



**Packaging  
Green Marketing  
EcoDesign for Businesses**

San Jose State University  
Environmental Studies 152



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**Agenda**

- Packaging
  - Introduction
  - Legislation / Economics
  - Env. friendly Strategies:
    - Source Reduction
    - Selection of Materials / DfE
  - Future Packaging
- Green Marketing
- EcoDesign Business Planning

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**Packaging Introduction**



- Most visible component of waste streams
  - 1/3 of total annual household garbage
- Volume of packaging increasing exponentially over 40 years
  - Population increase
  - Convenience products
  - Self-serve retailing
  - Food preservation
  - Single use → disposal

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### Green Dot Economics

- Wine bottle
  - Weight-related fee:
    - Glass bottle: 400 g x 7.6 cents/kg = 3.040 cents
- Coffee
  - Weight-related fee:
    - Paper wrapper: 7.63 g x 20.6 cents/kg = 0.157 cents
    - Composite film: 9.96 g x 104.5 cents/kg = 1.041 cents
  - Total weight-related fee: 1.198 cents
- Bottle of aftershave in a cardboard box
  - Weight-related fee:
    - Glass bottle: 130.70 g x 7.6 cents/kg = 0.993 cents
    - Plastic lid: 18.42 g x 140.3 cents/kg = 2.584 cents
    - Cardboard box: 25.35 g x 20.6 cents/kg = 0.522 cents
  - Total weight-related fee: 4.099 cents




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### Green Dot Benefits

- 20.3 billion KW-hrs of primary energy were saved by recycling 5.7 million tons of used sales packaging through the System.
  - Converted into electricity, this would mean that each of the almost 38 million households in Germany could wash a machine-load of laundry about 200 times a year or run the drier 54 times.
  - Emissions of global warming gases were cut by 1.16 million tons. Equivalent to heating-oil consumption in 161,000 households (370,000 people)
- Packaging recycling with the Green Dot saved as much gasoline last year as 9,300 cars would use in their entire lifetimes (252,122 tons of crude oil → 105 million liters of gasoline)

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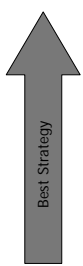
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### Waste Prevention Techniques: 4Rs

- Reduction
  - Do I really need it? Biggest opp. for \$ savings
  - e.g. Berkeley: ban on PS take-out boxes
- Reuse
  - ca. 93% more efficient than recycling
  - Innovative commercial solution/business model: [www.iReuse.com](http://www.iReuse.com)
- Recycling
  - ! Recycling ≠ Downcycling !
- Recovery
  - e.g. materials, energy




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### Packaging Source Reduction

- Avoid unnecessary components
  - Primary consumer packaging
    - In direct contact with the product
      - Toothpaste tube, CD Jewel Case, etc.
  - Secondary packaging
    - Package around the primary packaging for display or security purposes
      - Toothpaste box, cardboard and/or plastic CD enclosure; shirt wrappings
    - Transport/distribution packaging
      - Cardboard boxes, pallets, shrink-wrap, strapping, polystyrene (PS) beads ("popcorn"), bubble wrap
- Example: toothpaste boxes have been eliminated in countries with strict waste laws.



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### San Francisco

#### Plastic Bag Reduction Ordinance

- Requires large (sales > \$2M) grocery stores to discontinue use of petroleum based plastic bags (e.g., polyethylene)
- Can use compostable materials
  - e.g., derived from cornstarch
  - Recyclable paper bags with >40% post consumer recycled content
- Currently 180M bags/yr in SF alone (240/person!)
  - Equal to 774,000 gal of oil;
  - @ 22.4 lb CO2/gal = 8,700 tons CO2/yr
- Other places (e.g., Ireland) charge tax on plastic bags (€0.17 ~ \$0.25) → 90% reduction



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### Selection of Packaging Materials

- Materials:
  - Metals (aluminum & steel)
  - Paper & cardboard
  - Glass
  - Plastics
  - Composites
- NO MATERIAL IS UNIVERSALLY IDEAL
  - Each system performs differently
  - Trade-offs

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### Tellus Institute Waste Study (1992)

- Recycled materials
  - IN ALL CASES, production of recycled materials has lower environmental impact than virgin materials. ALWAYS use recycled
- Polyvinyl chloride
  - PVC has the worst environmental impact...vinyl chloride monomer is carcinogenic, incineration can produce dioxins
- Waste reduction
  - Apart from PVC, the lightest weight material = least harmful. Focus on Source Reduction

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### "Lightweighting"



- Lightweight packages produce less waste than packages manufactured from materials with higher recycling rates and use less energy to transport

Product	Package type	Material	Recycling Rate (%)	Package discarded per l of milk (gms)
Fresh milk	Plastic bag	LDPE	0	6.2
Fresh milk	4 l bottle	HDPE	42	10.9
Fresh milk	2 l bottle	HDPE	42	12.3
Fresh milk	2 l gable-top carton	Liquid paperboard	12	27.7
Fresh milk	1 l gable-top carton	Liquid paperboard	12	27.9
Fresh milk	0.5 l gable-top carton	Liquid paperboard	12	30.8
Powdered milk	1 kg bag	Laminated plastic	0	2.9

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### Case Study: Al Cans

- History
  - 1809: Nicas Appert, wins 12,000 FF prize for preserving food through sterilization and canning
  - 1810: English patent for tin-plated iron can
  - 1880-1890: automated can manufacturing
  - 1935: 1<sup>st</sup> 3 piece steel beverage can; Kreuger Brewing
  - 1940s: Government shipped huge quantities of beer in cans to servicemen
  - 1958: 1<sup>st</sup> Aluminum beverage can: Coors
  - 1960: 20 B steel cans/yr; easy opening can
  - 1963: Reynolds pioneers modern method of Al can manufacturing
  - 1972: Aluminum multipack beverage cans introduced
  - 1978: 50% Al/50% steel (20B each)
  - 1996: virtually all steel in beverage cans replaced by Al
  - -2000: 100B Al cans/yr

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### Case Study: Al Cans

- Process
  - 2 pieces: base and sides from one piece
  - Filled with beverage, then sealed with top
- Thickness
  - 0.3mm (0.0118")
- Can weight
  - 33.35 cans/lb. 13.6g/can
- 100.5 B! cans/yr
  - 3,180/sec
  - 49 B new, 51.5 B recycled
  - 335/person!
- New Al → 2.3MJ/can = 639 Whr → 1 lb CO2
- Value ~ 1.5¢/can

http://www.mmat.ubc.ca/courses/mmat380/lectures/2004/Case%20Study%205.pdf

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### Leightweighting: Al Cans

- 1985 can = 0.013", 15 gm/can
- 2005 can = 0.0118", 13.6 gm/can
- 9.2% reduction in mass, 1.4 gm/can
  - Energy: 47 Wh/gm for new cans
  - 49B new cans x 1.4 g/can x 47 Wh/g = 3.22 x 10<sup>6</sup> MWh
  - x 15.8 lb CO<sub>2</sub>/MWh ÷ 2000 lbs/ton ÷ 10<sup>6</sup> tons/Mt = 2.55 Mt CO<sub>2</sub>
- Vehicle equivalent:
  - + 5.7 tCO<sub>2</sub>/vehicle x 10<sup>4</sup> t/Mt = 447,000 vehicles
- Cost savings: ~\$1.10/kg
  - 49B new cans x 1.4 g/can ÷ 1,000 g/kg = \$68.6M

In the 1970s the aluminum in beverage cans was .017 in. Lightweighting progress leveled-off in the early 80s, then resumed in 1984 due in part to computer modeling.

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### Design for Reuse

- Reusable packaging
  - Starbucks...use your own mug and save \$0.10 per purchase
    - \$20 mug...will take about 30 weeks for payback. ☺
- Reusable plastic pallets and boxes
- Refillable products
  - Body Shop
  - Detergents

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### Reusable Boxes

Box Material	# of times used	# of boxes per million shipments	Weight of box (lb)	Total wt of box per million shipments (tons)
One-way corrugated	1	1,000	1.5	750
One-way corrugated	2	500	1.5	375
Reusable corrugated	5	200	2.2	220
Re-usable plastic	250	4	5.5	11




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### Design for Recycling

- Packaging made from a single material should be easily recyclable
- However, a system for recycling is needed to make an effective program
- Barriers:
  - Volume...need sufficient volume to make it worthwhile
  - Contamination...e.g., food
  - Multi-component packaging...e.g., laminated materials, metal + plastics, etc.
  - Financing... who pays? who is responsible?

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### Design for Degradability

- Use of natural fibers
  - Non-wood pulp, bamboo, bagasse
- Photodegradable plastics... breakdown form but don't disappear
  - Useful for 6-pack rings
- Education
  - Composting vs. landfilling




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### Future Packaging

- Reduction
  - Minimum amount needed
  - Minimum weight
  - Bulk packaging (reduce package: package wt. ratio)
- Re-use
  - Durable materials
  - "In-mold" labels
  - Efficient return system
  - Monetary incentives
- Recycling
  - Single material packaging
  - Use materials for which a collection system exists
  - Water soluble adhesives for labels
  - In-mold identification symbols for plastics
- Use post-consumer waste materials
- Use biodegradable materials
- Safe disposal of "toxics"
- Marketing!

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### Green Marketing

- Used to promote the sale of environmentally superior products and services.
- Strong marketing too in some regions of the world.
- Why do it?
  - Perceived opportunity to further economic objectives
  - Moral obligation to be more socially responsible
  - Governmental drivers
  - Competitive pressures
  - Cost factors




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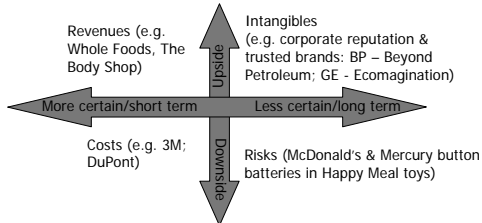
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### Green Marketing as Competitive Advantage

2 Basic categories of competitive advantage:

- Lower costs compared to competition
- Differentiate product (quality, features, service...)




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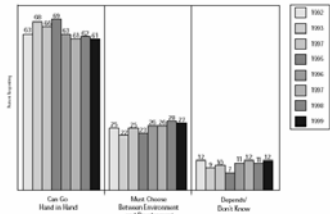
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## Forces behind green marketing: public perceptions

Marketers look at perceptions over time to confirm trends. Figure 1 shows that during the 90's the majority public perception was that economic development and environmental protection can go hand and hand.

Figure 1. Environmental Protection and Economic Development Can Go Hand in Hand




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## Opportunities

- Consumers becoming more concerned and aware about the natural environment.
- 1992 study of 16 countries, more than 50% of consumers in each country, other than Singapore, indicated concern about the environment
- 1994 study in Australia found that 84.6% believed all individuals had a responsibility to care for the environment. Additional 80% indicated that they had modified their behavior, including their purchasing behavior, due to environmental reasons
- Examples:
  - McDonald's replaced "clam shell" packaging with waxed paper because of increased consumer concern relating to polystyrene production and Ozone depletion
  - Tuna manufacturers modified fishing techniques because of the increased concern over driftnet fishing, and the resulting death of dolphins
  - Xerox introduced a "high quality" recycled photocopier paper in an attempt to satisfy the demands of firms for less environmentally harmful products.




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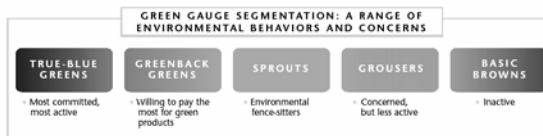
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## Forces behind green marketing: consumer behavior

- Market research can segment "green" consumers based on actual purchasing behavior. This research on US green consumer segmentation was performed by the Roper marketing group in 2001.



RoperASW  
THE POWER OF INTELLIGENCE IN ACTION

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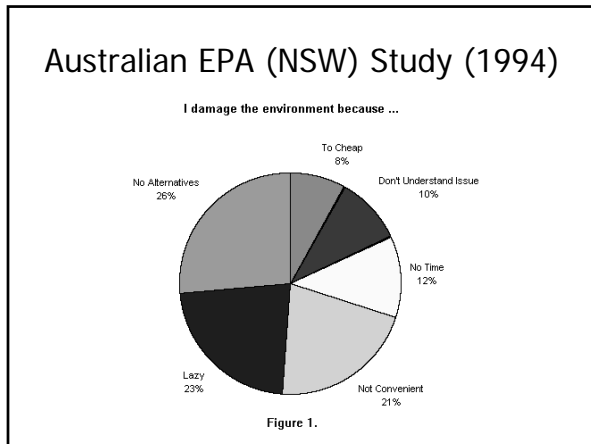
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- ### Forces behind green marketing: legislation
- Governmental regs change the way many companies do business. Spurs new marketing strategies as global business expands.
  - Landmark US environmental legislation affecting products:
    - The National Environmental Policy Act, 1969
    - The Clean Air Act, 1973, (leading to automobile CAFE standards)
    - The Clean Water Act, 1973 Endangered Species Act, 1975
  - State and local laws regulate air quality, toxic content in packaging, bottle deposits, battery and hazardous waste disposal, materials recycling, etc.
  - European Union "take-back" legislation requires collection and recycling of automobiles (85% of the vehicle reused/recycled by 2005) and used electronic or electrical equipment (WEEE directive).
    - Similar take-back regulations developed in East Asian countries, Canadian provinces, and soon in California.
  - Framework for Energy Using Products (EuP): July '07

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- ### Environmental certification / Eco-labels
- Environmental certification uses an external organization to verify that a product or material meets or surpasses specified environmental performance criteria.
  - The testing is organized to be objective and the results of the tests are intended to be independent of payments made to the certifying organization.
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## Environmental certification / Eco-labels

- The US **Energy Star** program is organized by the US EPA. The program provides a marketing incentive for companies to develop more energy efficient products. It is the most successful environmental certification program in the US. For example, Energy Star qualified dishwashers use up to 25% less energy than the federal minimum standard for energy consumption.



- The **Forest Stewardship Council (FSC)** introduced an international labeling scheme for forest products, which provides the most extensive and credible guarantee that the product comes from an ecologically managed forest.



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## Environmental claims / "Green-washing"

A company might intentionally or unintentionally present misleading claims when promotion "green" products or services. The

**Federal Trade Commission (FTC)** has developed specific guidelines to help prevent companies from overstating "green" benefits, thus protecting consumers.



- Green claims must:
  - Clearly state environmental benefits;
  - Explain environmental characteristics;
  - Explain how benefits are achieved;
  - Ensure comparative differences are justified;
  - Ensure negative factors are taken into consideration; and
  - Only use meaningful terms and pictures.

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## ISO Environmental claim standards

- The International Organization for Standardization (ISO) has developed the 14020 series standards for product environmental claims.
  - The ISO 14020 family covers three types of labeling schemes:
    - **Type I** is a multi-attribute label developed by a third party;
    - **Type II** is a single-attribute label developed by the producer;
    - **Type III** is an eco-label whose awarding is based on a full life-cycle assessment.



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### Green marketing strategies: Secondary green message

- Many consumers are cautious about buying "green" products because they perceive green products to have lower quality.
- Many market experts advise that the primary qualities of the product be promoted first, and that the environmental benefits be placed as a secondary message. This provides an additional reason to purchase the product.



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### Green marketing strategies: Smart Car marketing

- Designed by Swatch and engineered by Mercedes Benz, the Smart Car is only 2.5 meters long.
- Environmental benefits were promoted as secondary to the overall performance of this urban vehicle. Benefits include:
  - Excellent visibility combined with a very small turning circle
  - Unsurpassed ease of parking
  - Modular panel design
  - Average 58 mpg
- Market result: 110,000 Smart cars were sold in Europe in 2001, and they are scheduled to become available in the USA in 2008.



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### Green marketing strategies: Ecology as a primary benefit: Vulcan Dishwasher

- Vulcan, a manufacturer of dishwashers in Australia, created a new washer with the RMIT EcoReDesign\* team.
- Designed from the inside out, engineers developed a more efficient water system and heating elements. Designers created a control panel encouraging the use of the energy efficient and water-conserving wash programs.
- Environmental gains included:
  - AAA rating for water conservation
  - Low end-of-life cost through recycling
  - Highest energy rated dishwasher in Australia
- This strategy established Vulcan as a market leader.



\*EcoReDesign team, Center for Design, Royal Melbourne Institute of Technology

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### Green marketing strategies: Building a brand reputation

- A good brand name evokes a clear and positive impression in the mind that includes both tangible and intangible benefits. You relate a brand to its unique promise of quality.
- Effectively positioning, managing and marketing of brand(s) can increase market share, increase the perceived value of products, help retain customers, and increase the value of a company.
- Discussion: What brand names are associated with environmental awareness?



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### EcoDesign business planning

- Businesses can undertake a wide range of actions to address environmental issues within their operations. For many these actions merely comply with environmental laws and regulations.
- Environmental Management Systems (EMS) are useful to monitor operations. Some companies have broader programs that integrate product planning. Many develop an environmental policy that guides all business planning.
- Key is that a given business must focus on key env. issues relevant to their core business (incl. upstream & downstream analysis) in order to be successful (e.g. Starbucks vs. Ford)



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### EcoDesign business planning

CASE STUDIES:

- Sportswear - Nike
- Consumer Electronics - Canon
- Furniture - Herman Miller

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### Environmental policy as foundation for environmental product planning

Nike's corporate environmental policy

- Integrate principles of sustainability into all of their business decisions
- Scrutinize our environmental impacts in their day to day operations and throughout every stage of the product lifecycle
- Design and develop product, materials and technologies according to the fundamental principles of sustainability



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### Change requires specific strategies

- Develop sustainable "best practices" associated with design, development, engineering, manufacturing, packaging and product recapture, enabling the development of a product sustainability index.
- Nike's advance materials group is researching substitutions to some of the materials identified as being harmful to the environment.
- Develop closed loop systems that enable Nike to take 100% responsibility for all products created.



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### Managing Public perception

- Companies need measurable, consistent results over time to influence public perceptions about environmental commitments

"Nike Steps Up Greenwashing with New Organic Products"

- The Guardian reports that Nike is launching a line of environmentally friendly products in a bid to head off its critics. The US sportswear giant will launch a range of PVC-free products and this autumn intends to launch a range of clothing made out of 100% organic cotton. Nike is the world's largest buyer of organic cotton, which is incorporated in small percentages to some of its products.
- Greenpeace said the move did not go far enough and must be extended across all Nike products to avoid being seen as a "greenwashing" tactic.
  - Source: [www.organics.com](http://www.organics.com), January 2003



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## Business Growth and Social Values

### Canon

- "Our corporate philosophy is kyosei, which means 'living and working together for the common good'. We seek coexistence and harmony in our pursuit for corporate growth and development to contribute towards the prosperity of the world and the happiness of mankind.
- We aim to help realize a society of sustainable development by maximizing resources efficiency to contribute towards the prosperity of the world and the happiness of mankind.
- We integrate environmental and economic goals in all corporate activities in line with the EOCD Policy, provide 'Green Products' by improving resource efficiency through innovation, and also eliminate behaviors that threaten the health and safety of mankind and the environment."

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## Philosophies into Design Practices

- Canon's business product groups' equipment recycling process:



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## Environmental Policy Statements

- Herman Miller's Environmental Policy Statement
  - "At Herman Miller respecting the environment is more than good business practice – it is the right thing to do. We believe that continued economic growth and environmental protection are inextricably linked – that the quality of life depends on meeting human needs without destroying the environment on which all life depends. As business leaders we are committed to develop sustainable business practices that meet the needs of the present without compromising the welfare of future generations. Sustainability demands that we pay attention to the entire life cycle of our products. We will develop strategies that enable us to move toward sustainability while enhancing the value offered to customers. We will measure and monitor progress toward our environmental goal(s) as a key metric of our business success."

HermanMiller



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## Credibility

- To be credible, policy goals must reflect actual practice.
  - Go beyond mere compliance with our environmental standards
  - Reduce, reuse and recycle the materials used in our products and processes
  - Pursue the elimination of waste of any kind
  - Implement technologies to efficiently use energy resources
  - Design our products, processes and buildings for the environment
  - Promote environmental knowledge and awareness

 Herman Miller



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## Product Development Tools

- Herman Miller initiated DfE (design for the environment) team goals.
  - Development of an environmental rating tool for new products.
  - Creation of a materials database that prioritizes existing environmentally friendly materials and spurs the development of new ones.
  - Establishment of disassembly guidelines and related training procedures.
- "We see a growing amount of interest in sustainability both inside and outside of the company. Stockholders, the R&D community, and customers are asking more questions about product lifecycles, recyclability and product disassembly. At some point in the future we may not have a choice about how we handle these issues, so we're taking advantage of the choices we can make now."
  - Scott Charon, commodity manager, new product development

 Herman Miller



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