



Assessment

A comprehensive evaluation of key technology topics

Report Number: 2002-51

Information Cutoff Date: 05-24-02

Distribution Date: 05-28-02

SUBJECT: Environmental Sustainability Strategies and Initiatives at DCX

PURPOSE: Background and context in support of policy and other decisions

SUMMARY:

- DCX makes extensive use of Life Cycle Assessment to support design-for-environment activities.
- DCX incorporates Eco-Teams in Vehicle Development Programs.
- DCX aims to lead in supplying transportation services in areas where infrastructure limitations adversely impact vehicle usage.

IMPLICATIONS:

- DCX is emphasizing life-cycle-based design for environment as a potential mechanism to gain competitive advantage.
- DCX actions indicate it believes environmental performance will become a marketplace distinguisher.

SOURCE ASSESSMENT: Company annual environmental reports, press releases, corporate web-sites, conference presentations, third party evaluations, and personal contacts

POINT OF CONTACT: Name: Robert D. Stephens Phone: 586-986-1608

CONTRIBUTORS: Daniel Y. Wong

ATTACHMENTS: DCX environmental assessment paper

DISTRIBUTION LIST

Advanced Technology Council

Energy and Environmental Core Team

Energy and Environmental Strategy Board

R&D and Planning

- Chris Borrioni-Bird
- Larry Burns
- Linda Chota
- Hazem Ezzat
- Roger Fruechte
- Steve Holland
- Jamie Hsu
- Barb Kunkel
- Bob Lust
- Bill Peirce
- Clay Phillips
- Jim Spearot
- Alan Taub
- Mark Verbrugge
- Brian Wicke

AP

- Hideki Isetani
- Yuji Yamamoto

Competitor Intelligence

- Lisa Pawlik

GME

- Detlev Heinke
- Veit Held
- Claus Keller
- Burghardt Kiy
- Carsten Knauf
- Stefan Ostling
- Harald Schenk
- Thomas Schmitz
- Wolfgang Voelxen

GM Powertrain

- Gary R. Blair
- Richard Peterson
- Dino Raptis

GMNA Manufacturing

- Pierre BouMansour
- Alan Hsueh

Market Intelligence

- Mark Thibault

PPC

- Kit Green

Saab

- Bang Soderlund

WWP

- William M. Hartman

Introduction

This is the second in a series of reports looking at OEM environmental sustainability strategies and initiatives. A comprehensive synthesis of all OEMs is to follow this series. Additional information can be found in a prior report (TI Report 2002-50: "[Environmental Sustainability Strategies and Initiatives at Ford](#)").

OEMs are increasingly being driven to provide sustainable mobility. Sustainability is broadly defined as the ability to meet the needs of the present without compromising the ability to meet future needs. Sustainable mobility is generally recognized as having three essential components: economic, social, and environmental. For an OEM to be economically viable in an ongoing, sustainable fashion, it must succeed in all three areas. An OEM must: 1) provide economical transportation products to a market with the financial means and desire to purchase them, 2) provide products that meet the needs of the market and be consistent with an available and sustainable transportation infrastructure, and 3) meet or exceed the needs/desires of the market for environmental performance.

Increasingly, Life Cycle Assessment (LCA) is a tool that is being used to support the design of products that meet the environmental aspects of sustainability. LCA is a methodology for evaluating the environmental burdens of acquiring raw materials, manufacturing, using, and disposing/recycling of end-of-life products as illustrated in Figure 1. The environmental burdens across these life cycle stages are largely determined by decisions made during vehicle design. Companies that are leading in the pursuit of sustainability are utilizing life-cycle based tools in the vehicle design process.

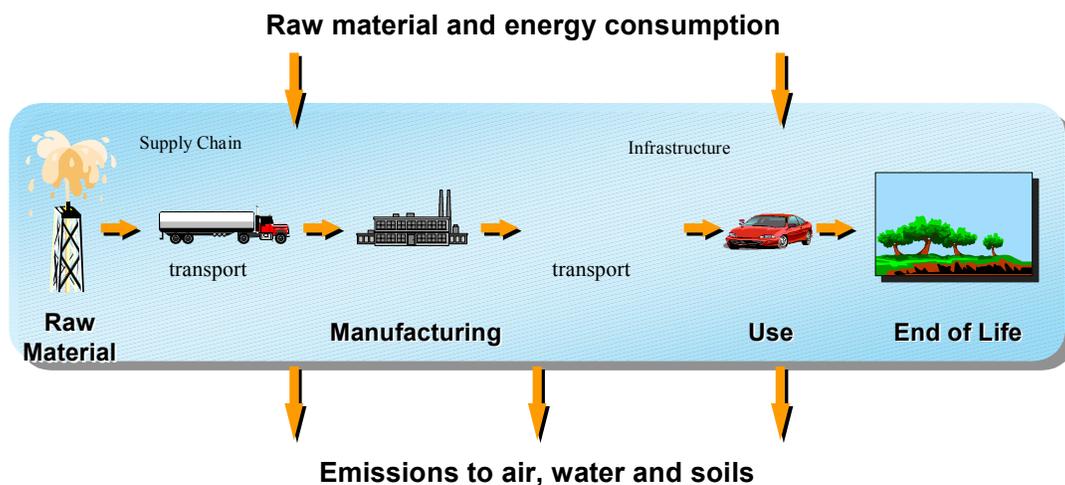


Figure 1. The Environmental Lifecycle

Corporate policies and activities directed toward achieving sustainable mobility are influenced by having dialog with, and acknowledging and addressing the concerns of, a number of stakeholders including:

- Government bodies
- Non-government organizations
- Shareholders
- Customers
- Academia

Hence, company performance in sustainable transportation covers a broad range of activities. However, the activities that will lead to sustainable mobility are still largely undefined. Consequently, success in this area is partly a matter of perception. However, in the area of environmental performance, there are more clearly defined metrics for assessment. In this report, the activities underway at DCX for achieving sustainability are covered in the following general categories:

- Corporate Policy
- Design, Stakeholder, and Strategic Initiatives
- Supply Chain Initiatives
- Facilities/Manufacturing
- Fuel Economy/Emissions
- Recycling/Recycled Content
- Socio-economic/Infrastructure Initiatives
- Developments in Alternative Propulsion

Following a review of activities in each of these areas, DCX's strengths will be reviewed in the Summary section.

The following acronyms will be used in this report:

DFE – Design for the Environment

ELV – End-of-Life-Vehicles

LCA – Life Cycle Assessment

PVC – Polyvinylchloride

VDP – Vehicle Development Process

VES – A German abbreviation for Transport Sector Energy Strategy

Corporate Policy

DCX has made a corporate commitment to the principles of sustainability. In corporate policy making, equal consideration is to be given to economic, ecological, and social objectives, while always considering the long-term impact of current decisions.

Their annual report states that their “responsibility also extends to nature and the environment which, as they provide the very foundations for human life and activity, must be protected and conserved.”

In their annual environmental report, DCX defines the objectives of sustainability as:

- Responsibility for the economic performance and long-term business success of the company;
- Responsibility for the sparing use of the Earth's natural resources and for maintaining an intact environment - for present and future generations;
- Responsibility for people and society- which the company sees itself helping to shape.

Design, Stakeholder, and Strategic Initiatives

DCX's strongest environmental emphasis is on DFE activities. They are an extensive user of LCA-based design tools to improve product environmental performance across the entire life cycle. Actions in this category of activities include:

- DCX has quietly moved toward leadership in the application of LCA tools in the VDP process. They now integrate eco-teams with each new vehicle development program, using the teams' skills and LCA expertise to provide material/processing information to make design decisions early in the development process. They were an early adopter of a single LCA software tool and now have a history of more than 10 years of utilizing this tool for LCA analyses. Having this historical background, they are now able to re-analyze components for material and/or processing changes without needing to perform full environmental LCA analysis, hence providing them with a time-efficient LCA-based DFE process. This process supports environmental targets that are established within each product program. Daimler's LCA/DFE process is fully integrated with each product development program.¹ They also involve tier 1 suppliers in the LCA/DFE process. This process is not as well integrated on the Chrysler side of the DCX business.
- DCX has implemented environmental leadership awards to promote environmental innovations throughout the company's day-to-day activities. The awards consist of a trophy and \$10,000 given at a corporate awards function. 2001 awards were given for projects in a number of areas, including waste minimization, LCA of the Mercedes S Class, use of natural fibers in vehicle components, changes to paint materials and processes, and improving air quality in mega-cities in developing countries. DCX claims that environmental programs have saved the company \$100M and has eliminated an estimated 60 million pounds of waste and emissions from their processes.
- DCX has established Environmental Synergy Projects to pursue improvements in areas such as environmental management, communications, and remediation.
- DCX has established an ecological product-testing program, which is now being used by 8 German environmental organizations to test DCX products for environmental compatibility. They are also developing a guide to provide environmental information to its customers regarding the environmental implications of their products, explaining the relationship between fuel economy, CO₂ emissions and the greenhouse effect and how these can be improved by driving behaviors.
- DCX is a member of a German research consortium, VES (a German abbreviation for Transport Sector Energy Strategy), which is exploring potential alternative fuels. The intent is to draw up a strategic proposal for Germany and the EU.

- DCX has worked with the Japanese Ministry of Economy, Trade and Industry, the Nippon Mitsubishi Oil Corporation, and Mazda Motor Corporation to conduct field trials of a fuel cell vehicle on the public roads in Japan.

Supply Chain Initiatives

This is an area of strength for DCX. They are working with suppliers to develop processes for recycling wastes and improving environmental performance of components. They recently reported Care Car II; a show car touting recycled content in 54 parts produced by 26 suppliers. Much of the technology in Care Car II is not new. However, DCX has worked extensively with suppliers to develop new processes to incorporate recycled materials. Accomplishments include:

- Development of Symar-T™, a material made in part from recycled tires, that is also recyclable itself. This material has been used in Jeep radiator air seals and is claimed to be a lighter weight material substitute.
- In another supplier program, waste paint sludge was converted into materials used in floor pan plugs.
- Eliminating PVC in the underbody of Mercedes Benz cars, except the M-class. DC has also committed to minimizing the use of PVC in passenger cars.
- In the area of social concerns, DCX is working with suppliers and the highway construction sector to develop special tires and roadway surfaces to reduce road noise.
- Substitution of truck freight carriers with rail in Ontario, Canada, claiming to have eliminated 120 truck runs per day to reduce roadway congestion.
- Establishment of a business in Brazil to provide components made from renewable materials. This supply chain initiative has implications to both environmental aspects of the vehicle, but also the socio-economic infrastructure in one depressed region of Brazil.

Facilities/Manufacturing Initiatives

This area of effort does not appear to be a strength at DCX, however their environmental focus is likely to change this in the future. Actions they have reported include:

- All DCX European manufacturing plants are now certified with EMAS, the EU's Environmental Management and Audit Scheme.
- DCX has developed uniform criteria and parameters for ecological site assessments, which they have conducted at every DCX facility.
- DCX claims to have the most advanced wastewater recycling facility in the western hemisphere in operation at their Toluca, Mexico manufacturing facility. It will recycle all of the water in use at the plant.

Fuel Economy/Emissions

DCX has active programs underway in hybrid propulsion development as well as in the development of small, light, highly fuel-efficient vehicles. DCX:

- Made significant investments in developing the Smart™ brand of highly fuel-efficient vehicles.
- Committed to the European VDA pledge of 25% reduction in passenger car fuel consumption by 2005 relative to 1990. For the Mercedes Benz fleet, this means a target of 6.8L/100km.
- Has active hybrid vehicle and fuel cell vehicle development programs. DCX is developing a Dodge Ram HEV with a 20% fuel economy improvement target, to be released in 2004. A similar program for the Dodge Durango was recently cancelled.
- Was the first to market with a “3L” vehicle, i.e. vehicle fuel economy of 3L/100 km, about 90g/km of CO₂.

Also, Detroit Diesel Corporation (wholly owned by DCX) has a commercial catalyst/filtration system that will reduce PM, HC, and CO emissions from diesel engines.

At the NAVC conference on Climate Change and Transportation, held on May 20, 2002, DCX’s Director, Environmental and Energy Planning was a strong proponent of using diesel technology to improve the fuel economy (and reduce the CO₂ emissions) in the US light duty fleet.

Recycling/Recycled and Renewable Content

DCX is focusing a lot of effort in this area and is starting to report significant progress. DCX has:

- A commitment to increase the recycled content in Chrysler, Jeep, and Dodge vehicles by 33%.
- Introduced the DCX Smart car, which contains plastics with 10% recycled material content.
- Worked with a number of suppliers to develop opportunities to turn waste streams into useable materials. DCX and NRI Industries developed Symar-T™, a TPE containing up to 25% rubber from recycled tires. The material is itself recyclable and is being used in Jeep products. NRI Industries recycles 15 million tires annually.
- Challenged 60 of their suppliers to find applications for waste paint sludge, ultimately working with one to develop a patented paint sludge drying process that is to produce a material that’s been used to produce 20 million floor pan plugs in DC products.
- Recently announced the development of a show car – “Care Car II”, a product of cooperative work with 26 suppliers to produce 54 components made fully or in part from recycled materials.
- Been working with Stermat, LaserLabor Adlershof, Ford, and BMW to develop a plastics separation technology to attain the EU ELV recyclability/recoverability standard. DC, like all European OEMs must meet the EU ELV standards of 85% recyclability and 95% recoverability by 2015. This is a technical challenge for all OEMs, requiring them to develop ELV strategies to meet these goals.
- The C-class Mercedes, which already attains the 85% recyclable/recoverable requirement of the EU 2005 standard.

- The C-class, which contains 33 components made from renewable materials, a 27% increase from its predecessor.
- Worked with the government of Para (a state in Brazil) and the University of of Para to set up a production facility with a goal of producing 80 tons of natural products per month with up to 60% being used in DCX products.
- Started using renewable lubricants at some of their manufacturing facilities.

Socio-Economic/Infrastructure Initiatives

DCX seems to be positioning themselves to be a leader in transportation “services”, addressing long-term issues of sustainable mobility. Examples include:

- Working with the Berlin Traffic Management Center (VMZ) to develop traffic management/trip management systems to improve the efficient use of the existing infrastructure. Limitations of traffic infrastructure are becoming a growing concern in many cities in Europe.
- In Germany, Smart buyers automatically receive a year’s free membership in a car-sharing program. Pilot programs also exist in a numbers of German cities enabling season ticket holders of mass transit systems to use Smart cars free of charge in a car sharing program.
- Development of Fleetboard, an internet-based system for managing freight fleets and individual trucks to improve efficiency and reduce fuel consumption by reducing the number of trucks running empty.
- Helping to reduce congestion on Ontario’s highway 401 by replacing trucks with Canadian Pacific Railway’s Expressway service, thereby eliminating 120 truck runs per day.
- Providing eco-training to commercial vehicle and passenger car drivers for five years, teaching them how to save fuel by changing their driving habits. DCX is also working on a guide to provide customers with information on how to reduce fuel consumption and the relationship between it and CO₂ emissions, and the greenhouse effect.
- Establishment of a factory (POEMAtec) in Belem to build backrests, head restraints, bunk cushions, and sun visors for Mercedes Benz vehicles using coconut fibers and latex. This technology promotes sustainability by utilizing renewable resources, providing economically viable products, and improving the economic quality of life in an otherwise depressed region. It will provide income for 5,200 people.
- Working with the EU to establish a common noise policy.
- Working with DUH to develop an Ecological Product Testing protocol now being used by 8 German environmental organizations to test DCX products for environmental compatibility.

Developments in Alternative Fuel/Propulsion

DCX, in conjunction with Ballard, has a very active fuel cell development program. They have also made investments in electric vehicles and hybrid vehicle programs. DCX has made the following developments in this area:

- Development of the first 3L vehicle, i.e. a vehicle capable of traveling 100km on 3L of fuel. The Smart Cabrio utilizes a common rail direct injection diesel engine.
- Has road tested a fuel-cell-powered Town & Country minivan, the Natrium, in April of 2002, which uses sodium borohydride salt as the hydrogen source. DC has also developed the NECAR 4A, a fuel cell powered version of the Mercedes A-class model. Delivery of a passenger car fleet is scheduled for 2004. A Mercedes Benz Sprinter van was scheduled for delivery to Hermes Versand Service in 2001. DCX plans to introduce a gasoline-fueled fuel cell hybrid electric vehicle next year. DCX has also developed the first fuel-cell powered bus and claim to have sold approximately 30 of these buses for operation in 8 cities in Europe and Iceland.
- Has purchased the assets of Global Electric MotorCars, LLC (GEM), the largest producer of electric vehicles that can be licensed for use on public roads. DCX intends to market Neighborhood Electric Vehicles with maximum speeds of 25 mph. DCX has also developed the Electric Powered Interurban Commuter (EPIC) being used at the Los Angeles World Airport.
- Committed to having A Dodge Ram HEV available by the beginning in 2004. A similar program to develop an HEV Dodge Durango was recently cancelled.
- Plans to sell fuel cell powered Sprinters to Hermes, a parcel delivery service, for use initially in Stuttgart and later in Hamburg.
- Has committed to providing the California Fuel Cell Partnership with 15 fuel cell vehicles.

Summary

The strongest environmental initiative within DCX is their use of LCA in the design process. DCX is the industry leader in utilizing LCA tools in their vehicle development programs. They believe there are direct cost benefits to these activities and have assigned significant headcount to this effort while also establishing official organizational structures and functional roles to implement the process.

DCX has also worked well with their suppliers to develop new processes to convert waste into useful materials and has made significant progress in utilizing recycled and natural renewable materials in their vehicles. For example, 10% of the plastic content in the SmartTM Car is recycled content.

DCX, in conjunction with Ballard, has a very strong fuel cell vehicle program with a number of vehicles under test. They have also sold 30 fuel cell powered buses to be used in a number of European cities.

DCX also aims to be a leader in transportation services by addressing infrastructure limitations, particularly in European cities by establishing car-sharing programs.

References

1) The Use of Life Cycle Information in the Automotive Sector in Europe, Prepared for Battelle Institute by Five Winds International, March, 2001.