet/en/about_fleetguard/en_facts.jsp>.

From the company's beginning, Fleetguard has led the industry with creative products designed to reduce environmental damage, increase equipment longevity, and maximize equipment uptime and user comfort. Over time this creativity has been a key component of Fleetguard's continued success. The over 200 active global patents that Fleetguard currently holds for product technology are illustrative of the culture of innovation that characterizes the business.¹¹²

Summary. Although Fleetguard products are primarily used in heavy-duty diesel-powered equipment, the business is continually searching for, and finding, new applications and markets for its innovative products and ground-breaking technologies. For example, Fleetguard filtration products and technologies are now being used in select consumer electronics products.¹¹³ The ability of a business to innovate and look beyond current market paradigms is also a critical element in adopting and capitalizing on a systematic approach to sustainability. The Mach filter is an example of how innovation at Fleetguard has led to a new product offering that incorporates aspects of sustainability while simultaneously providing significant customer and business benefits.

FACTORS DRIVING THE MACH FILTER

Fleetguard initially produced filters that were designed specifically for Cummins engines. Over time, Fleetguard's business expanded, and eventually Fleetguard was also developing filters that could be used with engines from other original equipment manufacturers (OEMs). This expansion of the business provided new opportunities for Fleetguard sales in both the "first fit"¹¹⁴ and "aftermarket" categories. Eventually, Fleetguard's aftermarket sales surpassed first fit sales. Strong aftermarket sales continue to be critical to Fleetguard's ongoing business success.

By 2003, the design and functionality of products across filter manufacturers had become increasingly similar. Filters had become a commodity product, and Fleetguard (as a relatively high-cost U.S. producer) was losing its competitive position in the global marketplace. According to Fleetguard's own assessments, key global competitors had a several-year lead on Fleetguard with respect to low-cost filter production processes, and new rivals from the Asia-Pacific region were moving in with extremely low-cost, high-quality products.¹¹⁵ The company began aggressively searching for ways to reduce costs, improve profitability, and ensure the long-term survival of the business. One way to do this was by designing and developing a unique *new* filter product that would make use of low-cost sourcing and manufacturing techniques.

¹¹² Fleetguard Inc. History, Fleetguard Inc. website, 3 January 2006, <http://www.fleetguard.com/fleet/en/about_fleetguard/en_history.jsp>.

¹¹³ Pamela Carter, President, Fleetguard Inc., personal interview, 16 November 2005.

¹¹⁴ When Fleetguard produces a filter that is used as part of the original equipment package for Cummins or an OEM, this is known as "first fit" business.

¹¹⁵ Fleetguard Inc., "Mach 1 Contract," Fleetguard Internal Document, dated 10 September 2003.

At the same time, Fleetguard saw the need for a product that would provide more customer benefits than the current filters on the market. The company recognized that certain inconvenient product features that customers had just “learned to live with” presented opportunities for improving design and functionality that could differentiate Fleetguard filters from other products in the marketplace. For example, serviceability (features that would make the filters easier to install and remove) and product aesthetics were characteristics desired by customers that could be incorporated into the development of a new filter product.

Disposal Concerns. Another customer convenience feature that the Fleetguard wanted to address in a new product was the ease of disposal at the end of a filter’s useful life. This feature had significant environmental implications. Around the world, used traditional filters are landfilled. The steel external filter housing prevented filters from being disposed of via other methods, such as incineration, waste-to-energy, and recycling.¹¹⁶

In Europe, an important market for Fleetguard, landfill space is especially scarce. For example, due to more stringent European Union regulations and increasing landfill taxes, the number of operational hazardous waste landfills in England and Wales fell from 250 to less than 10 in 2005.¹¹⁷ Accordingly, the cost of landfill disposal has increased throughout Europe; for example, in France average landfill disposal costs have risen from 40 Euros/tonne (approx. 50 US\$/ton) to 90 Euros/tonne (approx. 110 US\$/ton) since 2002.¹¹⁸ To minimize the total volume of waste going to European landfills (and thereby minimize costs), incineration is frequently used to reduce waste volume prior to final landfill disposal. Yet because the used traditional steel filters cannot be incinerated, they have to be sent directly to a landfill with only a minimum of volume-reducing activity (crushing prior to disposal). As a result, landfill disposal of used steel filters is very expensive for European customers, particularly for the numerous fleet customers who service hundreds of trucks each year. The desire to provide better end-of-life disposal options for all Fleetguard filter customers, and particularly for European customers, was a driving force behind development of a new Fleetguard product.

Summary. The drivers behind the development of the new filter at Fleetguard were:

- An urgent need for cost reductions (including finding an alternative for the increasingly expensive steel filter housing) and profitability improvements.
- A desire to differentiate the product in a commodity-type market by offering more customer benefits.

¹¹⁶ The inability to utilize incineration and waste-to-energy techniques was due to both the prohibitively high temperatures required to burn metal and the concerns about harmful emissions resulting from metal combustion. Recycling of the steel filter housing was also problematic because the housings were typically contaminated with oils and coolant, and it was difficult for customers as well as recycling centers to open the filter and separate the useful steel from the dirty filter media and associated parts inside.

¹¹⁷ The Business of Sustainable Waste Management, The EIC Guide Online, 31 March 2006, <<http://www.eic-guide.co.uk/default.asp?navid=2671&pid=2671&clid=2677&edname=15337.htm&ped=15337>>.

¹¹⁸ Phillipe Robert, “Status and Trends of Waste Treatment Options in France,” Proceedings of the Future of Residual Waste Management in Europe conference, Luxembourg, 17 December 2005.

- A specific goal of offering additional end-of-life product disposal options for all customers – particularly those customers in parts of the world where the usual landfill disposal was becoming prohibitively expensive.

These key drivers emerged as the design objectives that would provide the foundation for the product development process.

The integrated way that Fleetguard was already starting to view the initiative – with a broad objective of optimizing the entire process from the materials of construction in product design, to efficiency and cost reduction in manufacturing, to ease of use in customer application, to the end-of-life disposal options – embodied the essence of sustainability. Whether intentional or not, this integrated approach would enable Fleetguard to create an innovative new product that met or exceeded business objectives and offered additional benefits that may have otherwise been missed.

DEVELOPMENT OF THE MACH FILTER

As previously discussed, Fleetguard decided to address end-of-life filter disposal options with a new product because of growing concerns about landfill space in Europe. Therefore, a heightened awareness of environmental issues in Europe drove Fleetguard to include environmental criteria in the program charter for this global product. This recognition of environmental concerns in other parts of the world caused the development of the new product, called the “Mach 1” filter (hereafter referred to as Mach), to be different from the majority of other products at Cummins. Other unique aspects of the design and development process include the initial concept and prototype design steps, the extent that Cummins’ product development tools were used during the design process, the way that the voice of the customer was incorporated into design, and the continuing high-level support and dedicated human resources for the initiative. Together these factors facilitated the incorporation of sustainability-related concerns throughout the design and development process.

INITIAL PROTOTYPE DEVELOPMENT

One way to overcome the disposal difficulties associated with the traditional metal filters was to make the filter housing out of a different material that could be incinerated. One potential alternative to the traditional steel housing material was plastic. In fact, according to Fleetguard’s own research, its European competitors were already pursuing products made with plastic components.¹¹⁹ Plastic was one of the few materials that could be both incinerated and formulated to meet the stringent performance requirements required in a diesel engine (including tolerance of temperature extremes, corrosion resistance, and high strength). Additionally, plastic was lighter than steel and not as subject to the price fluctuations that Fleetguard was beginning to observe in the steel industry.

¹¹⁹ Fleetguard Inc., “Mach 1 Contract,” [Fleetguard Internal Document](#), dated 10 September 2003.

In spite of the potential benefits, using plastic for the external filter housing was an idea that was initially hard to accept for three reasons. First, plastic had never been used for this particular application. Second, because the filter is such a critical piece of equipment in a heavy-duty diesel engine, employees thought that a plastic housing could not be made strong enough to meet the rigorous demands of the proposed application. Third, there were concerns that a plastic filter would be perceived as cheap or poor quality by customers when compared to the steel alternative. Because of these concerns, a plastic filter housing seemed too risky to pursue seriously. According to a key individual involved with the project, when the concept of a filter with a plastic housing was first proposed, “there were lots of people within the organization who said it couldn’t be done.”¹²⁰

Despite resistance, the Vice President of Sales and Marketing at Fleetguard was absolutely convinced that plastic was a viable alternative to steel. To ensure that the idea received a fair shot, she went outside the company and hired a contract engineering design firm for assistance with initial sketches and prototype design. This was an unprecedented move, but, as the Lead Engineer for the Mach filter project later explained, “at the point we [Fleetguard] were at, it was essential to get someone fresh who was completely outside the business to look into this idea.”¹²¹ Although Fleetguard was still heavily involved with the design development effort for the new product, the contract engineering firm brought an unbiased view to the discussions which allowed no idea to go unevaluated. This “fresh eyes” approach helped Fleetguard to be more open to new concepts, even the ones that may have previously been hastily discarded based on past experience. The contract engineering firm was also very skilled in conceptual design artwork. This helped the Fleetguard team, because ideas or thoughts could be quickly turned into sketches, facilitating even further discussion and idea generation among the team. The unbiased, outside perspective from the contract engineering firm was exactly the spark that Fleetguard needed. Upon seeing the sketches and discussing the concept in more detail, the plastic filter idea started to take hold among the Fleetguard engineering and design community.

The fact that Fleetguard needed to bring in an outside firm to progress with the plastic filter concept indicates that the company was having trouble breaking free of old paradigms and established ways of doing business. Once this barrier was overcome, a flood of creativity ensued from Fleetguard’s own employees, making the tremendous advances seen in the Mach filter program possible. In some respects, the cultural shift required to integrate sustainable business practices within a company can be likened to the plastic filter concept at Fleetguard: often there is a great deal of internal resistance to new, seemingly radical ideas, yet once the first step is taken to evaluate the potential afforded by a new approach, an atmosphere of innovation (with all of its associated business benefits) follows to capitalize on the new idea and bring about positive changes that were previously deemed impossible.

¹²⁰ Pamela Carter, President, Fleetguard Inc., personal interview, 16 November 2005.

¹²¹ Patrick Barge, Executive Director Global Engineering, and Gregory Hoverson, Manager Advanced Product Development, Fleetguard Inc., personal interview, 27 January 2006.

APPLICATION OF PRODUCT DEVELOPMENT TOOLS

Cummins and its subsidiaries are data-driven, performance-oriented companies. Information and facts are critical to making good decisions in every aspect of the business, including product design and development. Accordingly, the company employs specific data-driven processes and tools that provide the necessary information for product development decisions. These tools were central to the development of the Mach filter and played a key role in the incorporation of sustainability criteria. Although the tools are used extensively at Cummins, these two tools were not always applied rigorously at Fleetguard. That changed with the Mach program. Fleetguard recognized the benefits of closely following the systematic, group-oriented, integrated product development approach, which encouraged input from “multi-functional teams” of employees from key areas of expertise needed to deliver the product.¹²² The multi-functional teams brought new ideas and experience with different manufacturing technologies from around the world, enabling the group to meet the environmental and other objectives in the program charter.

Similarly, the premise of turning voice-of-the-customer feedback into concrete product requirements through another product development tool was appealing to designers and engineers, who often had difficulty prioritizing hundreds of customer inputs to develop a viable, robust set of product features. This tool forced the Mach team to think about which components of the product specifically added value, an exercise that eventually helped reduce complexity and the overall number of parts used, increasing efficiency in manufacturing. The simultaneous reduction in complexity and improvement in efficiency not only generated cost savings, but also directly complemented the environmental principle of reducing waste. These accomplishments were made possible in part by rigorous application of product development tools throughout the Mach design and development process.

VOICE OF THE CUSTOMER AND BRAINSTORMING

Overall, soliciting product input and generating ideas for the Mach filter included a far more extensive voice-of-the-customer process than either the Mach Lead Engineer or Executive Director of Global Engineering had ever witnessed at Fleetguard.¹²³ Prior to the Mach program, brainstorming, according to the Lead Engineer for the program, usually involved “several engineers, a sales representative, and maybe a handful of other internal people.”¹²⁴ With the Mach program, Fleetguard went far and wide to talk to employees and customers around the world about product ideas, preferences, and concerns. Employee contributors represented global engineering, manufacturing, sales, marketing, supply chain, and finance functions from within the company.

¹²² Cummins, Inc., “Value Package Introduction Roles & Responsibilities, Section 3: The Multi-Functional Team,” Cummins Internal Document, January 2006.

¹²³ Patrick Barge, Executive Director Global Engineering, and Gregory Hoverson, Manager Advanced Product Development, Fleetguard Inc., personal interview, 27 January 2006.

¹²⁴ *Ibid.*

Although the process may have taken more effort and resources to coordinate than a typical, more limited voice-of-the-customer process, it was not without significant benefits. First of all, by casting such a wide net during the brainstorming and customer-input processes, the Mach team was able to better understand customer concerns driving product preferences all over the world (versus just in North American markets), and, as a result, incorporate many of the primary global concerns (such as filter disposal) into the new product. Second, through talking with people from the Fleetguard manufacturing plants outside of the U.S., the Mach team recognized the opportunity to apply low-cost manufacturing methods that were successful in other parts of the world but had not yet become common in Fleetguard's U.S. plants. Finally, working with Fleetguard engineers from around the world exposed the Mach team to product innovations and design trends that again were commonplace in other parts of the world but not as prevalent in the United States. All of these benefits came out of the extensive brainstorming process and had a profoundly positive impact on the ability of the final product to meet the sustainability-related goals of the initial charter.

HIGH-LEVEL SUPPORT AND DEDICATED RESOURCES

A significant aspect of the Mach development process was the high-level management support that the program received from its inception. The Mach program was on the agenda of the president's meeting every month, and therefore the Lead Engineer had to report progress directly to the president of Fleetguard on a regular basis. The management team recognized significant revenue potential in the Mach program and thus wanted to keep close tabs on the status of the initiative. Additionally, the Vice President of Sales and Marketing at Fleetguard emerged as an early champion of this budding new product initiative. She clearly saw the need for a product that would help revitalize the Fleetguard business unit. By virtue of living and working for Cummins in Europe, she was also familiar with the concept of sustainability, the related integrated approach to social, environmental, and economic issues, and its relevance to business and manufacturing.¹²⁵

The high-level management support often put the Mach program team in the spotlight, but it conferred the benefit of guaranteeing dedicated human resources to support the initiative. Several Fleetguard employees were devoted full-time to the Mach program. This was unique; typically employees split their time between two or more product programs, with other job responsibilities as well. The dedicated resources enabled the team to function seamlessly and transition between different phases of the program without losing the institutional knowledge that came out of prior project stages and experiences. Because the team was dedicated to the Mach program, it also facilitated a more long-term approach to solving problems at the root cause, because team members knew that if an issue was not addressed properly it would come back to haunt them at subsequent stages of the program. This long-term approach was particularly compatible with incorporating the program's sustainability objectives, because effective integration of sustainability requires a long-term perspective.

¹²⁵ Pamela Carter, President, Fleetguard Inc., personal interview, 16 November 2005.

SUPPORTING A SUSTAINABILITY STRATEGY

Up to this point, we have focused on the story of the Mach filter: Fleetguard's history, factors driving the development of the Mach filter, and the processes used to achieve the charter objectives of the Mach program. By demonstrating how the Fleetguard team responded to customer demands and macro-environmental trends and incorporated solutions in the design of the Mach Filter, the case study has, thus far, provided a glimpse of some of the many benefits that can be gained by integrating sustainability concerns with product design considerations.

For example, having the specific criteria of "Green/Incinerable Design" in the Mach program charter prompted the Fleetguard team to consider different options for the filter housing material – including plastic. The use of plastic enabled the team to reduce the total number of filter components and the overall filter weight. Using plastic for the filter housing also facilitated several other design improvements that were not feasible with a steel housing filter, such as the stand-alone "no-tip" feature and the ribbed "grips" for ease of installation. These features positively differentiate Fleetguard Mach filters from other filters on the market. Finally, the use of plastic instead of steel allowed the team to develop a new, patented filter attachment mechanism that will be unique to the next generation of Mach filters, differentiating this product from others on the market. The sustainability-related criteria in the Mach charter helped the Fleetguard team develop an innovative new product that offers unique customer benefits.

In the following sections, we present analyses to confirm and quantify the environmental and financial benefits of following a sustainability-based approach. Specifically, we show that the Mach filter supports a sustainable business strategy in two ways:

- ***Improved environmental product performance.*** A life-cycle analysis provides data to confirm that the plastic Mach filter has lower environmental impacts than its steel filter predecessor.
- ***Improved financial performance.*** A financial analysis examines the cost savings and projected profits resulting from the Mach program. The analysis also demonstrates how specific sustainability business drivers such as operational efficiency, risk management, customer needs, and human capital influence revenue growth and savings for the Mach program.

LIFE-CYCLE ANALYSIS

The Mach plastic filter is being billed as a more environmentally friendly product than its metal predecessor, primarily due to the increased number of disposal options (including incineration with heat recovery) for the exterior plastic filter housing. The Mach filter also has a smaller number of internal components and a lower total weight when compared to its metal counterpart, leading one to believe that a plastic Mach filter might consume fewer

resources over its lifetime than a metal filter product. Although it sounds reasonable that the Mach filter would have a reduced environmental impact when compared to its predecessor, until now this assumption had not been confirmed with any data. Therefore, a life-cycle analysis was necessary to investigate the Mach's environmental impacts and ultimately support this report and its recommendations. The life-cycle analysis provided a more scientific, data-driven determination of the environmental performance of the Mach plastic filter versus a comparable metal filter. In order to provide the high quality of information required in a short timeframe, an expert in product life cycle modeling was retained to perform the Mach analysis.¹²⁶

LIFE-CYCLE ANALYSIS BACKGROUND

Product life-cycle analysis examines the total sum environmental impact a product has on the environment from the beginning to the end of its useful life (from “cradle to grave”).¹²⁷ The results of a life-cycle analysis typically include information on a product's total lifetime energy use and greenhouse gas emissions. These two impact categories are highlighted in life cycle analyses because of their global environmental significance.

This study compares the total *energy resources consumed* (ERC) and the associated *global warming potential* (GWP) over the life cycle of the two filter products. ERC is a measure of the product's overall consumption of primary energy resources.¹²⁸ ERC is expressed in terms of *megajoules, lower heating value*¹²⁹, or “MJ (LHV)”. Higher values of ERC mean more energy was consumed in the production, use, or disposal of the product. GWP is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. GWP is measured on a relative scale which compares the greenhouse gas emissions of a product over its lifetime to the emissions of the same mass of carbon dioxide (CO₂).¹³⁰ GWP is expressed in terms of *kilograms of CO₂ equivalents*, or “kg CO₂ eqv.” Higher values of GWP mean a product contributes more greenhouse gases to the atmosphere during its production, use, or disposal.

The data inputs for a detailed product life-cycle analysis are likely to include precise information pertaining to the product's raw materials, chemical composition, specific manufacturing processes, transportation, packaging, consumer use patterns, and eventual disposal. Yet with some basic product knowledge and proven software tools, a simplified

¹²⁶ The life-cycle analysis of the Mach filter versus a metal filter was performed by Bernhard A. Dietz (March, 2006). Mr. Dietz is an alumnus of the University of Michigan School of Natural Resources & Environment and an independent environmental consultant specializing in environmental life-cycle analysis and related software modeling tools.

¹²⁷ Definition: Life Cycle Analysis, AVEL Sustainability Knowledge Network, 21 March 2006, <<http://avel.library.uq.edu.au/green/lca.html>>.

¹²⁸ Dietz, Bernhard A., Life-Cycle Assessment of Filter Products, (Ann Arbor MI, 2006), 21.

¹²⁹ Lower heating value, or LHV, is the value of the heat of combustion of a fuel as measured by allowing all products of combustion to remain in the gaseous state. This method of measure does not take into account the heat energy put into the vaporization of water (heat of vaporization). (Definition courtesy of U.S. Department of Energy, 21 March 2006, <http://www.eere.energy.gov/hydrogenandfuelcells/glossary.html#heating_value>.)

¹³⁰ The GWP of CO₂ is, by definition, 1.

life-cycle analysis can be performed, generating valuable insights about the environmental impacts during the different phases of a product's useful life. Due to data availability and time constraints, a simplified life-cycle analysis was performed for the Mach filter and its steel housing counterpart.

The life-cycle analysis of the Mach filter and its steel counterpart was based on the general framework for life-cycle analysis provided by the ISO 14001 standard (specifically, ISO 14040). Modeling was performed using the SimaPro® life-cycle analysis software tool. Information on materials, product weights, general manufacturing processes, and product use for the Mach filter and its steel predecessor was provided by Fleetguard.

FILTER LIFE-CYCLE PHASES

The specific life-cycle phases of a product that are examined in a life-cycle analysis include raw material provision, manufacturing, use, and disposal (or “end-of-life”). A brief definition of these life-cycle phases in the context of the analysis of the Mach filter and its steel counterpart is provided below.

Material Provision. The filter housing materials (“fiber-reinforced nylon 6/6” for the Mach filter and “hot-rolled steel” for its predecessor) were the primary components considered in the analysis because these were the most significant in terms of overall product mass, and they also represented the greatest difference between the two filters. Adhesive used in the steel filter was also deemed to be significant in terms of the overall product mass, and was therefore included in the analysis. (The Mach filter does not use adhesives.) To simplify the analysis, other internal filter components were not considered. This assumption is reasonable because the internal structure is a much smaller percentage of the total product mass than the filter housing, and (for the purposes of this study) the internal structure is essentially the same for both the Mach and its predecessor.

Manufacturing. Processes directly related to the fabrication of materials were included in the model. These processes included plastic injection molding for the Mach filter, and cold-transforming of steel for the metal filter. Other manufacturing activities were modeled based on generic data available from publicly accessible life-cycle analysis data sets.

Product Use. The product use phase considers the impacts of the Mach filter and its metal predecessor when the products are in service on a truck. Energy is consumed and greenhouse gases are emitted as the truck moves its weight. The filters account for a fraction of the truck's weight moved over a certain distance, and therefore a fraction of the energy consumed and greenhouse gases emitted can be attributed to each filter product. In this analysis, the useful life of the Mach filter and its metal predecessor was 20,000 trucking-miles, according to information provided by Fleetguard. The usage phase does not take into consideration impacts related to technical product performance, as these issues lie beyond the scope of this study.

End-of-Life (EOL). End-of-life (EOL), or product disposal, is modeled in two ways – incineration with energy recovery for the Mach filter and landfilling for the steel filter. This

reflects Fleetguard’s belief that one of the most significant environmental benefits of the Mach filter is its ability to be incinerated with energy recovery at the end of its useful life, whereas the steel filter is likely to be landfilled at the end of its useful life.

LIFE-CYCLE ANALYSIS RESULTS

Overall Results. The main focus of the life-cycle analysis was to demonstrate the difference between the Mach filter and its metal predecessor with respect to energy resource consumption (ERC) and global warming potential (GWP) on a per filter basis. The ERC and GWP results for each life-cycle phase along with the total environmental impact for the two filter products are presented below.

Figure 1. Life Cycle Environmental Impacts for the Mach Filter and a Comparable Steel Filter, in terms of Energy Resource Consumption (ERC) and Global Warming Potential (GWP)¹³¹

Life-cycle Phase	ERC, MJ (LHV)		GWP, kg CO₂ eqv.	
	Mach filter	Steel filter	Mach filter	Steel filter
Material Provision	20.71	11.42	1.06	1.09
Manufacturing	2.49	0.78	0.15	0.05
Use	6.37	16.20	0.46	1.18
End of Life	-3.28	0.00	0.18	0.00
Total Impact	26.30	28.40	1.85	2.33

The results of this analysis confirm that, in terms of total energy resource consumption (ERC) and total global warming potential (GWP), the environmental impact of a Mach filter is less than the environmental impact of a comparable steel housing filter. In other words, when considering the product’s entire life cycle, the Mach filter exhibits superior environmental performance when compared to a steel housing filter.

Results by Life-Cycle Phase. To gain more insight into the environmental impacts of both the Mach filter and its steel predecessor, it is useful to examine the performance of the two filter products during the different life-cycle phases.

Material Provision and Manufacturing Impacts. For example, the amount of energy required (ERC) during the *material provision* and *manufacturing* phases is significantly higher for a Mach filter than for a steel filter. Prior to this study, it was assumed that the energy required to obtain the raw materials and process the metal via cold-rolling for a steel filter would be higher than the energy required to obtain the raw materials and process the plastic via injection molding for a Mach filter. However, the study results indicate that the Mach’s

¹³¹ Dietz 3.

plastic production and manufacturing processes are in fact more energy-intensive than the related steel processing steps.

Product Use Impacts. Another life-cycle phase in which the environmental impacts were significantly different between the Mach filter and its steel predecessor was the *use* phase. In this case, the Mach filter environmental impact was less than 40% of the comparable steel filter impacts for both ERC and GWP. Because the use phase impact was based upon the energy required and emissions generated by moving the filter around on a truck, and the weight of the Mach filter housing is less than half the weight of a comparable steel filter housing (approximately 0.5 kg and 1.0 kg, respectively), it follows that the use of a lighter-weight filter like the Mach would be more efficient (and hence less resource-intensive). Although the benefits of using a lighter-weight filter might have been anticipated, the magnitude of the difference between the Mach filter and its steel predecessor were unknown prior to this study. The life cycle results highlight the environmental gains that can be recognized by reducing overall product weight, particularly for products used in the transportation and trucking industry like those manufactured by Fleetguard and Cummins.

End-of-Life Impacts. It is also worthwhile to note the differences between *end-of-life* phase impacts for the Mach filter and its steel predecessor. The life-cycle analysis assumed that at the end of its useful life, the Mach filter would be disposed of in a “waste-to-energy” incineration facility, while the steel filter would be disposed of in a landfill. This is because the opportunity to dispose of the plastic Mach filter by incineration with energy recovery was thought to be an important environmental benefit of the Mach over its steel predecessor. Indeed, the life-cycle analysis showed that energy was actually recovered (instead of consumed) during disposal of the Mach filter, and accordingly the energy resource consumption for Mach during this phase is negative. This is in contrast to landfill disposal of the steel filter, which neither consumes nor recovers a significant amount of energy. Therefore, in terms of ERC, incineration with energy recovery of a Mach filter is superior to landfill of a steel filter.

Although the Mach filter performs better than the steel filter with respect to ERC in its end of life phase, incineration – even with accompanying energy recovery – generates air emissions, some of which are greenhouse gases. Landfilling the steel filter does not result in any significant emissions of greenhouse gases. Therefore, during the end of life phase, the Mach filter fares slightly worse than the steel filter in terms of GWP.

With respect to the end-of-life phase, there are other environmental impacts of both incineration (such as dioxin emissions) and landfill disposal (such as space constraints and risks of contamination to land and water) that were not included within the scope of this analysis, primarily because of time and modeling constraints. However, these other impacts are important and should be considered if a detailed life-cycle analysis of the two products were to be performed.

LIFE-CYCLE ANALYSIS SUMMARY AND KEY LEARNINGS

Conducting a life-cycle analysis to compare the impacts of the Mach filter to a comparable steel housing filter confirmed that the Mach is in fact a more environmentally friendly product than its predecessor. However, the relative magnitude of impacts during the different life-cycle phases of the two products was not the same as what would have been anticipated before the study was completed. For example, the analysis revealed that the total amount of energy required to produce the plastic material and form one Mach filter housing (during the material provision and manufacturing phases) is greater than the energy required to produce and form one steel filter housing. Yet the marked reduction in product weight of the Mach filter (made possible by the plastic housing material) significantly lessens the Mach's environmental impact during the product use phase as compared to its steel predecessor.

The analysis results show that the reduced environmental impact during the product use phase was the major reason that the Mach filter performed better than the steel filter over the total life cycle of the two products. The end of life phase, while important, did not impact the environmental performance of the two filters as much as the other phases (material provision, manufacturing, and use) in the life-cycle analysis. This result particularly highlights the fact that *environmental impacts occur at all phases of a product's life*. The simple fact that a product like the Mach filter can be incinerated, thereby reducing the need for landfill space, doesn't necessarily mean that the product is more environmentally friendly overall. Impacts can be shifted from one life-cycle phase to another, thereby canceling out supposed environmental benefits. These impacts may not be identified in the absence of a life-cycle analysis.

This example also illustrates how a life-cycle approach can provide useful insight into the environmental impacts of product and process alternatives, helping to guide future designs towards more sustainable options. Performing even a simplified life-cycle analysis was valuable because it illustrated the environmental impacts of the Mach and steel filters on a more scientific basis than what was previously available. As a data-driven company that is concerned about the sustainability of its products, Cummins should incorporate life-cycle analysis into decision making processes. This will help the company make informed decisions and enable it to track its progress towards becoming a more sustainable business.

FINANCIAL ANALYSIS

While most employees within Cummins agree that sustainability is aligned with Cummins' history, vision, mission, and values, there is no consensus on the real financial implications of embracing a sustainability strategy. The Fleetguard Mach filter provides a real-life example of the economic value that can be realized by incorporating aspects of sustainability into product development and manufacturing.

DIRECT INVESTMENT AND COST SAVINGS

The Mach filter program was implemented in two project phases. Phase 1 included the necessary capital equipment, product tooling, and related expenses to produce one size of filters and their associated cartridges. Phase 2 of the Mach program enabled Fleetguard to produce the entire platform of filters and associated cartridges. Phase 2 was justified in part by taking a long-term approach and recognizing that a present-day investment was necessary to secure the future option to launch a new product and gain additional profitable aftermarket business. *(Numbers removed from this section for confidentiality.)*

The calculated net present value (NPV) of the project includes several cost savings identified by the Mach program team. For example, the new Mach filter is estimated to deliver a significant unit cost reduction over the unit standard cost of the existing legacy products.¹³² This unit cost reduction is comprised of savings in material costs, labor, variable overhead, and fixed overhead.

The largest contribution to Mach's unit cost reduction comes from material costs and labor costs. Eliminating the use of steel in filter housings and switching to plastic resulted in a significant material cost reduction per filter for existing part numbers being replaced by new Mach part numbers.¹³³ Other material-related savings resulted from a new cartridge design, reduction of plastic components in the centrifuge product line,¹³⁴ and reduction in freight costs (since metal filter products previously produced at the Fleetguard facility in Quimper, France, and shipped to the U.S. would be converted to plastic Mach 1 products and produced domestically).

The company took a conservative approach to estimating projected sales volumes and number of potential new customers for its NPV analysis; still, the anticipated savings from

¹³² Fleetguard Inc., "Mach Request for Appropriations (RFA) Phase 2 Final Submission," Internal Fleetguard Document, provided 27 January 2006.

¹³³ Derived from data in Fleetguard Inc., "Mach Request for Appropriations (RFA) Phase 2 Final Submission," Internal Fleetguard Document, provided 27 January 2006.

¹³⁴ The "centrifuge product line" is another separate product line that uses the same plastic material as the Mach filter. By moving to the Mach product and commonizing the type of plastic used, Fleetguard was able to realize a material cost reduction simply due to volume discount. The centrifuge is not part of the Mach family of products.

the Mach program versus its metal filter predecessor are significant, ranging between approximately three and five million dollars per year between 2006 and 2010.¹³⁵

The Mach 2 filter is a product derivative of the Mach product line with a patented attachment mechanism. Using plastic for the filter housing made this attachment mechanism possible. The Mach 2 is to be supplied by Fleetguard and used by original equipment manufacturers in new diesel engines. The unique attachment mechanism guarantees aftermarket business for Fleetguard as long as the engine is in use. This new product is projected to provide additional sales above and beyond the main savings objective of the metal filter product replacement and redesign. The projected profit from the Mach 2 program represents a significant new revenue stream for Fleetguard.

This discussion summarizes the economic benefits identified as part of a traditional financial analysis focusing on direct savings – for example, savings that are typically attributed to short-term, tangible aspects of the materials sourcing and manufacturing processes, as well as projected volume and demand of the new product. With the Mach program, the direct savings alone were significant enough to warrant going ahead with the program; separate financial criteria (such as allowing a longer payback or using a risk-adjusted discount rate) were not necessary to justify the required level of investment in capital equipment and product tooling.

One rationale for using financial analysis techniques focused exclusively on direct savings is that these techniques provide a standard, objective, and consistent way to compare a variety of different investment opportunities. However, while traditionally derived direct savings are vitally important to an assessment of the overall project, looking only at direct savings can result in a company neglecting high-potential, sustainability-related project investment opportunities that could prove to be infinitely more profitable than alternatives in the long term.

INDIRECT FINANCIAL BENEFITS

In addition to the numerous cost savings quantified in the formal Request for Appropriations (RFA) document, the Mach program generated additional quantifiable savings and benefits, some of which were not considered in the financial evaluation because they were deemed to be beyond the scope of a traditional financial analysis. These include sustainability-related benefits in operational efficiency, risk management, meeting customer needs, and human capital. Over the long term, these factors together create additional product value while meeting sustainability goals by decreasing costs and reducing resource use, waste, and pollution along the product value chain. *(Numbers removed from this section for confidentiality.)*

Operational Efficiency. Perhaps the largest cost savings impact of including the “Green/Incinerable Design” criteria contained in the Mach charter can be seen in the area of

¹³⁵ Fleetguard Inc., “Mach Request for Appropriations (RFA) Phase 2 Final Submission,” Internal Fleetguard Document, provided 27 January 2006.

operational efficiency. The development of the new filter drove innovation and best-practice sharing that reduced waste and energy consumption (in terms of unnecessary materials or process steps) throughout the Mach manufacturing process. In the case of the Mach program, increases in operational efficiency led to real cost savings in energy, complexity and plant overhead, and packing and transportation. These operational efficiency improvements are described below.

Energy Cost Savings. The energy required to operate manufacturing equipment is usually a significant portion of a plant's overhead costs. Replacing energy-intensive machines and processes with energy-efficient counterparts, or eliminating energy-intensive manufacturing steps altogether (through innovative process and product improvements) can lead to significant cost savings which are typically ignored in financial analyses. One example from the Mach program is the use of an "advance cure" media for the cellulose-based filter in the Mach product. In both the Mach and its predecessor, the filter media is impregnated with a resin, which, upon curing, provides the filter with the necessary stiffness. Previously, the filter media was cured in Fleetguard plants using cure ovens. According to the Mach Lead Engineer, the media cure ovens were known as "energy hogs" in the manufacturing process.¹³⁶ Now, the filter media is cured at the paper mills where they are produced. This makes sense because the paper mills are already set up to do the curing, freeing up valuable plant floor space and reducing overall energy consumption and manufacturing emissions for Fleetguard through elimination of the media cure ovens. From a material cost standpoint, the filter media cost is the same whether it comes from the paper mill cured or uncured.

Another benefit of the advanced cure filter media is that it allows Fleetguard to bond the first and last pleats of the filter media together with an ultrasonic welding process, whereas with the traditional process (curing in-house), Fleetguard needed to use an adhesive (or adhesive and clip combination) to bond the first and last pleats together. The traditional media could not be ultrasonically bonded because the pleat bonding step had to be accomplished before the resin curing step, but the heat created from the ultrasonic bonding process also cured the filter media resin. This caused the filter media to stick to the weld horns. Benefits of ultrasonic welding over traditional welding processes include energy efficiency, high productivity with low costs, and ease of automation.¹³⁷ Therefore, using the advance-cure media also enabled Fleetguard to eliminate this adhesive filler and the costs, energy use, and process steps associated with it.

While the magnitude of energy-related costs and benefits was not calculated for the Mach program, the elimination of process steps like the media cure oven points to further measurable cost savings that would make the project look even more favorable if manufacturing energy costs had been included in original financial analysis.

Reducing Complexity and Plant Overhead Costs. Another significant sustainability-related benefit in operational efficiency is the overall reduction in components, which results in

¹³⁶ Patrick Barge, Executive Director Global Engineering, and Gregory Hoverson, Manager Advanced Product Development, Fleetguard Inc., personal interview, 27 January 2006.

¹³⁷ Ultrasonic Welding Technique, The Welding Institute (TWI) World Centre for Materials Joining Technology, 25 March 2006, <http://www.twi.co.uk/j32k/protected/band_3/pjkultrason.html>.

fewer raw material inputs for the manufacturing process. The Mach filter has fewer components than its predecessor, and, unlike its predecessor, it does not use adhesive or paint during the manufacturing process.¹³⁸ Using fewer components not only reduces raw material inputs, but also leads to fewer assembly steps, thereby minimizing energy and labor inputs and freeing up plant floor space for other beneficial uses. These cost savings were incorporated as part of the original RFA and are summarized in the previous section (“Direct Investment and Cost Savings”).

Reducing Packaging Costs. Creating a plastic filter housing led to a reduction in overall product packaging. In this case, environmental impacts were reduced and coupled with efficiency- and material-related cost savings. Filters with steel housings require additional cardboard packaging to prevent denting during shipping and distribution steps. Plastic is not as susceptible to dents as steel, and therefore the Mach filters can be packed closely in a box without any extra packing material. This eliminates both the packing step and the need for additional packing material, resulting in a more efficient process, fewer material inputs, and an estimated “print and packaging” cost reduction over the previous product.

Risk Management. Sustainability-related projects frequently provide financial benefits through risk reduction, which ultimately impact insurance rates and ease of obtaining capital. By incorporating sustainability criteria in the product design process, the Mach filter mitigates some of Fleetguard’s competitive, environmental, and operational safety risks.

Reducing Competitive Risk. First, with Mach, Fleetguard is in a better strategic position to compete more on product innovation and less on low-cost production, thereby removing the competitive risk of remaining within a commodity market.

Avoiding Liability Costs. Second, risks related to environmental liability and unexpected compliance costs are reduced through the incorporation of sustainability-related criteria. With several potential disposal options for this filter, it is more likely that the product will be disposed of properly and in accordance with local laws and regulations. This reduces the likelihood of product liability issues for Fleetguard in the future. Without the use of paint, adhesives, or the media cure oven to support the Mach program, Fleetguard avoids significant costs associated with continuing environmental compliance, as there is no need for monitoring, permitting, or aftertreatment to meet increasingly stringent EPA standards for emissions from the painting or curing processes. These are real costs and fees: emission aftertreatment devices are significant capital equipment expenditures requiring regular maintenance and large energy inputs. (One study reported that annual operating costs for a thermal oxidizer with the capacity to treat emissions from a small 5,000 CFM airflow adhesive cure oven were between \$4,500 and \$50,000 – depending on the efficiency of the unit and the price of natural gas.¹³⁹) Furthermore, EPA permitting involves periodic fees payable to the permitting authority, and annual or semi-annual monitoring performed by a

¹³⁸ Fleetguard Inc., “The User-Friendly Filter from Fleetguard,” Internal Fleetguard Document, provided 12 December 2005.

¹³⁹ Steven Rach, “Reduce Energy Costs,” Process Heating 1 November 2005, 17 February 2006, <http://www.process-heating.com/CDA/Articles/Feature_Article/6a7028d875e48010VgnVCM100000f932a8c0>.

third party organization can cost anywhere from \$5,000 to \$25,000 per year, depending on the magnitude and scope of the testing required.¹⁴⁰ A traditional analysis would fail to consider the financial benefits of eliminating these costs.

Avoiding Safety Hazards. Third, the Mach filter leads to a reduction in operational safety risks. Using no adhesives or paints means that fewer chemicals are used in the manufacturing of the Mach; the reduced volume of chemicals entering the manufacturing facility in turn lowers the risk of potentially harmful spills, human exposure, and insurance costs.

Meeting Customer Needs. The Mach filter is an example of Fleetguard's decision to provide a product that incorporated sustainability concerns in response to customer demands. In Fleetguard's case, customers wanted filters that had more end-of-life disposal options. By including "Green/Incinerable Design" as a target in the program charter, and deciding to make the filter housing out of plastic instead of steel, Fleetguard was able to respond to this specific customer need. However, the Mach's enhanced customer benefits do not end with a wider range of end-of-life disposal options. With the sustainability-inspired plastic filter housing material, the Fleetguard team was able to integrate other beneficial product features, such as the ability to stand upright without spilling, textured ribs at the bottom to improve the installer's ability to grip and twist the filter into place, and a dent-free, corrosion-proof, aesthetically pleasing exterior. Incorporating sustainability-related design criteria enabled the Fleetguard team to meet customer needs in several ways beyond the original "Green/Incinerable Design" intent, leading to the creation of an innovative and unique new product.

Flexibility. In order to create a product that met the sustainability-related charter requirements, the Fleetguard team summoned manufacturing experts from around the world for input. While facilitating processes with maximum efficiency, this strategy also provides Fleetguard with the flexibility to produce future product derivatives, such as the Mach 2 filter, from the same line with minimal to zero equipment or process changes.¹⁴¹ Flexibility is inherently valuable to the company, because it allows Fleetguard to closely tailor its product mix according to sales volumes, resulting in less waste and enhanced ability to meet customer demands. Ultimately this leads to production that is highly efficient and highly responsive to customer needs, thereby increasing profitability.

Product Differentiation. In the case of the Mach filter, using sustainability-related criteria for the design enabled the Fleetguard team to develop a product that is differentiated from others on the market not just in terms of disposal options but in many other aspects as well. The rapid time-to-market, patented attachment mechanism, and customer convenience features (no-tip, ribbed grips) are examples of how the Mach filter sets itself apart from the competition. Product differentiation gives Fleetguard the ability to charge a price that reflects the unique functionality and value that Mach provides over other commodity-type filters. Similarly, the patents and intellectual property surrounding the Mach product also

¹⁴⁰ Based on project team member's own work experience with industrial stack emission testing.

¹⁴¹ Fleetguard Inc., "Mach Request for Appropriations (RFA) Phase 2 Final Submission," Internal Fleetguard Document, provided 27 January 2006.

ensure that competitors cannot copy its proprietary aspects, giving Fleetguard a more secure place in the market and pricing flexibility for at least the duration of the patent life. The sustainability-driven innovation that inspired the Mach filter removes Fleetguard from the realm of competing solely on cost, another intangible benefit not necessarily captured in a typical project financial analysis.

Human Capital. In the words of the Vice President of Sales and Marketing who championed the Mach filter concept, “This product has really given some of our engineers, who might otherwise be ‘buried’ in a lab somewhere, the chance to shine.”¹⁴² Conversation with Fleetguard employees clearly demonstrates that working on an exciting, sustainability-related product like the Mach filter energized people and provided opportunities to develop a sense of project ownership and involvement while “doing the right thing” for the environment. The sustainability challenge of a “Green/Incinerable Design” necessitated a collaborative approach, bringing Fleetguard employees from various functional areas together. This will likely have the effect of improving inter-departmental communication and efficiency for future projects.

Mach team members are proud of both the Mach’s “Green/Incinerable Design” and the fact that its plastic filter housing makes it more likely to be recycled as more recycling facilities become available. “This (Mach) filter could go to a waste-to-energy disposal facility,” remarked one of the Fleetguard program leaders. “That it could help create energy, even at the end of its life as a filter, is a neat aspect of the product.”¹⁴³ The Mach filter is an example of the way that considering environmental impacts provides a source of pride and causes employees to feel that they are doing the right thing. When present throughout the company, this positive morale and sense of purpose enable companies such as Fleetguard to attract and retain the best employees, reducing administrative and training costs, and, more importantly, reducing the loss of institutional knowledge and efficiency that occurs with rapid employee turnover.

FINANCIAL ANALYSIS SUMMARY

Based on the information outlined above, Fleetguard’s Mach filter provided cost savings through operational efficiencies while laying the groundwork for revenue growth in customer needs and human capital. These last two aspects are important because Cummins’ future financial performance is not simply a matter of reducing costs and increasing efficiencies, but also involves adding value and maximizing speed, flexibility, innovation, and responsiveness. Original, quality products that are environmentally sensitive, such as the Mach filter, can help to position Fleetguard and ultimately Cummins as leaders not only in sustainable business practices but also in their respective competitive marketplaces.

¹⁴² Pamela Carter, President, Fleetguard Inc., personal interview, 16 November 2005.

¹⁴³ Patrick Barge, Executive Director Global Engineering, and Gregory Hoverson, Manager Advanced Product Development, Fleetguard Inc., personal interview, 27 January 2006.

This analysis also demonstrates the importance of recognizing the value of indirect benefits. Projects that take a proactive approach to social and environmental issues often have significant indirect benefits that are missed in traditional financial analyses. Specific items such as energy cost savings, risk management, and flexibility are often alluded to but seldom actually captured in a project financial analysis. These benefits are not typically quantified because in many cases, projecting indirect benefits is regarded as inexact and subjective; therefore, the subject is avoided altogether in project financial analyses. Avoiding indirect benefits is certainly more straightforward than incorporating them in a financial analysis, but as demonstrated by the Mach program, these benefits become increasingly important as factors that play a role in determining a company's market value and future profitability. Recommendations for incorporating indirect benefits into financial analyses will be provided in *Section VII*.

SUMMARY

When executed well, sustainability provides opportunities to improve business. The Mach filter example illustrates this point by showing that *addressing environmental issues* and *business success* can go hand-in-hand. Many benefits, environmental and otherwise, resulted from an early and continued consideration of sustainability-related factors during the development and manufacturing of the Mach filter. These benefits can be replicated in product development activities throughout the company by following the example of the Mach program, and incorporating some of the other recommendations generated by the preceding life-cycle and financial analyses of the Mach program. For example, Cummins could benefit by:

- Including sustainability criteria in the program charter and staying focused on charter objectives throughout.
- Encouraging innovative thinking in-house, especially in terms of product design and development (ideally, eliminate the need for an outside engineering design firm during product development).
- Actively and deliberately seeking global input in brainstorming and voice of the customer activities to learn about global trends that might influence design and capture worldwide best practices.
- Providing dedicated human resources to support the program.
- Using a life-cycle approach to evaluate the environmental impacts of new products and guide the product development process towards more sustainable options.
- Looking at investment projects from a long-term perspective.
- Considering indirect financial benefits in financial analyses of projects.

In spite of the significant environmental progress in filter design exemplified by the Mach program, there is still room for improvement in the short and long term. Although the filter is billed as being “environmentally friendly” and performs better than its steel counterpart in terms of lower life-cycle energy consumption and global warming potential, a large proportion of the used product will still end up in landfills, particularly in North America. Working to establish recycling or take-back schemes could help to close the loop on this

product and get Mach closer to being truly sustainable. Plastic filter housings could be re-conditioned and used as raw material inputs for the production process, reducing material costs and environmental impact. Eventually, the petroleum-based nylon plastic housing could be replaced by a high-strength plant- or microorganism-derived polymer, further reducing the company's dependence on non-renewable resources and fossil fuels.

As a data-driven company, Cummins should use life-cycle analysis to critically evaluate the environmental impacts of new products, especially those like the Mach filter that will be billed as “environmentally friendly alternatives.” Increased use of life-cycle analysis tools will help to identify areas of environmental impact and specific opportunities for improvement (often with related cost savings) early in the design process. Additionally, elements of the previously introduced Four-Question Sustainability Framework could be applied throughout the product development and manufacturing design stages. This approach is described in further detail in *Section VII*. The Four-Question framework can guide the program team's thinking and decision-making, ensuring that the relevant sustainability issues are considered.

Finally, the Mach program was somewhat unusual in that it incorporated sustainability goals while still meeting the traditional criteria of Fleetguard's financial analysis methods. This will not always be the case with other sustainability-related projects. To assess the profit potential of sustainability-related projects more accurately, the company needs to determine how sustainability can be systematically incorporated into aspects of product design and development, material selection, and manufacturing processes, and then determine whether it makes economic sense to do so. Using only traditional financial analysis methods to make an economic determination with direct cost savings as the only basis will cause the company to continually overlook many of the benefits of sustainability-related projects, possibly resulting in the repeated rejection of such projects. This is because sustainability-related projects tend to have benefits that go beyond hard cost savings and accrue over the long-term, whereas traditional financial analysis methods are myopically biased towards short-term gains. Using a long-term benefits approach and incorporating alternative analytical methods or criteria (some of which will be discussed in *Section VII, Recommendations: Integrating Sustainability Throughout Cummins*) can demonstrate, in a quantitative way, the financial benefits of sustainability projects that are not identified by traditional analyses.

Although there is room for improvement, Fleetguard and Cummins have come a long way towards incorporating sustainability and recognizing some of the sustainability-inspired benefits of the Mach filter. Overall, the company should be commended for moving towards a proactive and integrated approach to sustainability with this product. Cummins would do well to use the Mach experience as a starting point for increasing the use of sustainability considerations in all future product offerings.

VI. RISKS OF A SUSTAINABILITY STRATEGY

The Fleetguard case study shows that significant value can be created when a business incorporates sustainability criteria to help drive improvements in its processes or innovation for future products. However, despite the strong benefits a sustainability strategy may bring, it is also important to recognize the risks of embarking on such a shift.

Uncertain Projections. When adopting any new strategy, businesses run the risk that initial market assessments and financial projections will not result in the expected returns. Business strategies are not developed in isolation, and they are highly dependent on macro-environmental trends, consumer preferences, and competitors' responses. Deviations of these factors from their projected paths may undermine the effectiveness or value of the proposed strategy. For example, though current trends indicate a rise in future resource costs and tightening environmental regulations, a firm adopting a sustainability strategy runs the risk that these trends will change course. In that case, the human and capital investments such as those needed to source new types of materials (like materials with high levels of recycled content) and develop cleaner burning technologies would neither be required by regulators nor, consequently, be followed by a corresponding rise in consumer demand. If regulations are not tightened, competitors may continue to produce less environmentally friendly products at a lower cost to capture market share.

Risk of Being a First-Mover. Not only are companies at risk if their strategy does not produce returns, but they are also at risk even if their strategy succeeds. If Cummins chooses to embark on a sustainability strategy and invests in the development of newer, cleaner-burning technologies that can be delivered at a price that the market will bear, it still runs the risk that competitors will copy the company's intellectual property and produce an equally effective, yet cheaper, product. Similarly, there is always the risk of a competitor copying a first-mover's sustainability strategy but executing it better, faster, and more cost-effectively, simply by having the opportunity to watch and learn from the first-mover's experience. Finally, by being the first mover in the industry, Cummins could bear a disproportionate amount of the research costs associated with the development of new technologies and new processes, which may translate into *higher* product costs.

While these threats should be considered and prepared for, they are not unlike the risks that Cummins runs in the implementation of any new strategy. Cummins has already developed a comprehensive and well-staffed risk identification and assessment process. With the top business risks identified and prioritized, Cummins is actively working to protect itself from the issues that pose the greatest threats. This established process enables Cummins to evaluate and mitigate any future risks generated by the incorporation of sustainability into Cummins business strategy.

In addition, as a data-driven company, Cummins is likely to conduct a comprehensive assessment of the market potential, expenses, and cost savings of the project before putting the strategy into action. The added value of a sustainability-oriented mindset is that future assessments of the costs and benefits of projects will become more comprehensive – incorporating not only revenue production and materials savings, but also other hidden savings such as a reduction in energy expenses and environmental compliance costs.¹⁴⁴

¹⁴⁴ For more detail, see *Section V, Case Study: The Fleetguard Mach Filter*.

TAKING A PROACTIVE & INTEGRATED APPROACH

As the example of the comprehensive assessment shows above, a sustainability strategy will only be partially effective and generate minimal savings if it is implemented piecemeal across the company. To capture the true gains this reorientation could bring to Cummins, we recommend a proactive and integrated approach.

Proactive Approach. A proactive approach requires Cummins to assess the risks and implement the processes necessary to integrate sustainability throughout product production and manufacture before it is compelled to do so by regulation. Functionally, adopting a proactive approach enables the company to work on its own timeline, monitoring and assessing the impacts of macro-economic and environmental trends that may lead to changes in the market, and allocating its resources to address these trends as the company sees best. The advantage in taking a proactive approach is that the company can integrate changes in a deliberate and cost effective manner, on its own terms, and not be rushed by outside forces. Because it has the benefits of lead time and a corporate mindset oriented toward generating returns from products that address social and environmental challenges, a proactive, sustainability-oriented company is more likely to innovate.

Integrated Approach. An integrated approach incorporates the concept of sustainability into processes throughout the company. An integrated approach is naturally more comprehensive, and will both enable the company to find synergies across divisions and reduce the chance of overlooking opportunities. It also facilitates the alignment of the employees' sense of mission and enables the establishment of company-wide targets, which ensures consistent messaging both within the company and to outside stakeholders. Finally, an integrated approach indicates a level of commitment from top management which can mobilize the different business units to put their full resource availability and creativity towards the innovation of sustainable business alternatives.

**VII. RECOMMENDATIONS:
INTEGRATING SUSTAINABILITY THROUGHOUT CUMMINS**

OVERVIEW

Up to this point, this report has explained *why* Cummins would benefit from adopting a sustainability strategy. This section is focused on *how* to integrate sustainability objectives throughout the company. We develop a sustainability vision statement that the company can adopt as a goal, and provide concrete steps Cummins can take to become more sustainable. We recommend implementing these changes through four main channels: overall company objectives, planning processes, operational practices, and financial analyses.

Envisioning a Sustainable Cummins. Before creating a roadmap for change, it is first necessary to establish an overarching goal to ensure that people can understand where the company is headed and to provide a context in which they can process proposed changes. In this section, we present a vision for a sustainable Cummins as a context for the recommendations that follow.

Integrating Sustainability into Company Objectives. Cummins' Goal Tree is used both to set corporate objectives and to evaluate employee performance. Incorporating sustainability into the Goal Tree will enable the concept to cascade throughout the company, since employees will be able to see how sustainability is aligned with the corporate objectives and how sustainability impacts their own roles at Cummins.

Integrating Sustainability into Planning Processes. Cummins is a data driven, process-oriented company. Integrating sustainability objectives into key planning processes during the early decision-making stages will enable Cummins to incorporate this concept into other practices throughout the company. In order to illustrate this, we analyze two processes which influence Cummins' strategy and product design.

- ***Strategic Planning Process (SPP).*** This process is used to assess macro-environmental trends that will affect the company over the next five years, and to ensure that Cummins' product strategy is aligned with these trends. By being aware of the social and environmental issues affecting the business in the short and long term, Cummins can formulate a strategic response, creating value for the company, the environment and society.
- ***Technology Planning Process.*** During the Technology Planning Process, Cummins categorizes and assesses customer preferences. By incorporating sustainability into this process, the company can ensure that the technology it develops creates economic benefits as well as improvements for the environment and global society over the long term.

While these two examples are essential to integrating sustainability into the company, a shift to a sustainability strategy would require incorporating sustainability into other key tools and processes as well.

Integrating Sustainability into Operational Practices. Operational practices include all of the day-to-day business decisions, including material sourcing, product design, and

manufacturing practices. It is essential to make sure that sustainability not only is integrated into the high-level strategy but also is incorporated into the company's operations.

Integrating Sustainability into Financial Analyses. Financial analyses are used throughout the company to evaluate new technologies, products, and manufacturing processes. Currently the company uses methods such as payback period, discounted cash flow, and return on investment to evaluate the economic aspects of new projects. These traditional methods are useful, but they do not fully account for the many financial benefits that a sustainability strategy can provide. Because these analyses are vital in determining the types of projects and initiatives the company will pursue, it makes sense to incorporate sustainability concerns into these financial calculations.

For each of the areas listed above, we provide background on the current processes and evaluate how well sustainability objectives are being addressed. We then recommend enhancements to the processes to better incorporate sustainability concerns.

ENVISIONING A SUSTAINABLE CUMMINS

The first step in developing a strategy for change is to create a vision toward which the company is working. Once this is established, the company can develop a roadmap of actions necessary to reach that vision. To create a vision for Cummins, we start by asking: *What would a company like Cummins look like 30 years from now if it enacted a fully integrated approach to sustainability?*

Envisioning a Sustainable Company. Imagine a company that is consistently profitable, even in times of economic downturn. Earnings and shareholder value are stable and steadily tracking upwards. The company has a reputation for innovation, reliability, and superior service. Its products and services are well-known and highly regarded around the world. New markets and exciting opportunities are continually discovered and seized upon. The company's product lineup is flexible and nimble, with the capability to adapt to changing circumstances, meet the diverse needs of customers, and take advantage of business opportunities when they arise. The manufacturing facilities are efficient and known for the positive impacts they have on the communities in which they operate. The products are fully recyclable at the end of their useful lives, and the company makes provisions for the full takeback of used products, making a profit in doing so. The company compensates its people generously and provides incentives to ensure the health and well-being of employees and the communities in which they live and work. In turn, productivity and morale are high, and employee turnover rates are low. Diverse viewpoints and different approaches are valued and encouraged. The company is able to attract and retain the best and brightest people to fill open positions. Employees at every level all over the world are proud to say they work for this company. Not only do the employees benefit from its success, but the wellbeing of people who are not affiliated with the company is indirectly improved as well.

Can Cummins be this company? Several aspects of the idealized sustainable company described above are already reflected in Cummins' current activities, such as the reputation

for reliability. At the same time, other elements of this scenario do not currently exist at Cummins, such as provisions for the full takeback of used products. A truly sustainable company is one that excels not just in a few areas but in all social, environmental, and economic aspects of its business, as described above.

For many reasons, the transition to becoming a truly sustainable company cannot happen overnight. First, employees and management find it difficult to overcome the current ways of doing business, which can stifle the innovation and change required to become a completely sustainable company. Second, technological and economic constraints limit the company's ability to rapidly change the raw materials it uses, the impacts it has on people and the environment, the considerations taken during the design process, and the social conditions across the value chain. Nevertheless, in order to move towards a more sustainable company, it is important to have a long-term vision of where Cummins would like to be in 30 years.

Example: Alcoa's Sustainability Vision Statement. Take the vision put forth in 2000 by Alcoa, the world's leading producer of primary aluminum, fabricated aluminum, and alumina, known as their 2020 Strategic Framework for Sustainability¹⁴⁵. The high-level vision of Alcoa is as follows:

- Supporting the growth of customer businesses.
- Standing among the industrial companies in the first quintile of return on capital among Standard & Poor's Industrials Index.
- Elimination of all injuries and work-related illnesses and the elimination of waste.
- Integration of environment, health, and safety with manufacturing.
- Products designed for the environment.
- Environment, health, and safety as a core value.
- An incident-free workplace (an incident is any unpredicted event with capacity to harm human health, the environment, or physical property).
- Increased transparency and closer collaboration in community-based environmental, health, and safety initiatives.

Alcoa has also set operational targets that will enable the company to measure its progress towards the high-level vision outlined above. For example, regarding the integration of environment, health, and safety with manufacturing and elimination of waste, the company has announced the following benchmarks:¹⁴⁶

From base year 2000, Alcoa will achieve¹⁴⁷:

- Reduction in SO₂: 60% by 2010, 90% by 2015

¹⁴⁵ Alcoa Inc., *Alcoa 2004 Sustainability Report*, 2004, 7 Jan. 2006, <http://www.alcoa.com/global/en/about_alcoa/sustainability_report_2004/sr2004_susandalcoa.asp>

¹⁴⁶ Alcoa Inc., *Alcoa in the EU CO₂ Management Program*, Mar. 2005, 7 Jan. 2006, <<http://www.businessroundtable.org/pdf/ClimateRESOLVE/ClimateRESOLVEALCOAPresentation033105.pdf>>

¹⁴⁷ Similar operational targets exist for other areas of the company.

- Reduction in volatile organic compounds: 50% by 2008, 95% by 2015
- Reduction in nitrogen oxides: 30% by 2007, 85% by 2015
- Reduction in mercury emissions: 80% by 2008, 95% by 2010
- Reduction in landfill waste: 50% by 2007, 100% by 2015
- Reduction in process water use and discharge: 60% by 2008, zero discharge (including stormwater) by 2015

Proposed Vision Statement for Cummins. The following vision is based on the definition of sustainability originally proposed at the beginning of this report: *Sustainability is meeting today's needs without compromising the future. For Cummins, this means ensuring the success of its business, the global society, and environment for both the short and long term.* We have referenced this definition and the previously introduced Four-Question Sustainability Framework as the basis for the proposed Cummins vision statement. (See page 6 for a description of the Four-Question Sustainability Framework).

A sustainable Cummins would:

- Develop products and services that use non-harmful materials and run on non-petroleum based fuels while remaining cost competitive and generating steady revenue.
- Have facilities powered by renewable energy that generate zero waste and no harmful emissions while remaining a low-cost producer.
- Improve people's lives—both those who are directly impacted by Cummins' actions and members of the broader global society.

Although this vision may seem idealistic and even unattainable, it is important to remember that the purpose of a vision statement is not to set a target that is within reach, but rather to describe an ideal and provide stretch goals to guide the company's future direction. A vision also provides an increased sense of purpose and an emotional rallying point for employees. The vision encourages a company to think beyond the current mode of operation, beyond familiar, present-day technologies and processes, and beyond any existing barriers or restrictions.

THE GOAL TREE

For purposes of confidentiality, the details regarding the Goal Tree and specific recommendations for this practice have been removed from the public version of this report.

Background. In order to integrate sustainability throughout the company, it is necessary for employees to understand the definition of sustainability and to have it influence their business decisions and day-to-day behavior. Almost any Cummins manager will say that if you really want to move something through the company and focus employees at every level on an idea or concept, it needs to be in the Goal Tree. The Goal Tree links the company's broad, overarching objectives to specific strategies, initiatives, and metrics that cascade down to the work plans of individual employees. Cummins employees use the Goal Tree to understand how the specific tasks they are undertaking relate to corporate-wide objectives. Furthermore, the Goal Tree provides a means for every manager throughout the company to measure and evaluate an employee's performance, and ensure that the department's activities support the company objectives. Employees at every level are evaluated on how they meet their objectives, which are derived from the Goal Tree.¹⁴⁸

Because the Goal Tree is well understood as a way to get things done at Cummins, and because employees are evaluated on how their individual work supports the strategies and objectives in the Goal Tree, this strategic tool is an effective place in which to incorporate sustainability concepts.

INTEGRATING SUSTAINABILITY INTO THE GOAL TREE

Integrating sustainability throughout the company requires participation from every employee; the responsibility does not lie on the shoulders of one person or one department. Therefore, it is important to make sure all employees see how their job can contribute or erode the company's move to become a more sustainable enterprise.

The current Goal Tree is already based on sustainability principles. By taking a step back, we note that the objectives and strategic principles in fact lie within a larger framework of the company, which is represented by the vision, mission, and values. As discussed in *Section II*, Cummins' vision, mission, and values are already strongly linked with sustainability. Thus, there is no need to change the current vision, mission, and values to incorporate sustainability, only the need to recognize sustainability as part of the existing frameworks at Cummins.

It may also help to recognize the current connections between the strategic principles and sustainability objectives:

- ***Being a low-cost producer in as many of the company's markets as possible.*** As discussed in *Section III* of this report, operational efficiency (e.g., reducing waste and

¹⁴⁸ Tina Vujovich, Vice President, Marketing and Environmental Policy, personal interview, 9 Dec. 2005.

energy) is a significant way to reduce the costs associated with environmental initiatives.

- ***Expanding into related markets.*** By focusing on sustainability issues, the company can identify new markets to enter and new products to produce. For example, the Emission Solutions business emerged from Cummins' consideration of future environmental trends.
- ***Maximizing return on investment.*** A sustainability strategy encourages employees to take on a more long-term perspective of the business, which can lead to more stable earnings and risk management, resulting in better return on investment.
- ***Leveraging complementary businesses.*** A sustainability strategy is a comprehensive approach to business and thus may unearth synergies among business units as the company finds different ways to address similar objectives, such as reducing emissions and improving fuel economy in both its engine and power generation businesses.
- ***Creating the right environment for success.*** Cummins' commitment to sustainability could help strengthen a cohesive environment in which employees are motivated to "do what they say they will do" by providing a goal that has the potential to resonate with people's personal values.

While these underlying links to sustainability exist, currently they are not as evident as they could be. Without visible connections, there is a risk that these buried concepts will get lost as objectives are cascaded down the Goal Tree.

RECOMMENDATIONS

There is already an underlying link between sustainability and the current Goal Tree system. However, this connection is not immediately obvious. We recommend that Cummins:

1. Make sustainability more visible in the interpretation and communication of the current vision, mission, and values.
2. Show the vision and mission in the Goal Tree.

This will enable employees and managers to identify the link between people's everyday business decisions and sustainability, and foster a culture dedicated to sustainability.

Details of the Goal Tree recommendations have been removed for confidentiality purposes.

STRATEGIC PLANNING PROCESS

The Strategic Planning Process (SPP) is highly confidential, and the analysis and recommendations have been removed from the public version of the report. In this section, we relate the key categories of the SPP to sustainability and apply the Four-Question Sustainability Framework to provide recommendations for improving this process.

Background. The Strategic Planning Process (SPP) is a new process currently being developed by the Corporate Strategy department. The goal of this process is to develop a comprehensive approach towards strategy at Cummins, beginning with a big-picture, long-term perspective of the business environment and making sure key issues are not missed. Therefore, the creation of this process is already a step towards developing a more integrated sustainability strategy throughout Cummins.

TECHNOLOGY PLANNING PROCESS

The Technology Planning Process is highly confidential, and the analysis and recommendations have been removed from the public version of the report. In this section, we relate the categories in the Technology Planning Process to sustainability and apply the Four-Question Sustainability Framework to one of the key areas to provide recommendations for improving this process.

Background. During the Technology Planning Process, Cummins researches and analyzes potential technologies that can be incorporated into Cummins' products and manufacturing processes. One of the key tools in this process allows Cummins to analyze customer requirements so that they can be documented, understood, and communicated easily and accurately. This process influences the products Cummins decides to produce. Because considering the impact of products is a big part of being a sustainable company, it is essential to review this tool to determine the extent to which sustainability concerns are represented.

OPERATIONAL PRACTICES

Background. In "Envisioning a Sustainable Cummins," found on page 85, we proposed a 30-year vision for what a sustainable Cummins would look like. In order for the company to reach this vision, it is critical to have a comprehensive action plan that incorporates all operational areas of the company. In this section we offer step-by-step recommendations for making Cummins' operations more sustainable.

Approach. We applied the Four-Question Sustainability Framework to Cummins' operations and created a list of 24 different categories on which the company should focus in order to become more sustainable. As a reminder, the four questions are:

1. What materials does Cummins use to build its products and facilities?
2. What are the impacts of Cummins’ manufacturing processes?
3. What are the impacts of Cummins’ products when in use?
4. What actions is Cummins taking to address social issues throughout the value chain?

For each category, we describe what the company is currently doing and present a vision for what a sustainable Cummins would look like. We then identify a list of steps that the company could take to move towards the vision we outline. Recognizing that there are barriers to implementing our recommended changes, we also present a list of these barriers and suggestions for how to respond to them. Because it would be impossible to implement all the changes we suggest at once, and some recommendations have more challenges associated with them than others, we identify two time horizon categories: short term and long term. Recommendations that have a short-term time horizon have barriers to change, but these barriers are low and the steps towards the vision can be implemented within one to three years. Suggestions that have a long term-time horizon have higher technological and economic barriers to change, but there are still immediate steps Cummins can implement to put the company on a path towards sustainability.

In many instances, the first steps suggested are to conduct analyses (e.g., financial, process, sourcing, and product-related analyses) which would determine the viability and savings potential associated with moving towards becoming a more sustainable company. Once these analyses have been conducted, we typically recommend creating a long-term goal as to where the company wants to be by a particular time. Then we suggest setting intermediate, measurable goals (such as % reductions in year 1, after 5 years, and in 10, 15, 20 and 30 years) to ensure the company’s progress towards the vision.

Below is an example of one of the 24 categories we have identified for action and our associated recommendations.

METAL USE	
Now	Products contain virgin metal materials including cast iron, steel, aluminum, copper, and rare metals.
Vision	Use 100 % recycled metal materials. For example, precious metals used to coat catalysts would be fully reclaimed rather than newly mined.
Steps to Get There	<ol style="list-style-type: none"> 1. Identify what materials are currently used to create Cummins’ products. 2. Set 5-, 10-, 15-, 20- and 30-year goals for increasing the percentage of recycled/remanufactured materials used.
Barriers to Change	Technology currently prevents a 100% transition to recycled/remanufactured raw materials, because products have desired properties that currently require virgin materials to meet the criteria. If the technology does exist, it is available at a cost much higher than what Cummins is currently paying.

	How the materials used in the engine can be recycled, reused or remanufactured is already taken into account during the design process.
Solutions to Barriers	By knowing what materials are currently being used in which products, the company can create a plan for transitioning to recycled/remanufactured materials while taking technology constraints into account. Moving toward a sustainability strategy would require a shift from thinking about how materials can be recycled after they are used in Cummins' products, to considering how to use recycled inputs in the company's products.
Time Horizon	Short term: Assess materials and set recycled metal percentage targets. Long term: Make the full transition to recycled materials.

Details of the 24 Areas for Action and their associated recommendations have been removed for confidentiality purposes.

FINANCIAL ANALYSES

Background. Intangible benefits are important considerations, particularly in projects related to sustainability. Neglecting intangible financial benefits altogether can result in a promising sustainability-related project being overlooked in favor of one that generates a more positive NPV under traditional analysis methods. However, attempting to quantitatively assess intangible benefits for incorporation into a financial analysis can be cumbersome. Given the difficulties, some financial tools are offered below to help overcome the lack of quantitative knowledge surrounding intangible benefits, and more importantly to incorporate these benefits into the assessment of investment opportunities related to new, sustainability-related products and technologies.

DIRECT AND INDIRECT COSTS AND BENEFITS

Projects with sustainability considerations often lead to benefits that are not accounted for in traditional financial analyses. Therefore, it is important to keep in mind the potential benefits. In some cases, recognizing these indirect benefits may enable actual quantification of these savings. In other cases, they are difficult to calculate, but are essential to Cummins' business strategy. Examples of these situations were discussed in the Fleetguard Case Study. We recommend considering and, when possible, measuring the potential indirect benefits and costs. The following chart is a list of the financial benefits to be gained when a specific business driver is addressed in a positive manner.

Business Driver	Effect on Profitability
Risk Management	↓ Costs
Business Growth	↑ Revenues
Operational Efficiency	↓ Costs
Customer Demands	↑ Revenues
Brand Equity	↑ Revenues
Human Capital	↑ Revenues, ↓ Costs
Shareholder Response	Final arbiter of profitability

FINANCIAL TOOLS

In addition to recognizing these sources of profitability, we would like to point out some of the shortcomings of traditional financial tools. While we do not necessarily advocate completely altering current financial models, recognizing their weaknesses will enable employees to understand that the resulting numbers should be considered along with a wide range of benefits and costs of a specific project.

Payback Period. Using the payback period criteria for making investment decisions provides a simple way to prioritize among several projects. However, choosing an acceptable payback period is often a semi-arbitrary decision, and all possible cash flows after the payback period are not included in the calculation. If a company uses the same payback cutoff date regardless of the nature of the project, it will tend to accept too many short-term projects and too few long-term ones. This method is inherently biased against sustainability-related projects, because sustainability-related projects typically involve extended time horizons and benefits that pay out over the long-term. One way to overcome some of the shortcomings with the payback method is to give projects with a sustainability component a longer payback cutoff date. Another alternative is to not use payback period when evaluating the financial merits of a sustainability-related project, and instead use another method such as discounted cash flow.

Discount Rate. To perform a discounted cash flow analysis as mentioned above, a company needs to project the net cash flows associated with an asset (which could be a product) over the life of the asset and discount the resulting cash flow by an appropriate discount rate. But what constitutes an “appropriate” discount rate? The discount rate is supposed to capture the level of risk associated with investing in a particular project. A higher discount rate means a project has more risk associated with it. Yet most companies use a single, standard corporate-wide discount rate to perform the discounted cash flow analyses of all their projects. This corporate discount rate is applied regardless of the risks or benefits that may be incurred by pursuing the project in question. Although calibrating risk is difficult to do for individual projects, using the corporate discount rate fails to take any risk-reducing benefits of sustainability projects into account in a discounted cash flow analysis. This can

be mitigated somewhat by performing a sensitivity analysis, or better yet by using a project-specific discount rate (instead of the corporate rate) when evaluating financial aspects of critical sustainability initiatives.

Sensitivity Analysis. A sensitivity analysis explores the relative degree to which changes in a discounted cash flow model (such as discount rate, fixed and overhead costs, and sales volume forecasts) impact the value of the overall project. The discounted cash flow model is “run” under a number of different scenarios, highlighting strategies and generating options that can reduce the risk of the overall project. This technique is particularly useful in evaluating sustainability-related projects, where risks and cash flows can be uncertain due to lack of previous experience. Specifically focusing on 1) different risk-adjusted discount rates and 2) cash flow estimates that incorporate intangible benefits will result in a big difference in the financial evaluation of sustainability projects. Performing a sensitivity analysis can also help a company to identify scenarios, such as changes in fuel prices or interest rates, under which a sustainability-related project would provide the most financial benefits.

Real Options. Real options analysis has recently emerged as an important tool for illustrating the value of sustainability-related projects.¹⁴⁹ The net present value (NPV) number that results from a discounted cash flow analysis can be incomplete or misleading – especially in the case of sustainability initiatives. Sometimes, in spite of a negative net present value, a project is still extremely worthwhile to pursue because it gives a company the ability (or option) to take advantage of a unique market opportunity in the future. Real options analysis is useful because it captures the value in this flexibility. When business situations involve a great deal of uncertainty--as in instances of changing regulations and performance expectations, new and untapped markets, dwindling natural resource availability, and undefined technologies--real options analysis provides a way to place a value on the flexibility associated with sustainability-related approaches.

RECOMMENDATIONS

When analyzing the financial costs and benefits of a project that incorporates sustainability objectives, it is essential to consider the additional indirect costs that may or may not be easily calculated. These benefits may come from a variety of categories including risk management, business growth, operational efficiency, meeting customer demands, brand equity, human capital, and addressing shareholder response. It is also important to recognize some of the limitations to traditional financial analyses in order to understand the significance of the numbers that may appear from these calculations. Therefore, our team recommends that Cummins recognize the shortcomings of the financial analyses techniques currently used and make adjustments to their financial analyses to better reflect the benefits of launching sustainability related products and initiatives. To do this, the company should:

- Recognize the indirect financial benefits from other business categories identified in *Section III*, including risk management, operational efficiency, brand equity, etc.

¹⁴⁹ Donald J. Reed, “Stalking the Elusive Business Case for Corporate Responsibility,” World Resources Institute Sustainable Enterprise Perspectives, December 2001.

- Refrain from using payback as a method of financial evaluation, or allow sustainability related projects a longer payback period
- Use a project-based discount rate rather than a company-wide rate
- Continue to rely on sensitivity analysis to measure the impact of sustainability initiatives
- Incorporate real options analysis as a critical component of a new product's or project's financial analysis.

VIII. CONCLUSION

The purpose of this report was to present the business case for why Cummins should adopt a sustainability strategy and provide suggestions for how the company can incorporate the concept of sustainability into its existing processes. The *Four-Question Sustainability Framework*, a tool created specifically for this project, is used throughout the report.

The five reasons *why* Cummins should adopt a sustainability strategy are:

- Sustainability is part of Cummins’ *history*.
- Sustainability is in line with Cummins’ *vision, mission, and values*.
- A sustainability strategy will help Cummins address *macro-environmental trends*.
- A sustainability strategy will enable Cummins to reap *financial benefits*.
- A sustainability strategy is necessary for Cummins to remain *competitive*.

These arguments are further illustrated in a case study examining the development of the Mach filter in Cummins’ Fleetguard business. In order to understand the potential drawbacks of a sustainability strategy, we also discuss the related risks. The final section of the report focuses on *how* a sustainability strategy can be implemented throughout Cummins.

Although this report has accomplished the goals described above, two questions remain:

- Given the information presented in this report, what should Cummins do next?
- What can other people learn from this report that they can apply to other organizations?

NEXT STEPS FOR CUMMINS

What should Cummins do with this report? We wrote this report to help Cummins communicate the value of integrating sustainability into the company’s strategy, as well as to provide a roadmap for implementing this change. Our recommendations are outlined below.

Communicate the definition of sustainability. We recommend that Cummins use the definition of sustainability¹⁵⁰ for Cummins, outlined in the introduction, to communicate the meaning of sustainability to employees. To help employees understand the assumptions underlying the concept of sustainability, the company should draw upon the historical evolution of the term “sustainability” as well as the reasoning behind the creation of the Four-Question Sustainability Framework.¹⁵¹

Customize the message to convey the benefits of sustainability. Depending on the audience, employees who want to make the business case for sustainability should draw upon some, if not all, of our five arguments for why Cummins should enact a sustainability strategy. In talking to Cummins employees, we have found that for some, a numbers- or strategy-based approach works best,¹⁵² while for others, the historical connection and link to the company’s

¹⁵⁰ Pages 2-3.

¹⁵¹ Pages 3-6.

¹⁵² *Section III, Financial Benefits of Sustainability.*

vision, mission, and values¹⁵³ resonates better. Regardless, we have found that sharing stories highlighting the benefits of sustainability (whether it is how the vision, mission, and values create value for the company¹⁵⁴ or the development of Fleetguard's Mach filter¹⁵⁵) is one of the strongest ways to convey the potential benefits of a sustainability strategy. In addition, the competitive analysis¹⁵⁶ can help motivate the company to take sustainability seriously, because it provides a snapshot of what Cummins' industry peers are doing, and employees and managers are concerned about competition within the industry.

Refine the vision for a sustainable Cummins. The recommendations offered in this report represent just the beginning of how Cummins could integrate a sustainability strategy throughout the company. We suggest that company executives begin by picking up the groundwork we laid in the *Envisioning a Sustainable Cummins* section,¹⁵⁷ and hone our proposed Cummins sustainability vision.

Include the vision and mission in the Goal Tree. Employees will be more inclined to work towards sustainability objectives if they understand how these activities are integrated into their employee evaluations. To help make this relationship clear, Cummins could use the updated Goal Tree to better reflect the relationship between the company's mission and vision, the strategic objectives of the company, and the day-to-day work conducted by employees.

Incorporate sustainability objectives into planning processes. Cummins should incorporate the questions and recommendations we identified using the Four-Question Sustainability Framework into the Strategic Planning Process and the Technology Planning Process.¹⁵⁸ To cascade sustainability throughout Cummins, employees should apply the Four-Question Sustainability Framework to processes and tools not included in this report.

Adapt operational practices to address sustainability concerns. *Operational Practices: 24 Areas for Action* (removed from the appendix for confidentiality purposes) should be shared with the sourcing, technology design and engineering leaders across the company so that they can begin benchmarking their performance in the highlighted areas, setting their 5-, 10-, 15-, 20- and 30-year sustainability goals and initiating processes to meet those goals.

Adopt financial analysis methods that measure the value of sustainability initiatives. We suggest that Cummins work with the finance departments to recognize the limitations of their current methods of financial analysis. The company should incorporate new tools, techniques, and policies as recommended¹⁵⁹ to ensure that projects with a sustainability component are not overlooked because of the biases inherent in the financial tools currently used at Cummins.

¹⁵³ Section II, *Sustainability & Cummins Philosophy*.

¹⁵⁴ Page 16-18.

¹⁵⁵ Section V, *Case Study: The Fleetguard Mach Filter*.

¹⁵⁶ Section IV, *Competitive Analysis*.

¹⁵⁷ Page 85.

¹⁵⁸ Page 90.

¹⁵⁹ Pages 92-95.

By following these suggestions, Cummins can ensure the success of its business, the global society, and the environment for both the short term and the long term.

LESSONS APPLICABLE OUTSIDE OF CUMMINS

What can people outside of Cummins learn from this report? While this report was written primarily for Cummins managers and employees, a secondary goal of this project was to provide others with an example of how to articulate the business case for sustainability and make recommendations for implementing a sustainability strategy. Some of the key lessons we learned from this effort are summarized below.

A “business case” means different things to different people. “Business case” is a broad term which could involve a financial analysis, a less quantitative strategic rationale, or a series of anecdotal arguments. It is important to realize that the best approach to articulating the business case for sustainability depends on the audience, and that there are industry- and company-specific reasons for pursuing a sustainability strategy. In our report, we chose to present five different reasons to adopt a sustainability strategy. To provide the company with a cohesive approach to understanding where it is today, and a vision of a more sustainable Cummins, we developed the Four-Question Sustainability Framework and used it throughout our analyses.

Advocating a sustainability strategy requires a clear vision and a feasible roadmap. It is difficult for a company to imagine where it will be in 30 years—particularly when the company must consider radically changing its products and its manufacturing processes. For the vision to be credible, it is essential to provide incremental concrete steps explaining how the company can get from where it is today to where it aims to be in the future. It is also important to recognize the complexity of the issues keeping the company from achieving the vision, and explain how those barriers can be addressed.

Financial benefits of a sustainability strategy are difficult to quantify. When conducting financial analyses, companies rarely consider the additional indirect benefits that often result from sustainability-oriented projects. These benefits may come from a variety of categories including risk management, business growth, operational efficiency, meeting customer demands, brand equity, human capital, and addressing shareholder response. Because of the way companies typically run their financials, it is difficult to look at past projects and evaluate the financial benefits due to sustainability factors. It is also difficult to create a compelling financial case for future projects that incorporate sustainability concerns. Typically, modeling inputs for financial projects include factors such as market size, customer base, and return purchases, and do not include uncertain potential benefits from sustainability, such as risk management and indirect cost savings (e.g., energy efficiency). For our project, we used the limited financial data available for the quantitative portion of the analysis to demonstrate the benefits of sustainability and augmented these calculations with qualitative explanations of additional financial benefits.

We wrote this report to articulate why Cummins should adopt a sustainability strategy and to provide a road map for incorporating it throughout the company. We hope that we have helped direct Cummins towards a more sustainable future and provided an example of how to make the business case for sustainability at other companies. We hope that students, businesses, non-profits and government entities can apply the lessons we learned to promote the well-being of businesses, the global society, and the environment.

APPENDIX

APPENDIX I: THE NATURAL STEP

HISTORY OF THE NATURAL STEP

In 1989 Dr. Karl-Henrik, a Swedish oncologist, frustrated by the piecemeal approach to addressing environmental problems that he saw around him, brought leading Swedish scientists together to develop a consensus on requirements for a sustainable society. The group's findings, which were based on systems reflected in natural cycles, have become the backbone of a Natural Step Framework. The Natural Step has been used by numerous Fortune 500 companies such as McDonalds Corporation, Nike, Ikea, Toyota Japan, Cargill Dow and Home to incorporate sustainability into their business practices.¹⁶⁰

BASIC PRINCIPLES OF THE NATURAL STEP¹⁶¹

The Natural Step is a set of science-based principles based on systems reflected in natural cycles. Thos principles are:

- Society mines and disperses materials at a faster rate than they are re-deposited back into the Earth's crust (examples of these materials are oil, coal and metals such as mercury and lead);
- Society produces substances faster than they can be broken down by natural processes, if they can be broken down at all (examples of such substances include dioxins, DDT and PCBs); and,
- Society depletes or degrades resources at a faster rate than they are replenished (for example, over-harvesting trees or fish), or by other forms of ecosystem manipulation (for example, paving over fertile land or causing soil erosion).

The Natural Step framework also recognizes the social aspects of sustainability and offers a fourth principle which is focused on meeting today's human needs as well as that of future generations. As a result of the principles outlined above, the Natural Step has created four system conditions for sustainability.

¹⁶⁰ Oregon Natural Step Network, "What is the Natural Step Framework?"
<<http://www.ortns.org/framework.htm>>

¹⁶¹ Alliance for Sustainability, Terry Gips, presenter, The Natural Step, Ann Arbor, Michigan. November 4, 2005

THE NATURAL STEP'S FOUR SYSTEM CONDITIONS¹⁶²

1. In order for a society to be sustainable, nature's functions and diversity are not systematically subject to increasing concentrations of substances extracted from the earth's crust.

In a sustainable society, human activities such as the burning of fossil fuels, and the mining of metals and minerals, will not occur at a rate that causes them to systematically increase in the ecosphere. There are thresholds beyond which living organisms and ecosystems are adversely affected by increases in substances from the earth's crust. Problems may include an increase in greenhouse gases leading to global warming, contamination of surface and ground water, and metal toxicity which can cause functional disturbances in animals. In practical terms, the first condition requires society to implement comprehensive metal and mineral recycling programs and to decrease economic dependence on fossil fuels.

2. In order for a society to be sustainable, nature's functions and diversity are not systematically subject to increasing concentrations of substances produced by society.

In a sustainable society, humans will avoid generating systematic increases in persistent substances such as DDT, PCBs, and freon. Synthetic organic compounds such as DDT and PCBs can remain in the environment for many years, bio-accumulating in the tissue of organisms and causing profound deleterious effects on predators in the upper levels of the food chain. Freon, and other ozone depleting compounds, may increase risk of cancer due to added UV radiation in the troposphere. Society needs to find ways to reduce economic dependence on persistent human-made substances.

3. In order for a society to be sustainable, nature's functions and diversity are not systematically impoverished by physical displacement, over-harvesting, or other forms of ecosystem manipulation.

In a sustainable society, humans will avoid taking more from the biosphere than can be replenished by natural systems. In addition, people will avoid systematically encroaching upon nature by destroying the habitat of other species. Biodiversity, which includes the great variety of animals and plants found in nature, provides the foundation for ecosystem services which are necessary to sustain life on this planet. Society's health and prosperity depends on the enduring capacity of nature to renew itself and rebuild waste into resources.

4. In a sustainable society, people are not subject to conditions that systematically undermine their capacity to meet their needs.

Meeting the fourth system condition is a way to avoid violating the first three system conditions for sustainability. Considering the human enterprise as a whole, we need to be efficient with regard to resource use and waste generation in order to be sustainable. If one

¹⁶² Oregon Natural Step Network, "What is the Natural Step Framework?"
<<http://www.ortns.org/framework.htm>>

billion people lack adequate nutrition while another billion have more than they need, there is a lack of fairness with regard to meeting basic human needs. Achieving greater fairness is essential for social stability and the cooperation needed for making large-scale changes within the framework laid out by the first three conditions.

To achieve this fourth condition, humanity must strive to improve technical and organizational efficiency around the world and to live using fewer resources, especially in affluent areas. System condition number four implies an improved means of addressing human population growth. If the total resource throughput of the global human population continues to increase, it will be increasingly difficult to meet basic human needs as human-driven processes intended to fulfill human needs and wants are systematically degrading the collective capacity of the earth's ecosystems to meet these demands.

APPENDIX II: COMPETITIVE ANALYSIS

1. WHAT MATERIALS DOES CUMMINS USE TO BUILD ITS PRODUCTS?	
Company	Company Actions
Cummins: ✓	<p>Summary: Cummins ReCon business recaptures some of the materials from the company’s products and reconfigures/recycles them. However, there is no evidence indicating that the company is looking to increase recycled content in its new engine product line. In addition, no evidence showed processes in place which systematically seek to replace virgin materials with recycled or biodegradable inputs.</p> <p>Recycled and recyclable materials: Like other auto manufacturers, Cummins designs engines for remanufacturing. The company currently remanufactures a wide range of its engines, from the smaller 4B through the high-horsepower K19 engine. Cummins’ 2005 Sustainability report lists the various parts and additives the company recycles and remanufactures.¹⁶³ According to company reports, Cummins’ ReConditioning captures approximately 20,000 metric tons of used “core” material annually, 99% of which is reused or recycled by the company and/or its recycling contractors. Additionally, the company announced in 2004 that its Fleetguard division (in partnership with EET Corp.) was the first coolant and chemical supplier in the industry to offer recycled coolant as part of its heavy-duty antifreeze product line.¹⁶⁴</p> <p>Bio-based materials: No information was found regarding integration of bio-based materials in Cummins’ products.</p>
CAT: ✓	<p>Summary: Caterpillar’s remanufacturing business ensures the recycling of some of its products. However, the company’s discussion of recycled and recyclable materials is limited to their remanufacturing business and does not address using recycled material in new products. No evidence showed that the company is looking to increase recycled content into its first fit product line, and no evidence showed that it is attempting to increase the content of bio-based materials. No goals have been set regarding material content.</p>

¹⁶³ Cummins Inc., Cummins Sustainability Report 2005, (Columbus, IN: 2005) 34, 5 Jan. 2006 <<http://www.cummins.com/cmi/attachments/public/About%20Cummins/Sustainability%20Report/SustainabilityReport2005FINALWEBVERSION.pdf>>.

¹⁶⁴ Cummins Inc., Cummins Sustainability Report 2004, (Columbus, IN: 2004) 27, 7 Jan. 2006 <<http://www.cummins.com/cmi/attachments/public/About%20Cummins/Sustainability%20Report/SustainabilityReport2005FINALWEBVERSION.pdf>>.

¹⁶⁵ The parts and processes listed are: turnkey transmission and engine remanufacturing, factory and field containment programs, salvage, computer-controlled solenoid testers, visual processing, contract machining, root cause failure analysis, packaging development, valve body assembly and kitting, parts sourcing, and TS 16949 certified, PPAP/CDP/FMEA processes. Caterpillar worldwide, “Remanufacturing Capabilities: Automotive,” 1 Feb. 2006 <<http://www.cat.com/cda/layout?m=95184&x=7>>.

¹⁶⁶ American Recycler, “Caterpillar Offers Remanufacturing to Other Companies,” (April 2004), 1 Feb. 2006 <<http://www.americanrecycler.com/0404caterpillar.shtml>>.

	<p>Recycled and recyclable materials: Caterpillar’s remanufacturing homepage lists the various parts and processes the company provides to the automotive industry.¹⁶⁵ According to company reports, Caterpillar currently processes over 2 million units annually, totaling 100 million pounds of used product per year. The company remanufactures on-highway truck engines; transmissions; and engine, hydraulic, and electronic components.¹⁶⁶</p> <p>Bio-based materials: No information was found regarding integration of bio-based materials in Caterpillar’s products.</p>
<p>Daimler Chrysler: ✓-</p>	<p>Summary: DaimlerChrysler’s recycling and remanufacturing initiatives appear to be limited to its regional workshop waste disposal recycling program in Europe. This program does not appear to extend across the company. The company’s use of coconut fiber material in its cars is an example of individual changes made within particular car models, yet these changes do not appear to be part of a larger program driving the replacement of non-renewable materials in cars across the company. Though the company has stated the goal of replacing current materials with recycled resources, no number targets or processes associated with this statement were found.</p> <p>Recycled and recyclable materials: DaimlerChrysler created the “Mercedes Recycling System” (MeRSy) in 1993 as a part of the DaimlerChrysler Recycling Management System for workshop waste disposal. This process captures end-of-life components and materials removed in the course of repairs, and it reconditions them for automotive and other industry use. This regional recycling system has been extended to Smart, Chrysler and Jeep workshops throughout Germany, Austria and Switzerland.¹⁶⁷ No evidence showed that this program has been since extended company-wide. DaimlerChrysler states that it is company policy to use “high-quality secondary (recycled) raw materials in place of expensive and precious primary resources” wherever possible.¹⁶⁸ Specifically, in the plastics sector, they say they prefer recycled raw materials or recyclable materials and have successfully tested the use of recycled raw materials for approximately 13% of the volume of plastics employed in their vehicles, approving them for series production applications.</p> <p>Bio-based materials: DaimlerChrysler has an initiative focused on using indigenous crop-based materials. For example, through its POEMA project in Brazil it makes seat upholstery from coconut fiber; through its Abaca project in the Philippines it produces natural fibers for use in three-door Mercedes-Benz A-Class models. In conjunction with other partners (including GM), they are also developing a process that will generate biodiesel from the seeds of the native Jatropha plant.</p>

¹⁶⁷ DaimlerChrysler, *360 degrees: DaimlerChrysler Environmental Progress Report 2003*, (Stuttgart, Germany: 2003), 6 Feb. 2006 <<http://www.daimlerchrysler.com/dccom/0,,0-5-74514-1-75352-1-0-0-78637-0-0-243-7166-0-0-0-0-0-0-0,00.html>>.

¹⁶⁸ DaimlerChrysler, *Sustainability Profile 2005: Reporting on Our Common Future*, (Stuttgart, Germany: 2005) 46, 1 Feb. 2006 <<http://www.daimlerchrysler.com/dccom/0,,0-5-505410-1-511460-1-0-0-0-0-8-220714-0-0-0-0-0-1,00.html>>.

<p>Ford: √+</p>	<p>Summary: Ford has created company-wide systems that substitute certain targeted materials with recycled content (such as recycled polypropylene containers). In addition, its Piquette Project is investigating how to create a fully recyclable car in the near future. These two examples show that Ford is currently extending its systems to increase the recycled content in its vehicles and taking this action as a part of a larger strategy to create a fully recyclable vehicle (itself made with a high degree of recycled content) in the near future.</p> <p>Recycled and recyclable materials: Ford is exploring some innovative systems for employing recycled content in its cars. For example, it is currently piloting a process (designed in conjunction with Georgia Tech University) to ship components from China to Wixom (MI) in polypropylene containers, which are then reprocessed at the plant and converted into vehicle splash shields. It is also monitoring the cumulative number of parts launched which contain recycled non-metallic materials, and it is working to improve these metrics year over year. (It has achieved a significant increase: from 790 parts in 2000 to 1,127 parts in 2004.)¹⁶⁹ Ford also recently leaked news of its Piquette Project, a research initiative to develop lines of hybrid, fully recyclable cars. The stated goal of the project is to “develop renewable, clean and safe vehicles that would be both socially conscious and provide a competitive advantage in the marketplace.”¹⁷⁰ The company hopes to showcase the results by 2008.¹⁷¹</p> <p>Bio-based materials: No information was found regarding systematic integration of bio-based materials in Ford products.</p>
<p>GM: √</p>	<p>Summary: GM has information systems in place to facilitate recycling by external parties and to show that the company has been making improvements on individual recycling products. Additionally, the company has financial incentive programs to encourage resource managers to reduce waste during manufacturing and increase recycling of these materials. This suggests that some processes do address materials concerns company-wide. However, these processes do not appear to be part of a larger strategy to increase recycled content in GM’s products, because the company has set no published targets for incorporating greater recycled or bio-based content into its vehicles.</p> <p>Recycled and recyclable materials: Like Ford, GM has implemented some individual systems to address specific materials concerns across the company. For example, each car has an update card which highlights the environmental features of new vehicles, as well as the eco-efficiencies of the plant in which it was produced. Additionally, GM provides dismantling manuals on its website describing which materials in the car can be recycled and how they can be</p>

¹⁶⁹ Ford Motor Company, Our Route to Sustainability: Ford Sustainability Report 2004/2005, (Dearborn, MI: 2005), 2 Feb. 2006 <<http://www.ford.com/en/company/about/sustainability/report/envReviewMaterialsLoops.htm>>.

¹⁷⁰ Joel Arellano, “Ford’s Piquette Project,” Autoblog, 24 Jan. 2006, 2 Feb. 2006 <<http://www.autoblog.com/2006/01/24/fords-piquette-project/>>.

¹⁷¹ Bruce G. Hoffman, “Top Secret Ford Plan: Recyclable Vehicles,” The Detroit News.com, 23 Jan. 2006, 2 Feb. 2006 <<http://www.detnews.com/apps/pbcs.dll/article?AID=/20060123/AUTO01/601230357>>.

	<p>removed. According to GM's 2005 Sustainability Report, the company's resource managers received financial incentives to find ways to eliminate waste created during manufacturing, and there is a supplier environmental advisory team in place, which works with the company's suppliers to improve their environmental performance. Though these systems were referred to briefly in the report, the lack of further detail surrounding these two systems leaves the impression that they are not a significant part of GM's operations.</p> <p>Bio-based materials: No information was found regarding systematic integration of bio-based materials in GM products.</p>
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2. WHAT ARE THE IMPACTS OF CUMMINS' MANUFACTURING PROCESSES?

Company	Company Actions
Cummins: ✓	<p>Summary: Cummins is monitoring its energy use and other emissions data, but it has neither attempted to make year-over-year comparisons, nor set goals for future reductions. However, Cummins does appear to be attempting to establish a baseline for its greenhouse gas emissions, and has indicated its intention to set up monitoring and reduction systems in the near future. Furthermore, the company's incorporation of recycled coolants shows progress in the area of recycling policies. However, Cummins has no comprehensive approach to incorporate additional recycled materials in their facilities' operations.</p> <p>Energy and emissions: Cummins currently reports (in its 2005 sustainability report) on the following environmental data: amount of process materials commonly used in its facilities, direct energy usage (kW) by fuel type, indirect energy use (electricity), GHG emissions for the current year (by fuel type), water emissions, industrial landfilled waste, general refuse, and recycled materials. All data given is for the current year only; no year-over-year comparisons are made, nor is the information linked to production data.</p> <p>In its 2003 sustainability report, however, Cummins reported that from 2001 to 2002 it reduced its total electricity usage by approximately 1.5%, and it says it has energy conservation programs in place. From 2001 to 2002, Cummins reduced its total use of diesel fuel and fuel oil for product testing and energy by 9% through its analysis-led design initiative, but during the same period, the company increased its use of natural gas for product testing and energy by 33% (a net increase in total carbon dioxide emissions by 0.2%). It also reported that, from 2001 to 2002, Cummins reduced its total emissions to water by approximately 4%. In 2003 Cummins reported that from 2001 to 2002 it reduced its total landfilled industrial waste by 22% and its total landfilled general refuse by 8%.</p> <p>GHG policy: Regarding green house gas policy, Cummins stated in its 2005 Corporate Social Responsibility Report that it has developed its GHG emissions baseline for 2003 and installed appropriate monitoring systems to measure progress. The company is currently compiling historical data to</p>

	<p>develop a year 2000 baseline to measure the contributions of its Six Sigma projects before 2003. From this data, it will develop a GHG intensity reduction goal in the near future. Progress will be reported in future sustainability reports.</p> <p>Waste and recycling: Cummins' progress on the recycling front has come mostly from the reduction of toxics and solvents in its facilities processes. For example, in 2003 the company reported that since 1995 it has recycled 100% of machining coolant on site, and the company now has a facility-wide ban on mercury barometers and thermometers in order to minimize spill potential and contamination. (No evidence was available for comparison purposes to determine whether such practices are common across the automakers.) Additionally, at most facilities, machine coolant is recycled until ineffective and ultimately added to the wastewater stream for pretreatment prior to discharge to public treatment works. Other sustainability efforts in facilities management include the newly finished building codes in the company's Distribution Business, which now incorporate aspects of green design.</p>
<p>CAT: √</p>	<p>Summary: Caterpillar has set goals to improve energy efficiency and decrease greenhouse gas emissions through the EPA Climate Leaders Program. However, no evidence indicated that a company-wide system was in place to meet these targets, and the company does not have a sustainability report (or a similar document) in which it regularly publicizes progress on these metrics. No commitments have been made to source electricity from renewable sources. Caterpillar has shown individual examples of recycling in plant processes (such as paint recycling), but no evidence of a systematic process in place to address recycling in plants.</p> <p>Energy and emissions: In 2000 Caterpillar set a goal of improving its energy efficiency by 30% by the end of 2006. In December 2002, the company reported that it had already achieved an improvement of 10%. Caterpillar later committed to intensity-based reduction of its facilities emissions upon joining the voluntary Climate Leaders Program (EPA) in 2003, stating that it "pledges to reduce global GHG emissions by 20 percent per dollar revenue from 2002 to 2010."¹⁷² As of January 2004, Caterpillar reported that it had reduced its total U.S. greenhouse gas emissions by 35% from 1990 levels. According to other sources, the reductions in direct GHG emissions from facilities (450,000 tonnes between 1990 – 2001) came primarily from fuel-switching (from coal to CHP), maintenance upgrades (improving compressed air systems and reducing air turnover), and lighting retrofits.</p> <p>GHG policy: In reference to climate change, Caterpillar leadership has stated that "we believe that intelligent, responsible public policies addressing global climate change will ensure that environmental protection is compatible with strong global economic growth and development. The Climate Leaders program will enable Caterpillar to develop a global approach to reducing</p>

¹⁷² U.S. EPA, "Caterpillar Inc.," *Climate Leaders, Partners*, 22 Jan. 2006
<<http://www.epa.gov/climateleaders/partners/partners/caterpillarinc.html>>.

	<p>greenhouse gas emissions and reinforces our long-standing commitment to preserving and protecting our environment."¹⁷³ Caterpillar does not explicitly acknowledge the link between CO2 emissions and global warming.</p> <p>Waste and recycling: Caterpillar reports that it has developed a method of recycling paint. This process reuses paint byproducts generated from the manufacturing process. The company has announced plans to share this technology with other industries. It has also developed a welding technique using laser-projecting that eliminates hazardous waste and improves the quality of the weld. Caterpillar is also developing a membrane-filtration technology that increases the life of coolants and metal-working fluids, allowing for extended reuse of the coolants and fluids and reducing waste by 30%.</p>
<p>Daimler Chrysler: ✓</p>	<p>Summary: DaimlerChrysler has systems in place to reduce energy and emissions use at its individual plants, but it is unclear how stringent the goals are and the extent to which this system is followed outside of Europe. DaimlerChrysler states that it pursues energy efficiency and cuts carbon dioxide emissions by using lower carbon content fuels wherever possible, but no greenhouse gas targets appear to have been established. Certain emissions levels are monitored and reported at the company-level, but no targets have been set.</p> <p>Energy and emissions: DaimlerChrysler reports on energy consumption, direct and indirect CO2 emissions, NOx, SOx, VOC, and solvent emissions at a corporate level. In terms of waste output and water usage, DaimlerChrysler reports its waste in Mercedes and Chrysler vehicles per kg/vehicle produced and records total water intake. However, it does not appear to have set corporate targets for energy, emissions, waste, and water reduction at its facilities. Instead, DaimlerChrysler plants set their own individual environmental targets and implement their own plant-specific measures for achieving these targets, which are monitored under the EU Eco-Management and Audit Scheme (EMAS)¹⁷⁴ and published in the Environmental Statements of the individual plants. The company has declared a long-term goal of achieving closed-loop material cycles, and its “ultimate goal is waste-free production.” Daimler Chrysler says it encourages its suppliers and contractual partners “to pursue proactive environmentally responsible practices.”¹⁷⁵</p>

¹⁷³ Ali M. Bahaj, Vice President, Corporate Auditing & Compliance Division. U.S. EPA, “Caterpillar Inc.,” Climate Leaders, Partners, 22 Jan. 2006 <<http://www.epa.gov/climateleaders/partners/partners/caterpillar inc.html>>.

¹⁷⁴ “Eco-Management and Audit Scheme (EMAS) is the EU voluntary instrument which acknowledges organizations that improve their environmental performance on a continuous basis. EMAS registered organizations are legally compliant, run an environment management system and report on their environmental performance through the publication of an independently verified environmental statement. They are recognized by the EMAS logo, which guarantees the reliability of the information provided.” EMAS, “The Eco-Management and Audit Scheme,” 16 Jan. 2006 <http://europa.eu.int/comm/environment/emas/index_en.htm>.

¹⁷⁵ DaimlerChrysler, Sustainability Profile 2005: Reporting on Our Common Future, (Stuttgart, Germany: 2005), 2 Jan. 2006 <<http://www.daimlerchrysler.com/dccom/0,,0-5-511674-1-513344-1-0-0-0-0-0-36-220714-0-0-0-0-0-0,00.html>>.

	<p>GHG policy: DaimlerChrysler states that it pursues energy efficiency and cuts CO2 emissions by using lower carbon content fuels wherever possible. No information was found to show whether the company explicitly acknowledges climate change and/or its relation to increased levels of GHG in the atmosphere.</p>
<p>Ford: √+</p>	<p>Summary: Ford has many individual examples of green buildings, sourcing green power, and reducing emissions at its facilities. There is also evidence to suggest that Ford has implemented information systems to facilitate recycling by external parties, and leadership committees to promote recycling internally. The company has multiple examples of systemic programs to promote internal recycling, which have been or soon will be implemented company-wide. The company has also set some important energy targets and shown progress toward these goals. Ford acknowledges climate change and the increasing presence of greenhouse gases in the atmosphere, and it has created structural entities within the company to address these issues.</p> <p>Energy and emissions: Ford, like the other large auto manufacturers, is tracking its current facilities energy use and resultant emissions company-wide. The full roster of metrics includes the facilities energy efficiency index, worldwide facility energy consumption, energy consumption per vehicle, facility CO2 emissions, facility CO2 emissions per vehicle, and global manufacturing water use. It has set company-wide goals to improve manufacturing energy efficiency by 1% year over year (having already improved 12% between 2000 and 2004), to reduce US facility emissions by 6% (over an average of 1998-2001 emissions levels) between 2003-2006, and to reduce US facility emissions by 10% per vehicle produced between 2002 and 2012. Since 2000, Ford facilities have reduced their energy use by over 18% and CO2 emissions by over 15%. Green (renewable) power represents 3% of company power globally, and in the US, Ford meets 5% of its energy needs through hydropower, landfill gas, waste gas and other waste energy capture. As a founding partner in the EPA's Green Power Partnership, the company has set a goal of sourcing 2% of its US energy from entirely renewable sources, though it has not provided a timeline for its completion.</p> <p>Individual examples of Ford's energy and emissions reduction are abundant. The new Ford Rouge plant is a progressive example of eco-design; its architecture incorporates green building materials, green power, and green operating systems (such as a green roof for storm water filtration). Another individual example is the Dagenham plant in the UK, where the full electricity load is provided by onsite, cost competitive wind turbines. Ford has employed geothermal technology at its Lima, Peru Engine plant to provide cold water for ambient cooling and equipment cooling at significant cost savings.</p> <p>Regarding systems development, Ford is currently gathering data on CO2 emissions on its incoming/outgoing logistics in EU facilities, and replacing this shipping with barges and trains where feasible. The Dearborn Truck and Michigan Truck Plant is piloting the development and deployment of a fumes-to-fuel program which uses exhaust gases from paint operations to generate electricity and cut VOCs. Ford plans to implement this program</p>

	<p>company-wide by the end of the decade. The Ford manufacturing plant in Cologne, Germany, processes its wastewater with nanofiltration technology, removing heavy metal ions from its wastewater and recirculating them into the production process. In 2002, Ford reported that it expected to use this application in other facilities as well.</p> <p>GHG policy: Ford acknowledges the increasing presence of greenhouse gases in the atmosphere and the existence of climate change, stating in its 2004/5 Sustainability Report that climate change is a “complex 21st century challenge that requires a systemic social, political, technological, and business solution.”¹⁷⁶ Ford published its first “Report on the Business Impact of Climate Change” in 2005. Structurally, the company has created three entities to address climate change issues – the VP’s climate change task force, the Climate Change Steering Team, and the Sustainable Mobility Governance division – all of which are overseen by the Chairman and CEO. Ford is the only auto manufacturer to participate in the Chicago Climate exchange and the UK voluntary emissions trading scheme.</p> <p>Waste and recycling: Ford has taken some important first steps in incorporating recycling into its facilities on a systematic basis. The company intensified its recycling efforts with the incorporation of Recycling Action Team (RAT) patrols in all of its U.S. and European facilities. Ford was also the first to issue worldwide recycling guidelines to its suppliers and engineers, and the first corporation to receive the "Recycling Leadership" award from The National Recycling Coalition.¹⁷⁷</p> <p>Regarding systems development, the company has created the Total Waste Management system (TWM), which encourages waste-management suppliers to take an active role in reducing waste via pay-based incentives. Ford is introducing this system at 80 facilities worldwide. Plant process systems have also been developed to replace machining oil. By the end of 2003, 8 company facilities had replaced mineral oil with a renewable canola-based oil, a machine lubricant which costs less and performs better (hence improving energy efficiency). Ford expects more plants to adopt the same practice.</p>
GM: √+	<p>Summary: GM has set company targets for reducing facilities emissions and wastes, and has measured steady progress toward these goals. Additionally, GM’s “Cost Council Initiatives” program has created a company-wide system to monitor progress and share best practices related to facilities, including those associated with environmental issues. However, there has been no mention of any systemic program to transition the company to renewable energy. GM has set carbon dioxide reduction targets for its facilities, and the company is measuring and reporting its progress year over year.</p>

¹⁷⁶ Ford Motor Company, Our Route to Sustainability: Ford Sustainability Report 2004/2005, (Dearborn, MI: 2005) 2, 7 Jan. 2006 <http://www.ford.com/NR/rdonlyres/ei6d4yhioz67cdwscvil5ci7konvrxbmszj3ogi4eoc7cbk6yllpn3i6o2otwdbvbwjwl7ljcrdhzdh2jxwwq57bxeg/Ford_report.pdf>.

¹⁷⁷ A 5,000-member not-for-profit group, this membership organization is dedicated to maximizing recycling. For additional information, see website. The National Recycling Coalition, 10 Feb. 2006 <<http://www.nrc-recycle.org/default.htm>>.

Energy and emissions: GM reports on its facilities' energy use, CO2 emissions, recycling rate, water use, and sites that are ISO 14001 certified in its sustainability report. The company sets its goals in five-year increments. The global goals set through 2005 were as follows: an energy reduction of 10%, a CO2 decrease¹⁷⁸ of 8%, and a water use reduction of 10%. The company has reported its progress from 2000 through 2004 and has made the following progress towards these goals: it has reduced energy use globally by 13.6% (exceeded target), reduced CO2 emissions by 12.5% (exceeded target), reduced water use by 23.3% (exceeded target), and certified 99% of its facilities as ISO 14001.

GM has made some strides in employing renewable energy to power its facilities. The company was the largest non-utility direct user of landfill gas in 2003,¹⁷⁹ and it has installed a 1 MW solar system on the roof its Service parts ops warehouse in California.¹⁸⁰

GHG policy: GM "recognize(s) that the concentration of greenhouse gases in the atmosphere is increasing" and believes the company should work with all stakeholders to find solutions to the issues.¹⁸¹ The company does not explicitly acknowledge climate change, nor the link between CO2 emissions and global warming. GM has set CO2 reduction targets for its facilities and is measuring the company's progress year over year. It has not set CO2 reduction targets for its vehicles.

Waste and recycling: GM has set global targets to reduce total waste generated (in both products and facilities) by 15% from the 2000 baseline, and to increase recycling (of wastes not currently recycled) by 15%. The company has reported that it has reduced total waste by 11.5% (on track to meet target) and increased recycling by 4.4% (will not meet target). The company is also working to reduce the amount of oil generated in manufacturing, to better segregate oil streams, and to recycle on site. Since 2000, GM North America has had a program to recycle waste oil, which has generated significant cost savings. It also required all power train and metal fabricating facilities to use at least 5% recycled oil in 2004 and at least 10% by 2005.

To promote systematic change in its facilities management, GM has launched its Cost Council Initiatives program, which defines best practices, drives implementation at facilities, and uses scorecards to monitor progress. "Progress is supported by top management and reported monthly and quarterly

¹⁷⁸ GM takes responsibility for reporting emissions that result from operations under its direct financial ownership, management or operational control. Simply put, "whoever buys the energy, owns the ensuing GHG emissions and reductions." Emissions are calculated from fuel and electricity use at each facility. General Motors Corporation, General Motors 2004/2005 Corporate Responsibility Report, (Detroit, MI: 2005) 6-36, 15 Jan. 2006 <<http://www.gm.com/company/gmability/sustainability/reports/05/images/pdf/2004-05full.pdf>>.

¹⁷⁹ More recent data not found.

¹⁸⁰ General Motors Corporation, General Motors 2004/2005 Corporate Responsibility Report, (Detroit, MI: 2005) 6-16, 15 Jan. 2006 <<http://www.gm.com/company/gmability/sustainability/reports/05/images/pdf/2004-05full.pdf>>.

¹⁸¹ *Ibid*, 3-14.

¹⁸² *Ibid*, 6-13.

	<p>at the facilities and at [the] regional level.”¹⁸² The program is currently fully integrated into the US facilities network, and it is in the process of being integrated into the EU, Latin America, Africa, and the Middle East. At the plant level, GM has energy sufficiency plans, which document energy conservation methods and describe ways to look for energy savings. Additionally, its WE CARE program (part of the UAW) creates materials for pollution prevention (best practices and case studies). The energy and utility services group handles employee training, calculates energy efficiency savings and conducts performance monitoring.</p>
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3. WHAT ARE THE IMPACTS OF CUMMINS' PRODUCTS WHEN IN USE?	
Company	Company Actions
<p>Cummins: ✓</p>	<p>Summary: Cummins has design for remanufacture criteria in place, but it does not appear to have any design processes that incorporate Life Cycle Assessment (LCA) and DfE. Cummins' current practices, such as Analysis-Led Design, touch only one part of the design process, and do not substantially change the life cycle impact of the designed product.</p> <p>Cummins developed new technologies such as the ComfortGuard system and its Fleetguard filters to lessen its product emissions. Additionally, the company has commercialized renewable technologies such as fuel cells and landfill gas generators in its power generation division, as well as natural gas and hybrid bus products in its Engine Business Unit. However, Cummins has made no public commitments to moving toward renewable fuel-powered engines or power generation units.</p> <p>Design for Environment (DfE): Though Cummins has not fully incorporated DfE into its design framework, it has taken some steps in this direction. Cummins recently adopted its analysis-led design initiative, which employs computer simulations to replace traditional hardware testing, leading to significant cost savings and the emissions reductions associated with abandoning the production of vehicle hardware for initial testing. Cummins has also invested more than half of the \$2.4 billion it spent on research and development in the last 10 years in emission reduction technologies. (Of course, the entire industry was obliged to reduce its emissions output drastically during this period, due to pending legislation.) In 2003, Cummins reported that, as part of its environmental mission, it planned to develop a viable commercial product that emits zero particulate matter by 2010. However, it has set no such targets for emissions reductions beyond those required by US federal legislation.</p> <p>Design for Remanufacture: Like Caterpillar, Cummins also designs its engines for remanufacturing and uses these engines as feeders for its ReConditioning Business Unit.</p> <p>“Bridging technologies”: Approximately 24 percent of the Cummins</p>

	<p>Westport's revenue in 2004 came from its natural gas engines sold to China, and the joint venture has so far produced approximately 12,000 CNG generators. On the mobile vehicle front, Cummins China has supplied 500 Compressed Natural Gas (CNG) buses to the Beijing Public Transportation Corporation, and it has manufactured engines for 50 clean diesel transit buses in Shenzhen. As both fleets meet or exceed the Euro II standard, which is not due to be implemented in China for several years, CMI is offering products that produce far less emissions than required by law. The company also has joint ventures with Fiat, Iveco, and New Holland to develop more environmentally clean diesel engines, as well as an alliance with a Vancouver, British Columbia firm to investigate diesel engine applications for high pressure direct injection (HPDI), a technology which allows heavy-duty diesel engines to operate on cleaner-burning gaseous fuels, such as natural gas, with no reduction in performance or fuel economy.</p> <p>Hybrid and fuel cell: On the renewable fuel front, Cummins noted in its 2004 sustainability report that the company's power generation business has produced a new low-heat generator that operates on diluted methane gas, a fuel emitted from such sources as land fills, sewerage pipes and coal seams. Regarding hydrogen, the power generation business is also conducting fuel cell research through a contract awarded by the Department of Energy (DOE) to develop and commercialize a 10-kilowatt (kW) solid oxide fuel cell system for commercial and consumer applications.</p> <p>Product emissions monitoring and reduction: To address emissions reduction, Cummins has been proactively growing its Fleetguard filtration business. In 2003 Cummins reported that as part of its environmental mission, it planned to develop a viable commercial product that emits zero particulate matter by 2010. It has also employed creative techniques to reduce emissions and save fuel: in 2004, it launched the ComfortGuard system for trucks, which enables the vehicle's heating and cooling systems to function without the engine running. The company also collaborated with the Taiwanese government through an information exchange in 2003 and pushed them to adopt more stringent emissions standards for engines used in non-road applications.</p>
<p>CAT: √-</p>	<p>Summary: Caterpillar currently designs for remanufacture but does not have a comprehensive design for environment process. Though design for remanufacturing is an important part of the design for environment process, it is only one small subset of this criterion. Design for remanufacturing does not take into account the potentially harmful life cycle impacts of sourcing or employing the materials that comprise the engine, nor does it favor the design of cleaner, renewable fuel-powered engines. Additionally, design for remanufacture does not guarantee that the engine itself will be remanufactured at the end of its useful life, and thus any environmental benefit from this design process may be lost.</p> <p>Caterpillar's current business is primarily grounded in diesel technology, with</p>

	<p>minimal entrance into the compressed natural gas (CNG) market. Caterpillar has shown individual examples of partnerships to facilitate its development of stationary fuel cell technology, and the company has developed two stationary fuel cell power generation plants, but it has no plans for large-scale production. Company comments on this topic indicate that Caterpillar is exploring biofuel and hydrogen technologies through research and development activities, but it is not evident that the company has any plans to commercialize this technology in the near future.</p> <p>Design for Environment (DfE): Caterpillar does not currently appear to have a DfE initiative.</p> <p>Design for Remanufacture: In an interview with the Michigan team,¹⁸³ W. Stan Born, Caterpillar’s Director for Social Responsibility, stated that the company designs all its engines for remanufacturing and durability. A strong motivator for this design criteria is Caterpillar’s large remanufacturing business, which currently has six remanufacturing facilities throughout the US, Mexico, and Europe. It also recently acquired Wealdstone Engineering Ltd., a leading remanufacturer of gasoline and diesel engines in Europe.¹⁸⁴</p> <p>“Bridging technologies”: In November 2000, Caterpillar began a five-year research initiative, partially funded through a U.S. Department of Energy grant, to develop natural gas engines. It also planned to develop technology in the areas of combustion, air-intake, exhaust sensors, and control and engine design.¹⁸⁵ Caterpillar states on its website that it now offers natural gas engines (with ratings from 55-4705 bhp) to fit a wide range of industrial applications.¹⁸⁶</p> <p>Hybrid and fuel cell: In August 2001, the company announced a joint venture with Williams Bio-Energy, Nuvera Fuel Cells, the Illinois Department of Commerce and Community Affairs, and the U.S. Department of Energy to develop an ethanol-powered fuel cell power source as an alternative to traditional generators. As of October 2003, Caterpillar and FuelCell Energy had two joint installations of fuel cell power generation plants, one in Illinois and one in California. When asked about Caterpillar’s long-term view of moving from diesel to renewable fuels, Mr. Born stated that this is a part of the company’s R&D work, but he was not free to share details. In terms of biofuels and hydrogen, the company is monitoring progress of fuel infrastructure and technology advancements, though it is not leading the category.</p>
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¹⁸³ Stan Born, Director for Social Responsibility, Caterpillar, personal interviewed, 7 Dec. 2005.

¹⁸⁴ Caterpillar Inc., “Caterpillar Expands Remanufacturing Business with Purchase of Leading European Automotive Engine Remanufacturer,” 16 Aug. 2004, News Release, 22 Jan 2006 <<http://www.prnewswire.co.uk/cgi/news/release?id=128358>>.

¹⁸⁵ Socrates Corporate Social Responsibility Monitor, “Company Profile: Issues - Environment,” KLD Research and Analytics, Inc., 25 Dec 2005, <<http://0-web.kld.com.lib.bus.umich.edu/Socrates/companyprofiles/CompanyProfile.asp?company=%BB%BCO%88&area=4&Link=yes&Tlink=Text>>.

¹⁸⁶ Caterpillar worldwide, “Engines: Industrial/OEM,” 15 Jan 2006 <<http://www.cat.com/cda/layout?m=37533&x=7>>.

	<p>Product emissions monitoring and reduction: Regarding emissions reduction, Caterpillar has stated that it is working closely with U.S. regional governments and the EPA to establish retrofit strategies for its legacy products.</p>
<p>Daimler Chrysler: ✓</p>	<p>Summary: DaimlerChrysler has processes and structures in place to ensure DfE and LCA on all products at the corporate level. Whether these design criteria are being rigorously adhered to and extended to the Chrysler division is unclear.</p> <p>To reduce emissions, DaimlerChrysler has entered into multiple research partnerships to develop biofuels in various regional markets. The company has made inroads in developing both hybrid and hydrogen technologies across product models, with a primary emphasis on the hydrogen bus market. Like Ford and GM, however, DaimlerChrysler does not have any specific targets set for transitioning its full product line to these new technologies in the future.</p> <p>Design for Environment (DfE): DaimlerChrysler created its Design for Environment department (DfE) a decade ago, and gave it responsibility for evaluating new component and vehicle concepts for Mercedes-Benz passenger cars and commercial vehicles through LCAs. (No mention was made of whether this department was also functioning within the Chrysler division.) The DfE department is staffed with personnel from the Production departments, Dismantling and Recycling Planning, and Materials and Process Engineering. Since the DfE department began work, over 100 LCA assessments have been conducted. No mention was made of the content of these LCA assessments, nor of the study results’ impact on vehicle production.</p> <p>Design for Remanufacture: There is no evidence to suggest that DaimlerChrysler’s cars are designed for remanufacturing.</p> <p>“Bridging technologies”: DaimlerChrysler has a smaller range of technologies available than GM and Ford. It does have a long history of producing CNG buses, which it first produced in the 1970s. Today, DaimlerChrysler CNG (Mercedes brand) buses are found in Australia, Thailand, Brazil and Germany, with the Orion and Thomas-built bus lines primarily in operation in the US. The company makes Freightliner, Sterling, and Western Star CNG trucks, as well as Mercedes-Benz Sprinter vans with natural gas drive.</p> <p>Hybrid and fuel cell: In the hybrid and hydrogen category, the company has made the Hybrid diesel/electric Dodge Ram Diesel HEV since December of 2004, as well as the Orion VII hybrid buses (100 of which are currently in operation in NYC).¹⁸⁷ DaimlerChrysler has also had a joint venture with GM since early 2005 to develop more hybrid technology, and the first volume production models from this collaboration will likely be available as of early 2007. Regarding hydrogen, analysts have commented that “public transport,</p>

¹⁸⁷ It should be noted that Cummins produces the diesel engine offered in the Dodge Ram.

	<p>rather than the private automobile, is where Mercedes-Benz is launching fuel cell technology in earnest.”¹⁸⁸ It is currently running a large-scale test of its Citaro urban buses and has been testing fuel cell drive in vans since 2001. It has produced the hydrogen A-class F-cell and Dodge Fuel Cell Sprinters since 2004, and in March 2005 it created a B-class model with fuel cell drive. This 100+ test fleet is presently the largest fuel cell fleet of any manufacturer.</p> <p>Product emissions monitoring and reduction: Like GM and Ford, DaimlerChrysler is also tracking fuel economy, though only in the US and German markets. The company makes no specific commitments to emissions reduction, but pledges only to “further reduce CO2 emissions and the consumption of fossil fuels,” and to “aim to achieve a further reduction in exhaust emissions from our products.”¹⁸⁹ DaimlerChrysler has partnered with Choren Industries and Volkswagen to develop SunDiesel (a biogenous diesel fuel, made from wood or other plant residues, which they say will have no sulfur or aromatics and much less CO2). The company has started testing the fuel in several E-Class models. DaimlerChrysler also joined GM in the Indian Institute of Technology (Delhi) partnership, and its fleet testing started in 2005. Regarding hydrogen fuel, the company joined the Clean Energy Partnership (CEP)¹⁹⁰ in Berlin in 2004 to open the country’s first public hydrogen filling station; it is taking part in the associated road tests with ten F-Cell models based on the Mercedes-Benz A-Class.</p>
<p>Ford: √+</p>	<p>Summary: While Ford has created a new type of vehicle which incorporates cradle to cradle design,¹⁹¹ it has applied this design principle only to one concept vehicle. Recently leaked news of the Piquette Project, whose goal is to create hybrid, recyclable cars, indicates that Ford might be shifting toward greater use of DfE. However, no evidence was found that demonstrated current systematic employment of techniques such as Life Cycle Assessment (LCA) or design for remanufacturing across all product line design processes.</p> <p>Ford has also entered into research partnerships to develop biofuels, and it takes part in joint ventures to set up alternative fuel filling stations in various regional markets. The company is currently offering and developing a wide range of products designed for alternative and renewable fuels. In addition, Ford is making significant strides toward investing in and producing more vehicles powered by renewable fuels such as hydrogen. Like others in the industry, it has also made general statements about its commitments to alternative fuel vehicles, since they see this technology as critical to the company’s future success. Although Ford has no established goals and targets,</p>

¹⁸⁸ Stephen Williams, “Fuel cell-vision becomes reality,” *African Business* 285 (March 2003): 42-43.

¹⁸⁹ DaimlerChrysler, *Sustainability Profile 2005: Reporting on Our Common Future*, (Stuttgart, Germany: 2005) 43, 1 Feb. 2006 <<http://www.daimlerchrysler.com/dccom/0,,0-5-505410-1-511460-1-0-0-0-0-8-220714-0-0-0-0-0-1,00.html>>.

¹⁹⁰ The Clean Energy Partnership (CEP) is a collaborative venture, involving nine companies and the German government, dedicated to opening hydrogen filling stations.

¹⁹¹ In cradle to cradle design, products are engineered to employ materials that can be continuously reused and recycled, with a neutral or positive impact on the environment. For further elaboration, please see the McDonough Braungart Design Chemistry, LLC website. MBDC, 22 Jan. 2006 <<http://www.mbdc.com/>>.

they appear to be much more proactive than their peers in this area and thus receive a $\sqrt{+}$.

Design for Environment (DfE): While Ford has not institutionalized sustainability uniformly across its design processes company-wide, it has taken the first steps by employing the principles of cradle to cradle design in the creation of the Ford Model U Concept car, a hydrogen fuel cell car that is 25% more fuel efficient than a gasoline engine, with about a 300-mile range.¹⁹² The concept car, which was built in collaboration with William McDonough, a leading architect in green design, incorporates many bio-based materials (such as soy-based biopolymers and corn-based fillers) and recyclable polyesters. It has been designed for easy disassembly to facilitate remanufacturing.

Design for Remanufacture: There is no evidence to suggest that Ford's cars are designed for remanufacturing.

"Bridging technologies" (CNG, flex fuel, and clean diesel): Ford has a significant presence in the "bridging technologies" sector. It currently has 1.6 million flex-fuel (E85) vehicles on the road. For example, in 2003/2004, over 80% of its new vehicles sold in Sweden were Focus Flex Fuel Vehicles. Ford also released its Mercury Meta One concept vehicle (advanced technology diesel) in 2005.

Hybrid and fuel cell: In the hybrid and hydrogen category, the company has put a priority on expanding its production and product offerings. In the hybrid SUV category, it currently offers the Escape Hybrid and the Mercury Mariner. The Mazda Tribute is in the pipeline for release in 2007. In the sedan category, the company will be releasing the Ford Fusion and the Mercury Milan in 2008. In its hydrogen product line, Ford offers both hydrogen-powered internal combustion and hybrid fuel cells. According to company literature, Ford shuttle buses were the "first commercially available hydrogen vehicles in North America."¹⁹³ Ford will be sending six buses to Florida for its hydrogen highway initiative. Five are currently located in California, and the company is currently negotiating with other cities in the US and Canada for additional purchases. Regarding hybrid fuel cells (fuel cell + battery), the company is testing the Ford Focus fuel cell around the world, with twenty-five vehicles on the road and more to come.

Product emissions monitoring and reduction: Though Ford has not committed to a designated percentage of renewable fuel vehicles to make up its fleet in the future, it does report on its US fleet fuel economy and US/EU fleet CO₂ emissions. Ford has stated it will adhere to the voluntary agreement between the European Automotive Industry (ACEA) and the EU Commission to reduce its European fleet's CO₂ emissions by 25%/km driven by 2008 (as

¹⁹² Treehugger, "Ford Model U Concept SUV," 2 Dec. 2004, 22 Jan. 2006 <http://www.treehugger.com/files/2004/12/wip_ford_model.php>.

¹⁹³ Ford Motor Company, *Our Route to Sustainability: Ford Sustainability Report 2004/2005*, (Dearborn, MI: 2005) 4, 7 Jan. 2006 <http://www.ford.com/NR/rdonlyres/ei6d4yhioz67cdwscvil5ci7konvrbmszj3ogi4eoc7cbk6yllpn3i6o2otwdbvbwjwl7lrcrdhzh2jxwwq57bxeg/Ford_report.pdf>.

	<p>have GM and DaimlerChrysler). The company has also made fuel economy commitments in Australia and Canada. Other efforts to monitor and reduce emissions have been made through alliances to develop and commercialize cleaner fuels, such as its partnership with organizations and communities across Sweden to develop and commercialize natural gas and biogas filling stations.</p>
<p>GM: √+</p>	<p>Summary: GM appears to have design systems in place to promote DfE and to incorporate LCA in vehicle design across the company. It is unclear how strictly these processes are adhered to or how comprehensively they are implemented across the different vehicles lines.</p> <p>Like Ford, GM is currently offering and developing a wide range of products designed for alternative and renewable fuels, and it has made significant commitments to make fuel cells one of its vehicle technologies of the future. GM's grade reflects the same characteristics listed in Ford's evaluation.</p> <p>Design for Environment (DfE): GM has created a Global Life Cycle Analysis (LCA) subcommittee, which is tasked with guiding the company's design-for-the-environment (DfE) and pollution prevention programs.¹⁹⁴ GM has stated that its design focus is on the reduction of fuel consumption and emissions, the improvement of safety, and the facilitation of recycling. It has set a regional goal (in Europe) to increase the amount of recycled materials to 20% through optimized production procedures, though it has given no specific timeline for this implementation.¹⁹⁵ GM has said it will provide dismantlers with information about all removable plastic within the vehicle, as is required by the new European End of Life Vehicle (ELV) legislation. GM has also stated that it has established a process and system for handling ELV recycling in Japan.</p> <p>Design for Remanufacture: There is no evidence to suggest that GM's cars are designed for remanufacturing.</p> <p>"Bridging technologies": GM produces natural gas, flex fuel, and clean diesel technologies. In CNG, the company produces the Chevy Silverado and the Sierra pickups. According to company literature, GM is currently the largest producer of flex fuel (E85) vehicles in the US. In the sedan category, it currently offers the Saab 9-5 biopower and will be bringing the Chevy Impala and Monte Carlo to market in 2006. For E85 trucks, it offers the Chevy Silverado and the Sierra pickups and has planned the Chevy Avalanche for 2006. Regarding SUVs, the E85 Chevy Tahoe and Suburban, as well as the GMC Yukon & Yukon XL, are all planned for 2006. The Chevy Police and Tahoe Flex Fuel are also planned for 2006. In the clean diesel category, it has created the Opel ECO speedster concept car.</p>

¹⁹⁴ General Motors Corporation, General Motors 2004/2005 Corporate Responsibility Report, (Detroit, MI: 2005) 4-4, 15 Jan. 2006 <<http://www.gm.com/company/gmability/sustainability/reports/05/images/pdf/2004-05full.pdf>>.

¹⁹⁵ General Motors Corporation Opel, Opel Corporate Responsibility Report 2003/4, (Rüsselsheim, Germany: 2004) 23, 23 Jan. 2006 <http://www.gm.com/company/gmability/sustainability/reports/04/800_regional/opel_crr_121704.pdf>.

	<p>Hybrid and fuel cell: GM's main focus has been on hydrogen, though it also offers hybrids in the larger vehicle category. GM reports that it has over 350 hybrid buses in service in the US and Canada (sales of which began in 2003), and that it has created the industry's first hybrid pick-up. In the truck category, it will offer Chevy Silverado and GMC Sierra Hybrid Pickups as well as Saturn VUE green line SUVs in 2006. The Chevy Malibu sedan is to be released in 2007. In hydrogen, GM set the 2003 world fuel cell distance record, and in 2004 created an on-road prototype. It currently partners with the US Army to develop a fuel cell powered truck for non-tactical use, and it is collaborating with Suzuki Motor Corp and Toyota on fuel cell research.</p> <p>Product emissions monitoring and reduction: Like Ford, GM is currently tracking its fuel economy per gallon and CO2 per mile per model year (in percent increase/decrease). Also like Ford, however, it has not set any company-wide emissions reduction goals. The company will also adhere to the ACEA/EU commission agreement to reduce its European fleet's CO2 emissions by 25%/km driven by 2008. In other regional agreements, it has said it will increase fuel economy 11-30% by weight in Japan, increase fuel economy in China (5-10% in stage 1, 15% by stage 2), and will voluntarily raise fuel economy by 18% in Australia between 2000 and 2010. The company states it is partnering with BP, Shell, Exxon Mobil, and ChevronTexaco in the development of cleaner fuels, and with Germany, California, and Japan on their hydrogen filling station initiatives. The company is also engaged with the Indian Institute of Technology (in Delhi) to produce an oil/diesel blend based on oil of karanja seeds (a native plant with significant rural economic potential). This research will result in a locally supported fuel with fewer emissions and particulates. The pilot for production is currently underway and will soon be followed by an on-road performance test.</p>
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4. WHAT ACTION IS THE COMPANY TAKING TO ADDRESS SOCIAL ISSUES THROUGHOUT THE VALUE CHAIN?	
Company	Company Actions
Cummins: √+	<p>Summary: Cummins has a strong diversity program, upon which the company puts great emphasis. It has systems in place to deal with human rights concerns in the supply chain. Cummins' volunteerism program (through the Community Involvement Teams mentioned on page 23) is a longstanding, well-used program that has the support of top management.</p> <p>Diversity: Diversity issues are one of Cummins' strengths, and the company has had an extensive history of focusing on diversity issues. All employees are required to pass a comprehensive diversity training program, and additional follow-up training is mandatory for career advancement. Structurally, diversity issues are championed through the Chairman's Diversity Council, which sets hiring practices, supplier relations, benefits policies, and training. For this</p>

	<p>work, Cummins has received a score of 86% on HRC's Corporate Equality Index (2004). At the grassroots level, forty-eight Local Diversity Councils (LDCs) have been created to address diversity issues in the workplace; these councils handle recruiting, retention and cultural differences as they arise. Not only are policies in place to promote diversity initiatives, but the company has also created an audit team to ensure that these policies are being met. The team's 3-4 day visits to plants include one-on-one interviews with employees, a local site policy review, and observation of plant processes, after which the team reports its findings to plant and corporate management.</p> <p>Like Ford and GM, Cummins has a commitment to contract with small and minority-owned businesses, and it spent \$147 million with small business and minority-owned suppliers in 2004. (No percentage ratios were given.) The company also hosted a diversity procurement conference.</p> <p>Human Rights: Since 1995, Cummins has had a Code of Business Conduct. It has been translated into eight languages and used in all employee regular training. In its 2005 CSR report, Cummins announced that it had begun creating a code of conduct written specifically for suppliers, with implementation targeted for 2006.</p> <p>Community Capacity Building: The Cummins India Foundation was created in 1991 to support community development efforts in the region. In 2001 it helped launch a School on Wheels in Pune, India, to supplement the education of local children who cannot get to school regularly. The India Foundation has also established a women's engineering college. In Brazil, the Sao Paolo plant has built an elementary school and medical center.</p> <p>Volunteerism: Cummins runs its volunteer program through the Cummins Foundation. Employees form Community Involvement Teams (CITs) that volunteer in their communities and sometimes solicit small grants from the Cummins Foundation to support community projects. The company recently ran an "Every Employee, Every Community" volunteer program, giving every employee a half day to volunteer within their community, in order to celebrate Cummins' selection by the magazine Business Ethics as Top U.S. Corporate Citizen.</p>
<p>CAT: √-</p>	<p>Summary: Caterpillar has shown individual examples of programs addressing social issues in the value chain, such as the Destination Technology program and efforts to increase purchasing from women- and minority-owned suppliers. However, there are no goals associated with growing the number of these programs or expanding their depth.</p> <p>Diversity: Since 2004, Caterpillar has had a program to purchase goods and services from women- and minority-owned businesses. Though no specific numbers were given, in 2001 Caterpillar reported that since 1997 it had steadily increased its contracting with such firms through its small business development program. Caterpillar has also created a Corporate Diversity</p>

	<p>Council, and says it “support(s) and obey(s) laws that prohibit discrimination everywhere we do business.”¹⁹⁶</p> <p>Human Rights: Caterpillar has not publicly published a company Human Rights code.</p> <p>Community Capacity Building: Caterpillar’s capacity-building efforts are primarily limited to corporate philanthropy and donations. It does run an outreach program (entitled Destination Technology) for underserved middle school students in Peoria, Illinois, to promote interest in math, science and technology in the public schools.¹⁹⁷</p> <p>Volunteerism: Caterpillar showcases individual examples of its employees’ regional volunteerism on its website.¹⁹⁸ There does not appear to be one overarching volunteer program for its employees.</p>
<p>Daimler Chrysler: ✓</p>	<p>Summary: DaimlerChrysler’s Global Diversity council was newly formed in 2005. Though the diversity guidelines are said to have been in place since 1998, there are no details as to how rigorously diversity principles are applied within the company. The company is expanding its AIDS education campaigns (first started in South Africa) to a few other at-risk countries where the company operates. It has set up five vocational training programs to build capacity in the communities where it works. Though these programs are examples of systems the company has in place to address social concerns, they do not appear to be part of a larger corporate strategy.</p> <p>Diversity: DaimlerChrysler’s commitment to diversity is supported by a Global Diversity Council, whose senior managers determine guidelines to be followed within the company. These guidelines are based on diversity measures that have been practiced at DaimlerChrysler since 1998. Divisional Diversity Councils are responsible for communication and implementation at individual sites. Upon the merger of Daimler-Benz AG and Chrysler Corporation, a joint statement of equal opportunity and minority protection was codified in the DaimlerChrysler Diversity Statement. The Diversity Statement is implemented around the world in line with regional requirements.</p> <p>Community Capacity Building: In 2005, DaimlerChrysler drafted company-wide guidelines to promote AIDS prevention and protect people with HIV/AIDS against discrimination. DaimlerChrysler has had successful programs in place in South Africa since the early 1990s, and it now plans to extend these programs to other countries in which it operates, including Germany.</p> <p>Regarding educational programs, DaimlerChrysler has multiple vocational training programs around the globe. In Afghanistan, the company</p>

¹⁹⁶ Caterpillar Inc., “Corporate Responsibility: Social, People” 30 Jan. 2006
<http://www.cat.com/cda/layout?m=52861&x=7#diversity>.

¹⁹⁷ Caterpillar Inc., “Corporate Responsibility: Social, Communities,” 30 Jan. 2006
<http://www.cat.com/cda/components/fullArticle/?m=38723&x=7&id=191133&languageId=7>.

¹⁹⁸ *Ibid.*

	<p>organized training programs for mechanics and technicians, which enabled 60 young people to complete their training and find employment in service workshops set up by DaimlerChrysler. The DaimlerChrysler Automotive Academy in Perm, Russia and the Automotive Academy Kuwait provide postgraduate training for technical graduates. Additionally, the company conducts a training program for students from South Africa at the DaimlerChrysler plants in Germany¹⁹⁹ and funds the Beith Saher Training Center in the Palestinian Autonomous Territories.</p> <p>Volunteerism: There does not appear to be one umbrella organization through which DaimlerChrysler employees can volunteer. The company publicizes its employees' contributions to disaster relief around the globe, but only in financial terms.</p>
<p>Ford: √+</p>	<p>Summary: Ford has substantial systems in place to ensure diversity in the workforce and is an industry leader in promoting human rights through the value chain. The company has also made significant investments in its supply chain work force through both health and education programs. Lastly, its volunteer corps offers employees a way to participate in the community.</p> <p>Diversity: Ford has done a great deal in the area of diversity. Efforts to increase diversity have had upper management support through the Executive Council on Diversity (created in 1995), and have been given added momentum through the company's Multicultural Alliance (created in 2004). This task force of Ford executives meets regularly to ensure that diversity goals are being met with employees, customers and other key stakeholders. On a more grassroots level, the company has also created ten employee resource groups in the U.S. representing African-Americans; Hispanics; Asian-Indians; Chinese and Middle Eastern employees; disabled employees; working parents; gay, lesbian, bisexual and transgendered employees; female professionals; and employees of many different religious faiths. In August 2004, Ford Motor Company received a score of 100% on the Human Rights Campaign's (HRC) Corporate Equality Index,²⁰⁰ a ranking which measures the company's actions relating to gay, lesbian, and transgender issues. The industry average score was 71%. Since 1993, Ford, like General Motors and DaimlerChrysler, has required its suppliers to set a goal of purchasing 5% of their goods and services from minority-owned vendors. Ford also provides technical and financial assistance to suppliers. As of 2004, the company reported that minority-owned dealerships represented 7% of its 5,100 U.S. dealerships.</p> <p>Human Rights: Ford established its Code of Basic Working Conditions in 2003 in order to better safeguard human rights throughout the supply chain, and it manages this initiative out of the new office of Supply Chain Sustainability. Ford extended the Code to suppliers as a part of their contract</p>

¹⁹⁹ This initiative is part of the larger Southern Africa Initiative of German Business (SAFRI). For more information, see website. BDI, 23 Jan. 2006 <<http://www.bdi-online.de/en/3830.htm>>.

²⁰⁰ HRC rated companies on a scale of zero to 100 percent on factors relating to gay, lesbian, bisexual, and transgender (GLBT) issues. For more information, see website. Human Rights Campaign, 23 Jan. 2006 <<http://www.hrc.org/>>.

	<p>conditions in 2004. Pilot supplier training programs (developed in conjunction with Business for Social Responsibility²⁰¹) have been conducted in China (where 200 managers trained in 2004) and Mexico (where the program started locally in 2005). They are to be expanded in coming years. Also, in 2001 the company developed and piloted a new community impact assessment process, in which it identifies positive and negative impacts of plant operations, and publishes the results in a public report. Both the community impact assessments and the Code of Basic Working Conditions are being integrated into the Ford Production system that manages all plant production worldwide.</p> <p>Community Capacity Building: Ford began its HIV/AIDS program in 1999 with an educational program at its Pretoria, South Africa plant. The program is now expanding to other high-risk regions of the world where the company operates, including China, India, Russia, and Thailand. Ford is the first American multinational to extend antiretroviral treatment to its global workforce. Continued action on this front is in part motivated by a 2003 shareholder resolution that requested a report on the impact of HIV/AIDS on the company's global operations and encouraged continued action on this front.</p> <p>Ford has also designed and funded education programs to build local capacity. As of October 2003, Ford was operating 13 Youth and Adult Automotive Training Centers (YAATC) in 10 states. These centers recruit and train disadvantaged, displaced workers and adults from diverse backgrounds for entry-level automotive technician positions. In 2001, Ford donated \$1.5 million to three Detroit-area schools and colleges to start automotive repair training centers for disadvantaged youths and young adults.</p> <p>Volunteerism: In 2005 Ford launched its Volunteer Corps, which matches employee volunteers with community groups in need of assistance.</p>
<p>GM: √+</p>	<p>Summary: GM has systems in place to ensure diversity in the workplace. It has a human rights commitment, though the self-monitoring of suppliers does not necessarily ensure compliance. The company has made investments in the community through education programs, and GM's Volunteer PLUS International program offers employees a way to participate in the community.</p> <p>Diversity: GM tracks diversity metrics in its yearly sustainability report, measuring the percent of females and percent of minority employees in the US work force as well as tracking the incidence of discrimination charges. As for structural promotion of diversity issues, the company's Diversity Initiatives division coordinates a network of activities from the corporate level: Strategic champions (responsible for integrating all policies across interactions with Consumers, Dealers, Employees, Communities, and Suppliers), Diversity partners (volunteers who act as employee resources and change agents), and Affinity groups and the affinity group council (representatives of nine constituencies who are responsible for the recruitment, retention and development of their members). In August 2004, General Motors received a</p>

²⁰¹ BSR is a social responsibility consulting service. For more information, see website. BSR, 23 Jan. 2006 <<http://www.bsr.org/>>.

	<p>score of 86% on the Human Rights Campaign’s Corporate Equality Index. The goals of the Diversity Initiative were concretized in 2004, and all GM managers are expected to meet or exceed diversity goals.</p> <p>GM claims to be the first automaker to have established a Minority Supplier Development Program. It requires its Tier 1 suppliers to source a minimum of 8% of their Tier 2 GM business from qualified minority companies.</p> <p>Human Rights: GM’s Global Purchasing Supply Chain (GPSC) Policy requires that any goods or services supplied must comply with all applicable regulations or standards of the countries of destination. As GM’s Corporate Social Responsibility Report states, “suppliers are responsible for assessing themselves as well as their subcontractors’ compliance with...GM’s terms and conditions. Global Purchasing is implementing an electronic self-certification process that suppliers will use to notify GM of their assessment.”²⁰²</p> <p>Community Capacity Building: In 2003, 23% of GM’s charitable giving went to education programs, including scholarships and educational programs aimed at improving science and math skills and providing support for minority students in those subjects.</p> <p>Volunteerism: GM created its Volunteer PLUS International program in 1999 in North America and has expanded it in successive stages around the globe. The program complements the employees’ volunteerism: when a GM employee (or team of employees) donates over 50 hours of service to an NGO over the year, the employee may request a \$250 grant to support the organization.</p>
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²⁰² General Motors Corporation, *General Motors 2004/2005 Corporate Responsibility Report*, (Detroit, MI: 2005) 7-25, 15 Jan. 2006 <<http://www.gm.com/company/gmability/sustainability/reports/05/images/pdf/2004-05full.pdf>>.

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