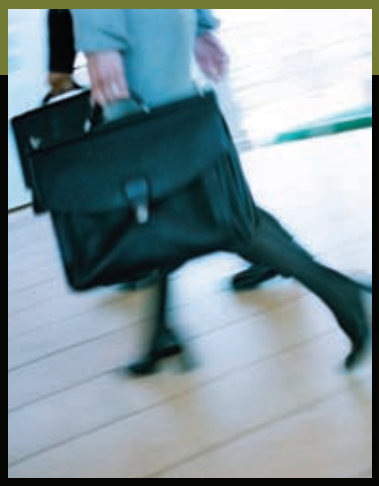
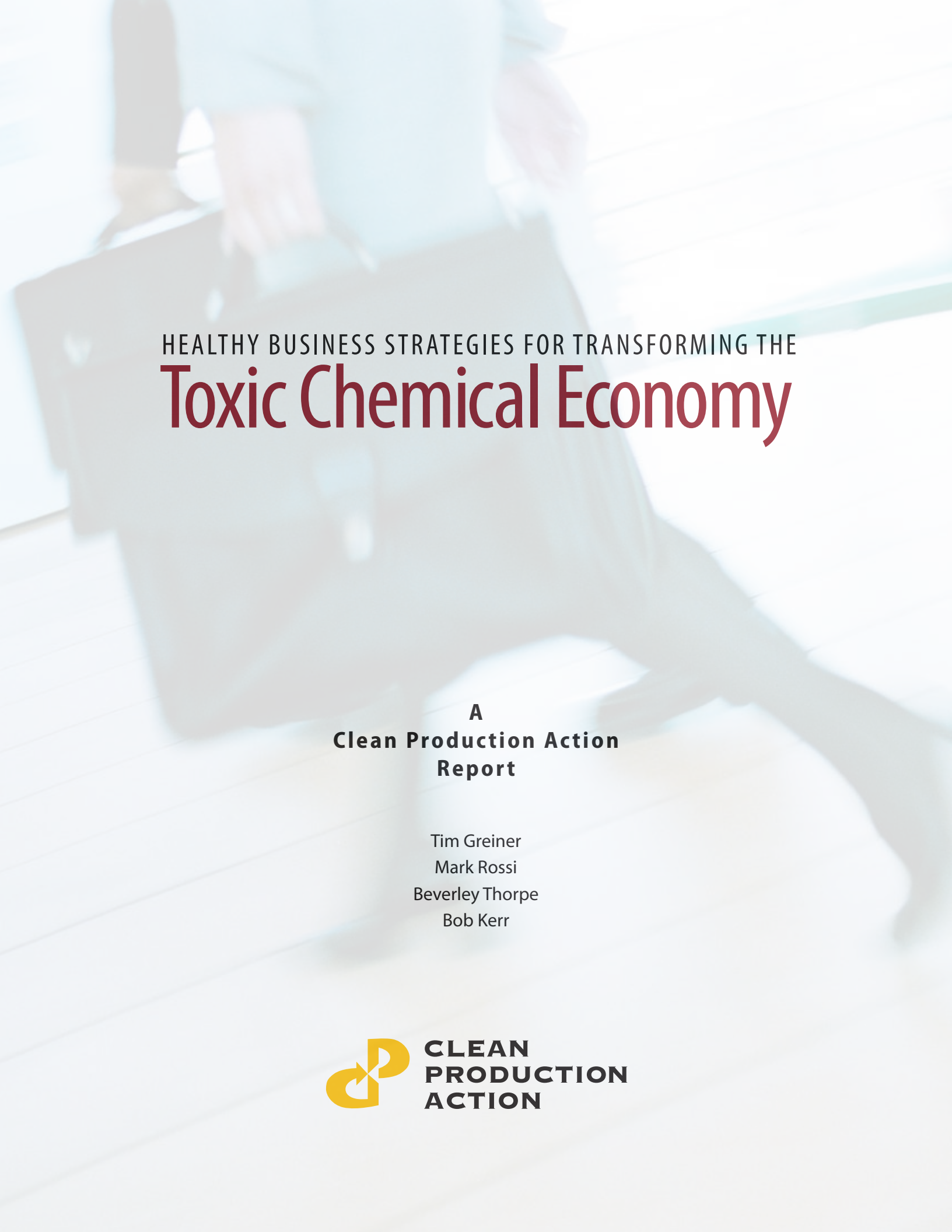



Healthy Business Strategies for Transforming the Toxic Chemical Economy

CLEAN PRODUCTION ACTION



HEALTHY BUSINESS STRATEGIES FOR TRANSFORMING THE

Toxic Chemical Economy

A
Clean Production Action
Report

Tim Greiner
Mark Rossi
Beverley Thorpe
Bob Kerr

CLEAN
PRODUCTION
ACTION

Clean Production Action
Mark Rossi, Beverley Thorpe
Clean Production Action promotes the use of products that are safer and cleaner across their life cycle for consumers, workers and communities. Our mission is to advance Clean Production which we define as the design of products and manufacturing processes in harmony with natural ecological cycles, the elimination of toxic waste and inputs and the use of renewable energy and materials.

Pure Strategies, Inc.
Tim Greiner, Bob Kerr
Pure Strategies helps companies improve their environmental and social performance using clean production tools, sustainable materials, strong community relationships and transparent measures of progress.

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CLEAN PRODUCTION ACTION

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CONTENTS

Healthy Business Strategies

Business leaders are creating value by embedding concerns for human health and the environment into their products. *Healthy business strategies* differentiate a company's brand from its competitors — lowering costs, enhancing consumer and employee loyalty and increasing market share by creating healthier products for people and nature. For these leading companies, using environmentally preferred chemicals and materials is a core value, not a secondary assignment relegated to the periphery of the company.

Unfortunately, the dominant approach of businesses using toxic chemicals involves no strategy other than toxics ignorance and compliance. *Toxics-ignorant* firms forego strategic thinking on chemicals and know little about the chemicals and materials used in their product nor the hazards they pose. *Toxics-compliant* firms do the minimum required by law, seeking only to conform with regulations that govern worker health, handling and storage of and pollution control of toxic chemicals. Firms operating in the toxics compliance and ignorance universe fail to anticipate market opportunities for healthy products and expend scarce resources combating chemicals restrictions and public demands for safer products.

This report profiles six companies that are crafting healthy strategies for using chemicals and materials in their products. This report does not address the totality of producer responsibility for each company's product life cycle such as end of life product management, energy use and social corporate responsibility. This report does, however, provide detailed examples of how companies are now integrating safer chemicals use into their policies and the recommendations and lessons resulting from this. This report synthesizes and presents a coherent approach any firm can adopt to move beyond outdated toxics ignorance and toxics compliance approaches and towards a fully integrated healthy business strategy.

The Problem — Toxics Ignorance

U.S. laws do not protect people and the environment from toxic chemicals. Each of us carries as many as 200 industrial chemicals in our bodies — chemicals that were invented in the past 75 years. These chemicals aren't

only in 55-gallon drums in factories or in bottles in the cleaning cabinet at home. Companies use chemicals in the manufacturing process for almost every product and as ingredients in the items themselves. Yet we know almost nothing about what chemicals are in everyday products and therefore little about the hazards they may pose.

We do know that some widely used chemicals last for decades, travel long distances from their point of origin, concentrate as they move up the food chain and can cause serious health problems for humans and animals. This is the outcome of the "toxic chemical economy," a market where chemical manufacturers make highly hazardous chemicals, product manufacturers add the chemicals into their materials and products, and workers, communities, consumers, mothers, babies and the environment are exposed to the chemicals. Studies documenting the presence of these chemicals in human tissue, umbilical cord blood, breast milk, food and dust are a sign that companies must change their product's ingredients and governments must revamp laws to responsibly regulate the use of chemicals and catalyze the transition to green chemistry. In fact, some chemically conscious companies are already doing this by phasing out hazardous chemicals in everyday products such as furniture, electronics, cosmetics, fabric and clothing.

The Solution — Healthy Business Strategies

Six chemically conscious companies are profiled in this report (see Table 1). We selected these firms to represent large and small business in different sectors of the economy to show companies at different places on the path towards chemical consciousness. None of these companies have perfected the manufacture and use of products made entirely from green chemicals and some are further along than others. Our case studies highlight the initiatives of these companies to transform the toxic chemical economy into a healthy chemical economy — a market where manufacturers make products entirely from chemicals and materials that are safe and healthy for humans and the environment.

All the companies highlighted here are aware of the dangers posed by toxic chemicals and are taking action to reduce their use. Although their individual actions to address toxic chemicals vary, their best practices, when gathered together, define the terrain of healthy chemical strategies:

- Identify all chemicals in their products.
- Eliminate toxic chemicals.
- Strive to manufacture and use only healthy ingredients in their products.
- Design new products.
- Innovate — design new products and develop novel partnerships.
- Work collaboratively with environmental advocates.
- Take responsibility for products from cradle-to-grave. Require data from suppliers on chemicals and materials used

TABLE 1: **Company Innovation and Chemical Policy Highlights**

Company	Industry	Featured Innovation	Chemical Policy Highlights
Avalon	Personal Care Products	Reformulate line of cosmetic products	Eliminate known and suspected hazards
Dell	Electronics	Adopted healthy chemicals policies	Mainstream the precautionary principle in the electronics industry
H&M	Clothing Retailer	PVC-free t-shirt and numerous other clothing items	Develop and enforce strict protocol with suppliers to eliminate hazards in products
Herman Miller	Office, Healthcare, Education and Residential Furnishings	Mirra® Chair— Award winning design	Use innovative eco-design protocol to guide product development
Interface	Fabrics and Carpet	Terratex PLA®— Award winning plant-based office interior fabric	Complete evaluation of chemicals used to manufacture fabric
Kaiser Permanente	Health Care	PVC-free carpet	Spur product development through supplier partnership

in products. Work with suppliers to create healthy ingredients. Design products to be reused, recycled or composted. Take products back at end-of-life.

- Adopt internal chemical policies, including the use of lower threshold of scientific certainty when threats of serious or irreversible damage to the environment become apparent — also known as the precautionary principle.
- Support laws that promote green chemistry and eliminate toxic chemicals.

Their motivations for taking action beyond compliance initiatives range from: pure business rationale such as product differentiation, cost savings and reputation management to deeply held values such as customer, community and worker health and well-being. Like all businesses, our six case study companies want to avoid "toxic scares" and gain the long-term confidence of their customers.

In all six cases, their work to reduce chemical hazards enhanced their brand reputation with investors, customers and environmental advocates. Some companies achieved considerable savings in the process. Others launched new product lines that differentiated them from their competitors. In several cases, their innovations led to the creation of new submarkets. Taken together, they exemplify the journey companies must embark on if they are serious about creating a healthy chemical economy.

Creating a Competitive Advantage

In March 2006, Reebok recalled about 300,000 charm bracelets after one was linked to the lead-poisoning death of a four-year-old boy in Minnesota. Reebok offered the bracelets, which have heart-shaped charms with the company's name on them, as gifts with the purchase of certain children's footwear. The child died from lead-induced brain swelling after swallowing a piece of the bracelet. According to the Minnesota Department of Health, the charm contained 99 percent lead. The safety threshold for lead content in jewelry is 0.06 percent.

In an interview for *The Boston Globe*, a Reebok spokeswoman said the bracelets were made by "a third-party, independent vendor in China." When asked how the lead content could be so high, she responded: "The questions you're asking are the same questions Paul Harrington (Reebok's CEO) is asking, and that is why he is personally leading this investigation. We simply do not have all of the details of what happened and how it happened, and getting those details is a top priority" (Reidy 2006).

Unfortunately, the Reebok charm is no anomaly. A month after the Reebok incident, Pepsi Cola appeared in the news, agreeing to eliminate labels containing lead on bottled soft drinks imported from Mexico and paying a $1 million civil penalty for violation of California's Proposition 65. The labels on some bottles contained up to 45 percent lead. According to Californian Attorney General Bill Lockyer, the lead can be transferred to hands and then ingested if a person touches his or her mouth (McGreevy 2006).

How could Reebok and Pepsi, two reputable brands, sell products that could be hazardous to their consumers? Unfortunately, this gap in chemical awareness is more the rule than the exception in most businesses. Many manufacturers are just realzing that they need to know the identity and risks of chemicals in their products. Most firms think they sell products, not chemicals. But firms in industries as diverse as electronics, clothing, office furniture and medical devices are finding that not only do they "sell chemicals," but that they are responsible for the health effects and safety of each of these chemicals as well. This can be daunting when a single product is made overseas, flows through a supply chain of a hundred or more suppliers each with dozens of processes and contains hundreds of chemicals embedded in plastics, fibers and other product components.

But companies that treat chemical issues as either irritating distractions or simply unjustified vehicles for attacks on business are turning a blind eye to circumstances that could fundamentally affect their competitive position. The need for companies to know what's inside — what chemicals make up their products — has never been greater. Toxics ignorance creates risk: reputation risk, toxic tort risk and market risk.

ONE

Toxic Chemicals in the Economy

The companies highlighted in this report are among dozens of corporate pioneers increasingly focused on the hazards of chemicals used in their products. To understand what's driving this change in corporate chemical consciousness, we need only turn to the burgeoning evidence of the harmful effects of chemicals on humans and the environment. When Public Broadcasting System's Bill Moyers' blood and urine tested positive for 84 synthetic chemicals in his blood in 2003, he was only one of many celebrities and everyday citizens to find their bodies contaminated with chemicals.

New technological advances have helped scientists to better detect chemicals in human blood, breast milk and urine. The results are disturbing. A 2001 study led by Mount Sinai School of Medicine in New York, tested a total of nine volunteers (including Moyers) for 167 chemicals. The study found an average of 91 industrial compounds, pollutants and other chemicals in their blood and urine. Surprisingly, the volunteers did not have jobs working with chemicals nor did they live near industrial facilities. Of the 167 chemicals found, 94 were toxic to the brain and nervous system, 79 cause birth defects or abnormal development and 76 cause cancer in humans or animals (EWG 2003). Table 2 describes the health effects of many of the chronic toxicological characteristics that have been associated with chemicals. Scientists refer to this contamination by chemicals found in blood, urine and breast milk as a person's body burden. More recent studies by the U.S. Centers for Disease Control and Prevention (CDC) confirm the presence of low levels of contaminants in people (CDC 2005).

TABLE 2: **Example Health Effects of Toxic Chemicals**

Toxicity	Description
Carcinogens	Cause cancer
Developmental or Reproductive Toxicants	Damage the normal development of the fetus, infant, or child or damage our reproductive tissues
Endocrine Disruptors	Cause damage through their interference with normal hormone function
Mutagens	Damage DNA and cell structure
Teratogens	Cause birth defects

Persistent, Bioaccumulative, Toxic (PBT)

Chemicals that are persistent, bioaccumulative and toxic worry public health experts. Persistent chemicals (or their breakdown products) can stay in our bodies for long periods of time — weeks, years and even decades. Bioaccumulative chemicals build up in animal and human tissue. Chemicals that are not only persistent and bioaccumulative, but also toxic are among the most dangerous. Take perfluorooctane sulfonate or PFOS. Once used in Scotchguard™, PFOS

David Masty, chief of Whapmagoostui First Nation, lives in Hudson Bay, Canada — an isolated area without roads or industrial smokestacks. He tested positive for 51 of 88 chemicals in his body. As Masty puts it, "It doesn't matter where you are. The pollution is transported through the air and from the products we use in our homes." *(White 2006; and Environmental Defence 2006)*

"Babies aren't supposed to be born pre-polluted."
— Jane Houlihan, Environmental Working Group

is now a known PBT. It is highly persistent, bioaccumulates in the bodies of animals and is toxic — damaging animal growth and development (Washington State 2005). For these reasons the British government is acting to ban the use of PFOS (UK 2004).

Implications for Public Health

Scientists are divided over what the presence of persistent, bioaccumulative and toxic substances means for public health. A synthetic chemical in someone's urine or breast milk does not automatically result in health effects — instead it's an indicator of exposure. But their ubiquity doesn't mean there is no effect either. It's well known that humans are not exposed equally and that we vary in genetic and physical vulnerabilities. Furthermore, most chemicals on the market have not been thoroughly tested for human safety. Moreover, scientists have yet to assess the risks of exposure to combinations of these chemicals.

Toxics ignorance creates risk: reputation risk, toxic tort risk and market risk.

One thing scientists are finding is that the timing of the exposure can be as important as the amount of exposure. Specifically, newborns, fetuses and infants are particularly vulnerable to even small chemical exposures during the critical moments of gestation and early development. Recent studies have measured this exposure — for example, a 2005 U.S. study of umbilical cord blood from 10 newborns found the newborns averaged 200 contaminants, many of them carcinogens, developmental toxins and neurotoxins (EWG 2005). Scientists worry that exposure in the womb could affect critical steps in fetal development.

Table 3 details below the health effects and sources of exposure for a handful of chemicals and materials that have been targeted by many companies, including some of the six case study companies. The high hazard chemicals include heavy metals such as arsenic, cadmium, lead and mercury; phthalates; perfluorinated chemicals; brominated flame retardants; and azo dyes. PVC, which has significant life cycle concerns, is unique within the list because it is a material as opposed to a chemical.

What about the U.S. Regulatory System?

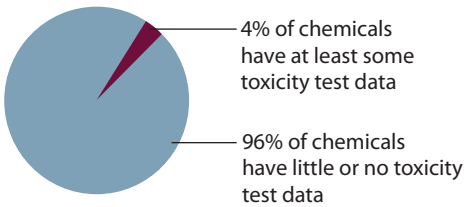
Some may wonder whether the U.S. regulatory system protects human health and the environment from chemical hazards such as PBTs. Unfortunately, the U.S. regulatory safeguards for toxic chemicals are inadequate. Only a small fraction of the 81,600 chemicals on the U.S. market have ever been screened for a single possible health effect such as cancer. This is because 76 percent of chemicals registered for use in the U.S. were "grandfathered" under the 1976 Toxics Substances Control Act — meaning chemical manufacturers were not required to disclose information on their toxicity. Today, these "1976 chemicals" constitute the majority of chemicals used by volume in the U.S. In 1998, the U.S. Environmental Protection

TABLE 3. **Health Effects and Sources of Chemicals and Materials Targeted by Case Study Companies**

Chemicals/Materials Targeted by Case Study Companies	Health Effect	Source(s)
Azo dyes	Azo dyes and pigments are known to release carcinogenic amines.	Natural fibers, synthetic fibers, prints, plastics and rubber in apparel, furniture and other fabric goods.
Brominated flame retardants (BFRs), including: polybrominated diphenyl ethers (PBDEs), especially DecaBDE	Accumulate in the food chain and human tissues. Adversely affects brain development and the thyroid.	Flame retardant in furnishings and consumer electronic goods.
Carbon black	Considered a possible cancer hazard based on animal data and a possible mutagen — may cause genetic damage, based on animal data.	Used as reinforcing agent in rubber products such as tires and as a pigment in printing, coatings and textiles.
Heavy metals: lead, mercury, arsenic and cadmium	Cause lowered IQ, developmental delays, behavioral disorders and cancer at doses found in the environment.	Lead — most exposures from lead paint. Mercury — most exposures from canned tuna. Arsenic — most exposures from contaminated drinking water and treated lumber. Cadmium — exposure sources include pigments and bakeware.
Perfluorinated chemicals (PFCs)	Global contaminants. Accumulate in the environment and the food chain. Linked to cancer, birth defects and more.	Active ingredients or breakdown products of Teflon®, Scotchgard™ fabric and carpet protectors and food wrap coatings.
Phthalates	Cause birth defects of male reproductive organs. Some phthalates are banned in toys and cosmetics in Europe.	Plasticizers. Found mostly in soft vinyl products but also in a wide range of cosmetic and personal care products.
Polyvinyl chloride (also known as PVC or "vinyl")	Combustion forms the carcinogenic and reproductive toxics: dioxins and furans, which persist for decades in the environment.	End of life combustion of PVC in electronics, wire and cable, plastic pipe, flooring and footwear. PVC may contain lead or phthalates.

SOURCES: EWG 2006, H&M 2005, CSTEE 1999, CCOHS 1997.

Agency (EPA) began gathering screening-level data on the toxicity of chemicals with the highest production volume (HPV) — accounting for over 99 percent of chemicals in U.S. commercial circulation. While an important first step, the EPA itself admits that the screening-level information does not adequately assess the hazards of exposure to chemicals in consumer products — chemicals children may be exposed to, those emitted from factories and those used or manufactured in workplaces with large numbers of exposed workers (EPA 1998). New legislation similar to the European Union's Registration, Evaluation and Authorization of Chemicals (REACH) would be required to obtain the types of data necessary to fully protect the public.



How are humans, whether infants or adults, exposed to toxic chemicals anyway? In the past, most chemical exposure occurred in the environment, from polluted air, water and soil. But scientists are finding the exposure is shifting from environmental exposure to indoor exposure from common household

Healthy chemical economy — a market where manufacturers make products entirely from chemicals and materials that are safe and healthy for humans and the environments.

products such as carpet, electronics, plastic toys, clothing and building materials. These home, office and car exposures from consumer goods have led public health advocates to demand that manufacturers substitute healthy and green chemicals for toxic chemicals in these and other consumer products.

As the Reebok and Pepsi Cola examples suggest, firms don't always adequately protect consumers from toxic chemicals. Often they rely on their contract manufacturers to track chemical inputs into products. This may be a risky strategy since chemicals are frequently combined with other chemicals into a mixture, shipped to a packager, then shipped to a producer and only later incorporated into a plastic or ink, and shipped again to the final manufacturer/assembler. It's all too easy to lose track of the original ingredients.

TWO

Brands at Risk

Companies must take a much more proactive approach if they are to identify all the chemicals in their products and reduce the use of toxic chemicals. The social trends calling for greater chemical safety mirror other long-term social trends affecting corporate strategy. In the automotive sector, increased oil costs and consumer demand for more efficient autos caught U.S. companies like General Motors and Ford off guard, while Honda and Toyota have seen improved profitability. In the fast food and restaurant industry, social concerns regarding obesity have led to calls for regulation and restriction of the sale of unhealthy foods. In the retail sector, concerns of big-box development, job loss and community impacts have constrained expansion plans. According to Ian Davis, Worldwide Managing Director of McKinsey & Company, "billions and billions of shareholder value have been put at stake as a result of social issues." Davis emphasizes that firms that manically focus on short-term profits at the cost of investments for long-term social trends face the prospect of being blindsided by trends they could have easily anticipated (Davis 2005).

Brands, retailers and original equipment manufacturers are especially at risk as they are increasingly being asked to insure the health and safety of their products. Advocacy groups regularly rate the toxic chemicals policies and programs of firms in the auto, cosmetic, furniture and carpet sectors. Even retailers are under scrutiny and being asked to ensure the chemical safety of the thousands of brands and private label products on their shelves. Companies closest to consumers, whether brand owners or retailers, want to avoid "toxic scares" and gain the long-term confidence of their customers.

Ignoring these trends not only leaves companies vulnerable to reputation, toxic tort or market risk; it also leaves them blind to the value-generating opportunities. Whether it is hybrids and energy efficient vehicles in the auto sector, organic and healthy meals in the fast food industry or more varied and local formats in the retail sector, social issues indicate the presence of unmet societal and customer needs. Companies that spot these opportunities and act on them gain market advantage over their competitors.

THREE

From Toxic to Green Chemistry — Taking Action

Companies that understand the need to assure product safety to customers, investors and other stakeholders see the issue not as how to be compliant with regulatory requirements, but instead as a catalyst for creating value. The six case studies in this report provide a road map for companies on the journey towards a *Healthy Business Strategy* (see Section Six — Recommendations for Healthy Business Strategies). What are the practical steps these companies taking to be chemically healthy?

First, they understand the importance of assessing chemical use throughout their supply chain — identifying chemicals their suppliers use and the hazards posed by those chemicals. Early in the process, they start by focusing on a chemical under regulatory scrutiny in the U.S., such as lead or mercury. But as they progress, they look beyond U.S. requirements to European, Japanese and other chemicals restrictions — understanding that to sell products globally they need to comply with the strictest standards globally.

Cognizant of the flawed regulatory system, the most fully aware companies track the latest scientific developments around chemicals and act on the latest science to eliminate

TABLE 4. **The Journey from Toxic to Green Chemistry**

Strategies	Toxic Chemistry → → → → → Green Chemistry			
	Phase I	**Phase II**	**Phase III**	**Phase IV**
Corporate Chemical Policy	None, ignorant	Examine products for legal compliance	Adopt the precautionary principle	Avoid the use of untested chemicals. Set intermediate and long-term goals for using green chemicals and healthy materials.
Public Policy Stance	Lobby against government action to limit use and exposure to toxic chemicals	None	Support voluntary efforts: e.g., Green Chemistry Awards and US EPA Design for Environment (DfE) program	Support: REACH, chemicals policy reform in the U.S., requirement for comprehensive safety data for all chemicals
Targeted Chemicals	None	Those required by law	Chemicals of concern, beyond those legally required	Find green chemicals and materials to use in products and processes
Monitoring and Assurance	None	Test for chemicals restricted by law in the US	Test for chemicals restricted anywhere worldwide	Test emerging chemicals of concern based on recent science and modeling data
Relationship with Environmental Advocates	None or see environmental advocates as misguided, misinformed and alarmist troublemakers that need to be marginalized	Aware of advocates' concern for persistent, bioaccumulative toxic chemistry	In dialogue with advocates regarding chemicals of concern	See advocates as a source of insight, skills and knowledge that should be listened to
Relationship with Trade Associations, Businesses and Business Groups	Allied with vested interests — chemical producers, traditional trade associations	Not strongly aligned	Outreach to socially and chemically responsible businesses and their organizations	Catalyze new materials and chemistry development through dialogue, specifications, standards or funding
Awareness of Health Effects of Chemicals	Deny any hazards associated with chemicals and actively undermine research indicating hazardous properties	Limited to Material Safety Data Sheets (MSDS)	Keep track of scientific developments on chemical hazards	Involved in defining what constitutes a safe chemical
Expected Role of Suppliers	None	Provide limited information if asked about chemical constituents	Disclose names of all chemical constituents	Partners in developing green ingredients
Product Innovation	Meet existing product specifications and resist demands for green chemicals	Only change product chemistry to meet regulations	Design a few new products with green chemistry, but keep vast majority of products the same	Bring innovative products to market and commit to changing entire product line to green chemistry

GREEN CHEMISTRY

Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances (Anastas & Warner 1998). As designers of molecules, materials, products, processes and systems, chemists play an important role in developing the future healthy chemicals economy.

hazardous chemicals — a policy known as the "precautionary principle." These companies, typified by the firms highlighted in this report, see environmental advocates as sources of insights, skills and knowledge. Often these advocates are closest to the emerging chemicals issues identified by academic and government scientists. Where less enlightened companies stridently defend the status quo, these healthy businesses not only see an opportunity to differentiate their products in the market, but see opportunities to create new value through healthy products. Table 4 shows the phases and strategies employed by firms as they evolve from toxic chemistry to green chemistry.

Everett Rogers' theory of innovation provides a useful lens to view the journey towards green chemistry (Rogers 1995). Rogers divides innovators and adopters into five categories: innovators, lead adopters, early majority, late majority and laggards. In the green chemistry phase — Phase IV — companies actively research green chemicals and materials, use those that meet the highest standards of safety and support initiatives to reform outdated government laws. Firms in this phase innovate and lead the adoption of new technologies. Phase III companies have moved beyond compliance and target high hazard chemicals. They work cooperatively with suppliers, environmental advocates and other businesses to advance their green chemistry goals. These firms constitute the early majority. In Phase II, the late majority firms are aware of chemicals hazards, but rely on a strategy built around compliance. In the toxic chemistry phase — Phase I — businesses deny that hazards exist with the chemicals they use. They actively undermine scientific efforts to demonstrate the toxicity of their chemicals and initiatives to restrict their use. These Phase I companies represent the laggards in the journey to green chemistry.

Firms on the path to green chemistry develop corporate chemical policies that include the precautionary principle (see inset box), establish credible monitoring and assurance programs and deepen relationships with suppliers. These supply chain efforts lead to not only healthier materials, but also better alignment with their suppliers in areas such as quality

TABLE 5. **Early Stages of the Journey – Recommendations from Case Study Companies**

Area	Company	Recommendation
Increasing Chemical Consciousness	H&M	Know your product and its chemical risks.
	Avalon	Understand EU chemicals directives.
	Kaiser Permanente	Understand emerging field of green chemistry and its applicability to your business.
	Dell	Based on what you can manage in your production process and supply chain, start phasing out chemical risks one-by-one. Establish goals and a process that's neither too far out, so as to avoid inaction, nor too close to create a strong backlash. Avoid starting out with high-cost changes.
	Herman Miller	Work on making changes to reduce chemical risks as early as possible in the product development cycle before bad selection of ingredients gets locked into production process and product design.
	Interface	Develop chemical risk reduction protocols appropriate to your business; don't use someone else's black box protocol.
Developing Materials and Products	Kaiser Permanente	Set clear goals for your suppliers to give them the signals they need to invest in new materials development.
	Dell, Herman Miller	Make product changes during the design process since changes to products on the market tend to be expensive and difficult. Design for disassembly.
Partnerships: including supply chain and trade associations	H&M	If sharing supply chain (e.g., for raw materials), work with other companies in industry with same suppliers to develop common chemical restriction requirements.
	Dell	Exchange information on chemical risks through trade associations. Even competitors can talk about pressing issues in industry, such as chemical risk.
	Dell, Kaiser Permanente	Push for more effective government programs/initiatives for testing of chemicals used in products.
	Dell, Avalon, H&M, Kaiser Permanente	Lobby for development of meaningful chemical regulatory standards.
	H&M, Herman Miller, Interface, Kaiser Permanente	Clearly communicate material restrictions and interest in green chemistry alternatives to suppliers. Reward suppliers that assist you, penalize those that do not.

and innovation. Green chemistry companies lead by funding and overseeing efforts to develop safer alternatives and advocate for reform to our country's broken chemicals policies. These firms realize it is imperative for business to engage in, and in some cases lead, the debate on the issue rather than react to it.

Brands operating in the toxic chemistry phase still have their blinders on. At best, they are ignorant of toxic chemical concerns; at worst they are defensive and reactive. Because their suppliers manage the chemical content of the plastics, metals, fibers, electronics and other components in their products and packaging, they know very little about the specific chemicals in their products. This

THE PRECAUTIONARY PRINCIPLE

An official part of European Union policy, the Precautionary Principle states that in order to protect the environment, a precautionary approach should be widely applied, meaning that where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The precautionary principle permits a lower level of proof of harm to be used in policy-making whenever the consequences of waiting for higher levels of proof may be very costly and/or irreversible.

chemical ignorance means they are also ignorant of health effects their products may have on their customers during use or afterwards when the product is disposed of.

Because they do not see chemical safety as part of corporate strategy, their typical first response to fears of chemical concerns is denial and opposition. In some cases, their business strategy is to be compliant with the law. But compliance alone is unhelpful as a guide for corporate policy, given the U.S.'s inadequate chemical regulatory system. Companies that focus too narrowly on compliance, especially when their sector or products are targeted for inadequate safeguards, face the risk of becoming entangled in public relations battles and negative attacks on their brand. At their worst, these unenlightened firms attack the messenger—questioning the plausibility of the science and opposing government action to limit use and exposure to toxic chemicals, all in an effort to defend existing products and markets.

Of course improving corporate chemical consciousness is not like turning on a light switch. The case study companies in this report show that real investments in research, development, testing, product development and marketing are necessary. Like any effort to change an existing product line or introduce a new product line, they dealt with the natural inertia to changing product design, chemical use and relationships with suppliers. And as our case studies show, the rewards have been meaningful—resulting in brand name enhancement, cost savings, increased market value, product/brand differentiation and employee loyalty.

Where do companies at the early phases of this journey begin? What are important first steps to take? Table 5 lists recommendations from the six case study companies for increasing chemical consciousness, developing new materials and products and building partnerships in the supply chain and with trade associations and business groups.

FOUR

Case Studies in Transforming the Toxic Chemical Economy

Kaiser Permanente: Healthy Patients, Workers and Communities

The Commitment

Just as we have responsibility for providing quality patient care, just as we have responsibility for keeping our facilities and technology up to date, we have a responsibility for providing leadership in the area of the environment. The stakes are extraordinarily high. We have to keep folding these questions and these considerations back into our leadership. We have to incorporate them into our incentives, into what it is we're held accountable to do, how we measure our impact.

David Lawrence, former CEO, Kaiser Permanente, October 16, 2000, San Francisco, "Setting Healthcare's Environmental Agenda" Conference

Environmental activism emerged within Kaiser Permanente four decades ago when the organization invited Rachel Carson to deliver the keynote address to a large symposium of physicians and scientists. Today the 8.5 million member organization with 145,000 employees and $31B in annual revenues has become a national environmental leader in the health care sector. Driving Kaiser Permanente to invest in the environment is the recognition that the health of its members is affected by the health of the communities they live in.

The depth of the organization's commitment is defined in Kaiser Permanente's Environmental Stewardship Vision:

We aspire to provide health care services in a manner that protects and enhances the environment and the health of communities now and for future generations.

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Kaiser Permanente is the nation's largest nonprofit health plan with 8.5 million members.

- **Founded in 1945 by Sidney R. Garfield and Henry J. Kaiser**
- **Headquartered in Oakland, California with operations in nine states and Washington, D.C.**
- **145,000 employees in the U.S. including 12,000 physicians**
- **$31.1 billion annual revenue**
- **Operates 431 medical office buildings and 37 medical centers**

KAISER PERMANENTE®

By integrating its Environmental Stewardship Vision into purchasing decisions, Kaiser Permanente is preventing problems and creating safer and healthier environments for employees, patients, and the community. For example, when Kaiser Permanente selects hard surface flooring that does not require stripping and finishing, it lessens workers' exposure to hazardous chemicals, eliminates potential exposure of patients and improves the environment by eliminating the use of hazardous chemicals.

The Process: Purchasing Specifications and Partnerships

Like the health care sector it is part of, Kaiser Permanente is a major consumer of medical equipment and supplies as well as building materials, interior furnishings, office supplies and food. In 2003, the U.S health care sector alone purchased $20 billion worth of durable medical equipment, $33 billion worth of non-durable medical equipment and invested $24 billion in buildings and their interiors.

"Kaiser Permanente is seeking to develop long-term partnerships with companies that are committed to developing the products we need. We want to collaborate with manufacturers to create products that have the design features we want at affordable prices."

— Tom Cooper,
Kaiser Permanente's Standards, Planning and Design

In the mid-1990s Kaiser Permanente began incorporating environmentally preferable purchasing specifications into contracts for medical, chemical and build-ing products. Mercury-free thermometers, PVC-free medical and building products, latex-free examination gloves, greener cleaners and recyclable solvents are among the many product changes implemented over the past ten years. The power of large scale purchasing to drive changes in the market is demonstrated in the case of how Kaiser Permanente catalyzed innovation in the carpet sector.

In 1993, Kaiser Permanente first signed a National Purchasing Agreement (NPA) for broadloom carpets and PVC-backed carpet tiles. During the NPA process the company negotiates directly with manufacturers of a product to be purchased — in this case, carpet manufacturers — and develops a partnership with the eventual supplier. Finalizing an NPA can take up to nine months as Kaiser Permanente and the vendors work through the evaluation and bidding processes. The three main parts of the contract concern quality, cost and partnering. "Quality" entails identifying products that meet the demanding needs of hospitals, which operate 24/7. "Cost" covers the cost of the product over its life, including maintenance and longevity, as well as the price of the product. And environmental issues come under "partnering," which also includes financial strength, corporate structure and ability to manage national accounts.

When Kaiser Permanente revisited its NPA for carpets in 2001, the first step involved a two-year assessment of carpet conditions and cleaning methods in all of its facilities. From this assessment, Kaiser Permanente decided to eliminate the purchase of broadloom carpets because of higher maintenance costs and problems with carpets wearing out.

With the carpet assessment finalized, Kaiser Permanente set out in the summer of 2002, with support from the Healthy Building Network, to find a high performance, environmentally preferable carpet tile for the millions of square feet in new construction it is planning for the next decade. To evaluate whether a carpet is indeed environmentally preferable, Kaiser Permanente asked leading manufacturers detailed questions about the impacts of their products from "cradle to grave." For "product content," Kaiser Permanente evaluated the carpets for PVC content, other

persistent bioaccumulative toxics (PBTs), carcinogens, and post-consumer recycled content. For "sustainable manufacturing practices" Kaiser Permanente assessed the progress carpet manufacturing facilities are making in minimizing waste, water use, non-renewable energy and air emissions. For the "use" stage, they examined whether the carpets posed problems to indoor air quality, including off-gassing volatile organic compounds — that new carpet smell. And for the "end-of-life" stage, carpets were evaluated on whether they can be closed loop recycled (carpet to carpet) or down-cycled (carpet to other products of lower value).

This scale of investment in evaluating the environmental performance of products sets Kaiser Permanente apart from its peers. At first, it even intimidated carpet manufacturers who have been leaders in incorporating environmental concerns into their products. As Kathy Gerwig, Vice President Workplace Safety at Kaiser Permanente recalled, "Manufacturers were unprepared and in some cases resented answering questions about the materials in their product. One president even said, 'I don't know if I want to do business with you.'"

The Decision: Catalyze Innovation

After evaluating the products and the company responses, no carpet emerged that was both PVC-free and met Kaiser Permanente's demanding performance specifications. The ideal product, it turned out, did not yet exist.

Lacking the ideal product, Kaiser Permanente added an innovation question to evaluate the in-terest, commitment and capacity of suppliers to develop a new product that met its needs. "Kaiser Permanente," Tom Cooper of Kaiser Permanente's Standards, Planning, and Design team emphasized, "is seeking to

KAISER PERMANENTE®

develop long-term partnerships with companies that are committed to developing the products we need. We want to collaborate with manufactures to create products that have the design features Kaiser Permanente wants at affordable prices. Partnering is about dialogue, finding shared interests, and moving forward with better products."

With the goal of creating a new product, Kaiser Permanente chose two vendors on the understanding, specified in a contract, that they would develop a PVC-free product with the necessary performance characteristics at the same cost as existing products within two years. The contract required each firm to submit quarterly reports, including indicators of progress towards PVC-free backing. One of the firms ran into difficulties, fell behind schedule, and stopped communicating with Kaiser Permanente. The other firm, Collins & Aikman (C&A), based in Dalton, GA met the challenge.

"In direct response to our request, C&A developed a new durable, low emission, PVC-free carpet with backing made primarily from post-consumer recycled plastic," said Tom Cooper. The achievement earned C&A a sole source contract with Kaiser Permanente. In responding to Kaiser Permanente's challenge to develop a PVC-free carpet that can meet exacting environmental and performance standards, C&A created a new carpet line for the firm and for other health care and institutional uses. The C&A trademarked "ethos" carpet is made with a PVB (polyvinyl butyral) backing, a chlorine-free material that is recovered from PVB laminate in automobile safety glass. The C&A carpet backing is made from over 75 percent post-consumer recycled product, which can be recycled into more carpet backing at the eventual end of its life.

The combination of mission, capacity to evaluate products, willingness to partner with suppliers, commitment to reducing PVC use and market size of Kaiser Permanente led C&A to design a new carpet product.

Continuous Improvement: Creating Comprehensive Environmental Purchasing and Chemicals Policy Programs

While every product Kaiser Permanente uses does not receive the same scrutiny as its carpets, Kaiser Permanente's National Environmental Purchasing Policy states the organization's preference for less toxic and easily recycled products. Specifically, Kaiser Permanente's Environmental Purchasing Policy prefers products that do not contain mercury, latex, PVC, phthalates, PBTs, halogenated flame retardants, bisphenol-A, carcinogens or reproductive toxicants.

Recognizing the limits to the chemical-by-chemical approach, Kaiser Permanente is working with Health Care Without Harm, an international coalition of health advocates representing 52 countries, to develop a comprehensive chemicals policy that requires suppliers to know the chemicals used in their products and the hazards they pose. "Rather than continuing to take an approach that is problem-focused (for example, eliminating mercury or PVC), we want our work to be solution-focused," emphasized Lynn Garske, Kaiser Permanente's Environmental Stewardship Manager. "Our aspiration is to provide health care services in a manner that enhances the environment and communities now and for future generations."

Interface Fabric: Benign by Design

Terratex PLA represents Interface's latest innovation on the company's journey towards sustainability. Launched in 2004 as the first commercial interior fabric made from 100 percent renewable biopolymers, Terratex PLA is used in window treatments and office cubicle paneling. Over the past eight years, Interface's product development team worked to introduce this new fiber, developing one of the most comprehensive approaches to selecting green chemistry in the textile industry.

What is Terratex PLA?

Terratex uses 100 percent polylactic acid (PLA) from NatureWorks LLC. Terratex PLA fibers originate from corn that is processed via fermentation to produce a 100 percent bio-based polymer. Lifecycle studies show that PLA polymer consumes less fossil fuels, uses less water, and emits fewer greenhouse gases, compared to most conventional petrochemical-based polymers. Terratex PLA also offers performance benefits comparable to and even exceeding petrochemical polymers. For example, it is naturally stain-resistant, exhibits superior fire-retardant properties and does not retain odors.

When Interface developed Terratex PLA technology, the company wanted to ensure that its bio-fiber would not be contaminated with the environmentally destructive chemistry commonly used in the industry such as heavy metals or alkylphenol ethoxylates. To ensure that only benign dye and finish chemicals were used, Interface Fabric created a screening protocol that goes far beyond government requirements for protecting the environment and human health. Furthermore,

Interface FABRIC™

INTERFACE FABRIC

Interface Fabric is a leading producer of interior fabrics and upholstery products.

- **Founded as part of Interface, Inc. in 1973**
- **Headquartered in Atlanta, GA**
- **1,380 employees worldwide**
- **$350 million annual revenue**
- **Manufacturing in four U.S. states**

the protocol made it clear that any fabric coatings or finishings could not interfere with the ability to recycle, reuse or compost the material.

The Interface Fabric Dye and Chemistry Protocol

Initial attempts at Interface Fabric to develop a chemistry screening protocol were difficult and challenging. The first iteration used a handful of regulatory lists to screen out bad-actor chemicals[1]. For every chemical on each list, the company developed a usage policy. Some chemicals were prohibited altogether from all company operations, while others were prohibited from products but could be used on plant and equipment.

The paper filing system was resource intensive to maintain and required frequent faxing and photocopying of information to multiple manufacturing locations. But more important, the system depended on suppliers to file accurate Material Safety Data Sheets (MSDS) for their chemicals. While a few suppliers provided accurate MSDSs, most did not. Perhaps the system's greatest flaw was its reliance on regulatory lists, which are notoriously out of date and lag years behind the newest scientific information on chemical hazards. Finally, while this system screened out bad chemicals, it did nothing to highlight good ones.

Going into the first efforts to develop the protocol, Interface assumed that its vendors were formulating textile chemistry mindful of environmental and human safety. But contrary to their expectations, Interface soon found out its vendors actually knew very little, and were instead relying on their vendors and even their vendors' vendors. Simply stated, there was little chemical consciousness, let alone shared assumptions, in the supply chain when it came to green chemistry.

In the late 1990s, Interface began questioning whether this approach was adequate for understanding if its dye and finishing chemistry was benign. The company was inter-

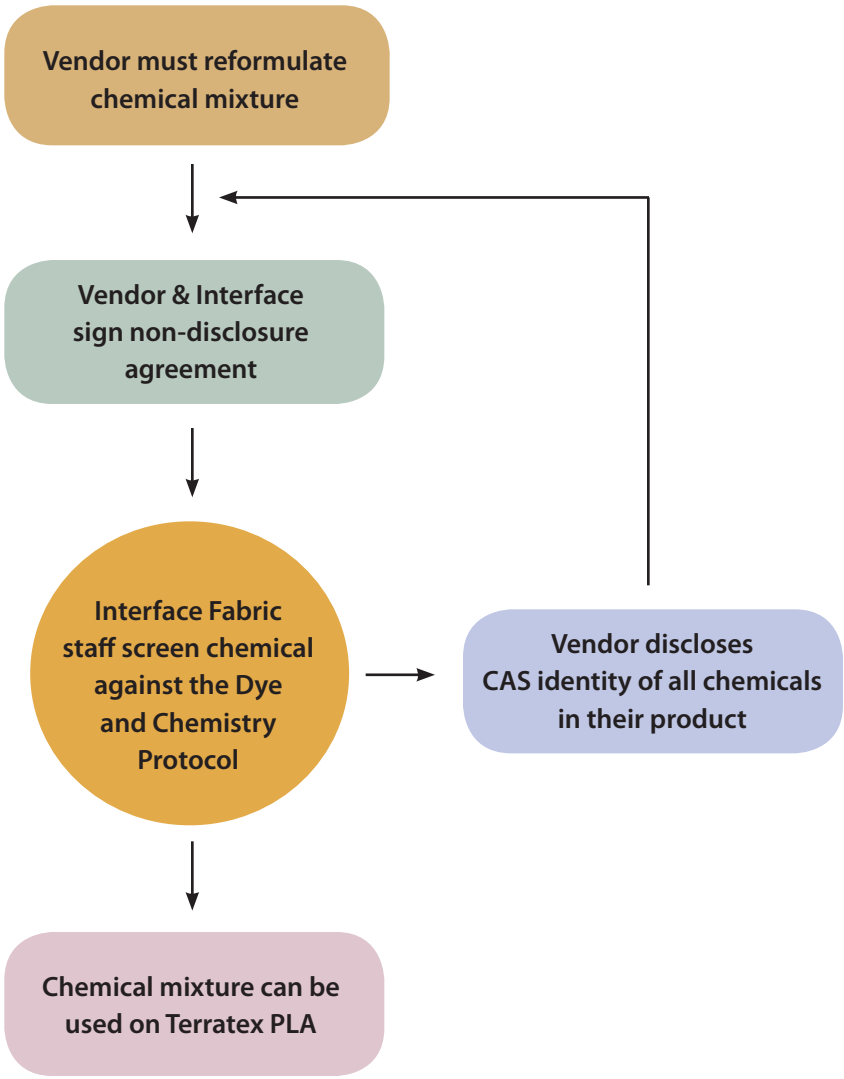
1 Lists included in the screening process were regulatory based and included Superfund Amendments and Reauthorization Act (SARA) 313, Occupational Safety and Health Act (OSHA) carcinogens, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulated chemicals, SARA Extremely Hazardous Substances, Clean Air Act Hazardous Air Pollutants, State of Michigan critical pollutants, Maine Toxics Use Reduction Act (TURA) chemicals and Massachusetts TURA.

ested in developing a system that could choose good chemicals using the most current science; leaving behind an antiquated paper system based on outdated regulatory lists and inaccurate supplier MSDSs.

Interface Fabric spent the next two years developing a more organized system using a proprietary chemical screening protocol developed by a third party. The system had many advantages: it evaluated against the most recent science, was not based on regulatory lists and identified benign chemistries. But despite a sizable investment of time and money, the effort failed. Interface had difficulty getting its suppliers to reveal their chemical formulations since they feared sharing such information might compromise confidential business information. Furthermore, Interface found that the third-party protocol provided too little feedback on why chemicals passed or failed the screen. Interface chemists and environmental managers could not examine the protocol's assumptions to determine if they were acceptable and therefore, would not fully understand why some chemicals were environmentally preferred and others were not.

Interface ultimately abandoned this effort with little to show for its investment, but the company did not abandon the idea of a chemical screening protocol. In early 2001, Interface Fabric assembled a team to begin thinking deeply about what "benign by design" really meant when it came to chemical-intensive textile dying and finishing. As Wendy Porter, Director of Environmental Management, recounts, "My boss liked what we were doing, but was bothered by the dialogue in our industry and the unwillingness to share information. He told me, 'I don't want to waste any more time and money, but I also don't want to sell PLA fabric without a good dye and chemistry protocol.'"

DYE AND CHEMISTRY PROTOCOL



Third Time Is a Charm

Interface Fabric decided to develop its own protocol — one that would incorporate the company's values and use the latest human and environmental scientific information. The protocol would need to give greater assurance to suppliers that confidential information would be protected. Staff drew up a

TERRATEX PLA AND DYE AND CHEMISTRY TIMELINE

1995
First efforts to develop a regulatory-list-based chemical screening system

1998
Began development work on polylactic acid (PLA) as the base material for Terratex® fabric

2001
PLA yarn spinning and dyeing processes developed

January 2002
Development of the Dye and Chemistry Protocol

December 2002
First weaving of Terratex PLA® fabric

January 2004
Approval of sufficient chemistry under the Dye and Chemistry Protocol to support PLA color development

May 2004
Official launch of two proprietary lines of Terratex PLA® at NeoCon® World's Trade Fair (Chicago)

May 2005
Dye and Chemistry Protocol implemented in all new Terratex polyester and wool fabrics

July 2005
Official launch of Guilford of Maine open-line of Terratex PLA®

August 2005
Completed a chemical screening study and pilot-scale composting project of Terratex PLA® fabric in a commercial composting facility

December 2005
Selected as one of the 2005 BuildingGreen Top-10 products

December 2006
Terratex PLA fabrics constitute ~ 2.5 percent of Interface Fabric sales

Future
Introduce Dye and Chemistry Protocol into other brands and product lines in the Interface family including carpet. Independently review and verify the Dye and Chemistry Protocol

draft protocol and successfully tested it on several dyes and chemicals the company hoped to use on its new line of PLA-based fabrics. With these promising results under its belt, Interface Fabric engaged its chemical suppliers as partners in this new effort. Interface held two meetings with its vendors in 2002. Chemical suppliers were told the company planned to cull its vendors from as many as 28 per chemical to three. Fewer vendors meant larger contracts for the firms selected by Interface. But to participate, chemical suppliers had to agree to supply the identity of every chemical sold to Interface.

Interface Fabric formulated a non-disclosure agreement that assigned significant penalties if the company compromised the vendor's confidential business information (CBI). Only two individuals in the company were permitted to handle CBI and were prohibited from sharing it with anyone else in the company. While several vendors chose not to participate in the program, most did. Vendors submitted Chemical Abstract Service (CAS) numbers and names under the agreement to Interface Fabric. Interface Fabric then screened the chemicals using the protocol. Although the exact mechanics of the protocol remain confidential, it uses a series of screens (see box on p. 21) to approve chemical ingredients. The protocol screens out lead, mercury, perfluorinated alkyl surfactants, polychlorinated or polybrominated biphenyls, and other persistent, bioaccumulative and toxic substances commonly found in fabrics.

If a chemical fails, Interface Fabric refrains from suggesting alternatives to its vendors. The company wants to avoid getting involved in its vendor's product development efforts. And more importantly, Interface Fabric wants its vendors to develop their own capabilities to determine whether a chemical is safe.

Since developing the protocol the company has screened 151 products comprised of roughly 280 chemicals, of which only 30 have been approved for use in Terratex PLA. Many of these products required vendors to reformulate and remove undesirable ingredients. The company spent nearly six years developing new chemistries and processes to process PLA so that it would hold its shape, retain color and meet abrasion and wearability specifications. According to Porter, "the first time we dyed it, it dissolved!" PLA fabric dyed and handled so differently from traditional fibers that the company had to throw out its conventional dye chemistry and start from scratch.

SCREENING CHEMICALS AT INTERFACE FABRIC

Interface Fabric screens chemicals using a proprietary screening protocol that asks questions such as:

- **Is there sufficient carcinogenicity, skin sensitivity, aquatic toxicity, mutagenicity, bioaccumulation and persistence information available on the chemical to make a decision?**
- **Is the chemical free of these hazards?**
- **Is the chemical structure similar to other chemicals of concern?**
- **Are other chemical hazards generated during chemical synthesis or during use, recycling or disposal?**

Given the complexity of screening chemicals, it seems reasonable to expect increased chemical costs after implementing the protocol. Instead, Interface saw recurring annual savings of around $300,000 per year. The savings came from consolidation of its chemicals supplier base, since vendors with larger accounts could offer discounted, volume-based pricing. According to Porter, the company has had a ripple effect in the supply chain as vendors have gotten smarter about proposing chemistry to the company. Rather than simply reacting to a customer approving or rejecting a particular chemical, Interface Fabric finds its suppliers proactively developing more benign chemistry for the entire market.

Closing the Material Loop and Saving Energy

In the highly competitive office interiors market, where green design carries significant weight, Interface Fabric stands out as a leader in designing environmentally conscious fabrics. According to Porter, "Our unique knowledge gives our sales person an edge over the competition. We even get inquiries from our competitors who want to know if certain chemicals are okay to use." Currently, Interface uses the protocol to screen all Terratex PLA product and all new Terratex polyester and wool products.

Further, in the company's quest to continually improve, Interface is finding enhanced capabilities to upgrade its analyses protocols using Life Cycle Analyses (LCA) and states that "these robust techniques are becoming a critical part of our product development and raw material selection processes." For internal guidance, LCAs are very descriptive of where environmental and health effects are impacted when a material substitution or a process change is being evaluated. For example, Interface found that the benefits of using recycled polyester (PET) for their Terratex brand fabrics and carpet face fiber versus virgin synthetic PET was quite dramatic. Similarly, the LCA benefits of closing-the-loop on PVC backed carpet tiles by recycling post consumer product is a key part of Interface's vision of a more environmentally friendly future. To date, Interface has recycled over 80 million pounds of post

consumer carpet retaining the PVC backing in the commercial cycle and out of landfills or incinerators. As part of Interface's long term challenge to eliminate the use of all virgin synthetic materials, the carpet business has invested heavily in new process technologies to further reduce the energy footprint of its recycling efforts and also to expand its technical capability to produce new carpet backing systems made from other thermoplastic post consumer waste streams. "One more step," as Interface says, "in reducing our dependence on non renewable fossil fuels for energy and synthetic raw materials."

Terratex PLA is not significantly more expensive than comparable recycled or virgin PET products. Interface did not develop Terratex PLA as a niche product, but one that could compete with comparable products on price. When Interface and office furniture manufacturer Herman Miller introduced Terratex PLA at the National Exposition of Contract Furnishings (NeoCon) 2004 in Herman Miller's Kira panel fabrics, the product won the Best of NeoCon Gold award in the Textiles Panel category.

In 2005, DesignTex, another customer of Interface Fabric, received a Silver Noun award for its 100 percent Terratex PLA panel. Interface designed the product so that customers in the architecture and design community need no longer sacrifice style, quality and durability when choosing an environmentally friendly product.

In addition to using biopolymers to make Terratex PLA and passing them through the dye and chemistry screening protocol, Interface Fabric manufactures the product at ISO 14001 certified facilities with 100 percent offset of carbon emissions (associated with manufacturing) and has instituted a reclamation program (known as ReSKU™) to recover product at the end of its useful life. When it's recovered, the fabric is compostable and biodegradable in commercial composting facilities. The compost material can then be used as a nutrient for agricultural crops, such as corn.

H&M: Fashion Chemistry

You've got to have your supply chain aligned to manage chemicals in retail fashion. In this fast moving industry, designs sell out in six months. With this high turnover rate, fashion companies like H&M never design the same product twice. As a result, chemistry for dying and finishing textiles is set during the earliest stages of the design process. Once design is complete, there is no chance to go back and redefine the chemicals used in the product.

H&M Chemicals Restriction Policy

H&M's first efforts to restrict chemicals started back in 1993, when the company decided to restrict the use of toxic Azo dyes in response to proposed German legislation to ban their use. But efforts to look beyond regulatory limits accelerated with the advent of an eco-cotton trend that spread across Europe in the mid 1990's. To meet these new eco-cotton requirements, the company developed its first detailed criteria around acceptable dying and finishing chemistry. But when the eco-cotton trend faded and customer interests shifted to synthetic polyester and nylon fibers, H&M was faced with deciding what to do with the knowledge they had gained about unsafe chemicals in the textile dying and finishing processes. Should they apply these same standards to the new lines which had no eco-branding? Faced with this choice, the company chose to bring the eco-criteria from its cotton experience to its entire line of products. As Corporate Social Responsibility Manager Ingrid Schullstrom tells it:

> **"The chemistry issues relevant to cotton were not necessarily relevant to other fabrics. But our experience with eco-cotton raised our awareness that dangerous**

HENNES & MAURITZ, INC.

H&M is a clothing retailer specializing in chic fashion apparel, which everyone — kids and adults — can afford.

- **Founded in 1947 in Sweden by Erling Persson**
- **Based in Stockholm, operates in 22 countries**
- **45,000 employees worldwide**
- **$ 9.2 billion annual revenue**
- **Sales growth rate 2004-2005: 14%**
- **Owns and operates all of its 1,200 stores**

chemicals were used in textile manufacturing. Once we applied ourselves to developing a broader list for more fabric types, and worked with our suppliers to develop testing and assurance methods, we just kept on adding new chemicals. We decided to adopt the strictest of any country policy for any sales country and later adopted the precautionary principle. Since then we've updated the list every two or three years by adding new substances or lowering the allowable limits of certain chemicals in our products."

The company first introduced its chemicals restriction policy in 1995 and revised versions in 1996, 1999, 2002, 2003 and 2005. Early on, H&M's policies were largely aspirational. Working in Hong Kong with its suppliers, H&M gave its mostly Asian-based suppliers a compass — that the company was planning on restricting materials in products, these restrictions would be contractual and H&M would not implement them immediately but instead would provide suppliers with time and in some cases resources to move away from chemical hazards. Today, H&M's restricted chemicals list is comprised of approximately 170 chemicals or chemical categories.

Know Thy Chemistry

With 22 offices around the world in locations as far flung as India, Romania, Turkey and China, H&M has placed the responsibility for chemicals restrictions in each of its 22 in-country quality offices. The restriction list, which is contractual, is presented to the supplier at the onset of the relationship, along with testing procedures and recommended testing labs. Like most textile firms, H&M represents a fairly small portion of a typical supplier's volume. With the help of company chemists, the quality staff conducts assessments of each product combination — conjecturing which chemical(s) might be found in a given product. Since colors, prints, fabrics and markets vary so widely, few if any chemicals on the list are relevant to every product. Products are then sent to H&M approved labs that run approved test regimes to detect the presence of restricted chemicals. H&M targets its random testing on products and suppliers with poor test records. Suppliers pay for the 70,000 tests (costing roughly $90 each) H&M conducts on running orders, totaling $1.75 million annually. The FAQ section of the company's 2005 chemicals restriction guidance document offers the following advice on supplier compliance assurance:

"The fastest, cheapest and easiest way (to comply with the restrictions) is to have total control over the substances used in the production of your products. H&M Chemical Restrictions must be handed over to your dye mills, print mills, tanneries and chemical suppliers, and you should tell them not to provide you with any chemical products containing substances listed in H&M Chemical Restrictions. Furthermore, tests could be carried out for substances that for some reason are difficult to have control over. Preferably at a laboratory recommended by H&M and as early as possible."

Overcoming Barriers

In implementing its policy, H&M must avoid compromising the look and feel of the garment — doing so would reduce consumer interest. Some substances are more difficult to replace than others, and may require a completely different approach. Alternatives can, for example, make use of other technical properties, other chemicals or changed processes. You might think that identifying all the areas where a chemical is used would be straightforward, but many suppliers and their chemical vendors don't necessarily know which chemicals they are using.

Sometimes substitute chemicals are more expensive for the first 100,000 pieces. While H&M will pay the premium for the new and untested material, most cost obstacles are temporary. Beyond short-term cost increases, H&M reports that restriction efforts sometimes require slight adjustments to design. In a few rare cases where H&M could not eliminate a material, it elected to discontinue the product. Examples include plastic toddler swim rings made from PVC and feather boas

H&M CHEMICAL RESTRICTIONS
(2005 VERSION)

- **Azo Dyes and Pigments**
- **Disperse Dyes**
- **Other Dyes**
- **Flame Retardants**
- **Short Chained Chlorinated Paraffins (SCCP's)**
- **Formaldehyde**
- **Polyvinyl Chloride (PVC)**
- **Phthalates**
- **Organotin Compounds**
- **Triclosan**
- **Bisphenol-A (BPA)**
- **Antimony (Sb)**
- **Arsenic (As)**
- **Cadmium (Cd)**
- **Chromium (Cr)**
- **Chromium VI (Cr6+)**
- **Cobalt (Co)**
- **Lead (Pb)**
- **Mercury (Hg)**
- **Nickel (Ni)**
- **Phenols**
- **Pesticides**
- **Alkylphenol Ethoxylates/ Alkylphenols (APEO/AP)**
- **Distearyldimethylammonium-chloride (DSDMAC)**
- **Isocyanates**
- **Perfluorinated Alkylated Substances (PFAS)**
- **Polychlorinated Biphenyls (PCBs)**
- **Polychlorinated Triphenyls (PCTs)**
- **Chlorinated Bleaching Agents**
- **Chlorinated Aromatic Hydrocarbons**
- **Solvents**

that required harmful flame retardants to meet flammability requirements.

Purging PVC

H&M's PVC elimination efforts illustrate the steps and missteps in chemical substitution efforts. In the mid 1990's, after first testing products to understand where PVC might be used, the company began a multiyear discussion with its suppliers, telling them that a formal restriction would come within a few years. H&M found PVC in children's rainwear, anti-slip plastic on baby socks, prints on t-shirts, ski gloves, zipper pullers and product labels. Each application required a different substitution approach: some used polyurethane, others ethyl vinyl acetate, still others silicon, polyester or acrylic prints. Eventually, the company set a 2001 phase out date. But as Ingrid Schullstrom recounts, "We came up with solutions for everything except a few uses (bags, ski gloves for kids and sequins) where we were having no luck. We extended the deadline, but still with no luck. Eventually, we had to set a hard and fast date for substitutes. Otherwise we were not going to sell the product. When we did that, suddenly our suppliers found a substitute. Sometimes, technical barriers get solved once you put your foot down." H&M successfully phased out PVC from its products in 2002, with no long-term increase in cost and very limited impact on design and quality.

H&M's PVC elimination efforts weren't without a misstep or two. Finding a PVC alternative to anti-slip bumps on baby socks proved difficult until H&M realized that silicone might work. The biggest miscue occurred during the company's 2002 Christmas underwear campaign. With a marketing campaign using famous models posing in H&M underwear already underway, the company found that the sequins used to decorate some underwear products contained PVC. Chemists and quality control had missed the 100 percent PVC sequins because, up until that point, all PVC uses were in soft plastics. Marketing wanted to sell the sequin underwear, but corporate responsibility protested and prevailed. It wasn't very popular at the time to market products that the consumer could not buy, but H&M's decision made a statement about the company's chemical restriction efforts: if you tell the world your product does not contain a chemical, you cannot compromise.

What Motivates H&M?

The company's history and values have a lot to do with why it's possible for H&M to implement its chemicals restriction program. H&M's Board Chair and major owner, Stefan Persson, is the son of the founder. This lineage has helped the company to retain the founding family's sense of responsibility towards its customers and for the environment. Still, to grow and prosper as H&M has, the company must take decisions that make business sense.

So what benefits does the company accrue for its precautionary chemicals policy? H&M does not brand its products as environmentally conscious in any way. To date, the company has not sought attention for its environmental policies. Company staff cannot point to specific supply chain cost savings, increased sales, brand differentiation or reduced operating costs. The main benefits that seem to accrue to the company fall into two themes. The first is managing business risk. By implementing changes based on chemical hazards, the company stays ahead of legislation and advocacy campaigns. By staying ahead, the company can avoid bad publicity and da-age to its reputation. The alternative practiced by many companies is to respond to legislative mandates in a crisis mode. The second theme involves learning about H&M's supply chain. The restrictions push H&M designers, product development and quality staff to work closely with their suppliers, where they learn about materials selection, manufacturing and quality.

Somewhat surprisingly, H&M is not looking to keep its green chemistry expertise proprietary. On the contrary, the company works closely with other textile businesses on chemicals policy. It not only learns from colleagues in other companies, but also finds that its efforts to restrict toxic chemicals become easier when other retailers join in to create a global standard for safety. That's why H&M participates in textile industry-wide forums to share its knowledge — for example, H&M contributed significantly to the apparel restricted substances list compiled by Business for Social Responsibility. And by sharing its knowledge on topics such as test methods and where to expect restricted materials in products, H&M helps move an entire industry to higher levels of chemical consciousness.

Herman Miller: Healthy Chairs

Environmental Design Roots

Long before green design became popular, a culture that would nourish it had formed at Herman Miller. Product design at Herman Miller has long been seen in the light of constraints, problem solving, and long-term value. The designer Charles Eames, renowned for his "Eames Chairs", saw constraints as a constructive force in design:

> **Design depends largely on constraints… the sum of all constraints. Here is one of the few effective keys to the design problem — the ability of the designer to recognize as many of the constraints as possible — his willingness and enthusiasm for working within these constraints — the constraints of price, of size, of strength, balance, of surface, of time, etc.: each problem has its own peculiar list (Neuhart et al. 1989).**

Where constraints overlap is the space, Eames wrote, where "the designer can work with conviction and enthusiasm" (see illustration). Within Eames' framework the natural environment becomes another constraint to guide designers to products that fulfill broader societal needs.

Good design also creates value for Herman Miller. The company's founder, D.J. De Pree, defined the benefits of good design in these terms: "We came to believe that faddish styles and early obsolescence are forms of design immorality, and that good design improves quality and reduces cost because it achieves long life which makes for repeatable manufacturing" (Knoll 1975).

HermanMiller

HERMAN MILLER, INC.

Herman Miller researches, designs, manufactures and sells furnishings for offices, healthcare and education environments, and the home.

- **Founded in 1909 by D.J. De Pree**
- **Headquartered in Zeeland, Michigan**
- **6,035 employees**
- **$1.7 B annual revenue**
- **Global company with sales offices, dealers and licensees in more than 40 countries**

In 1953, De Pree extended his vision of the company beyond products to encompass the environment, stating that Herman Miller would "be a good corporate neighbor by being a good steward of the environment." That environmental awareness led the corporation to establish a comprehensive corporate-wide environmental program in the 1980s, to help found the U.S. Green Building Council in 1994, and to create its Design for Environment (DfE) program in the 1990s.

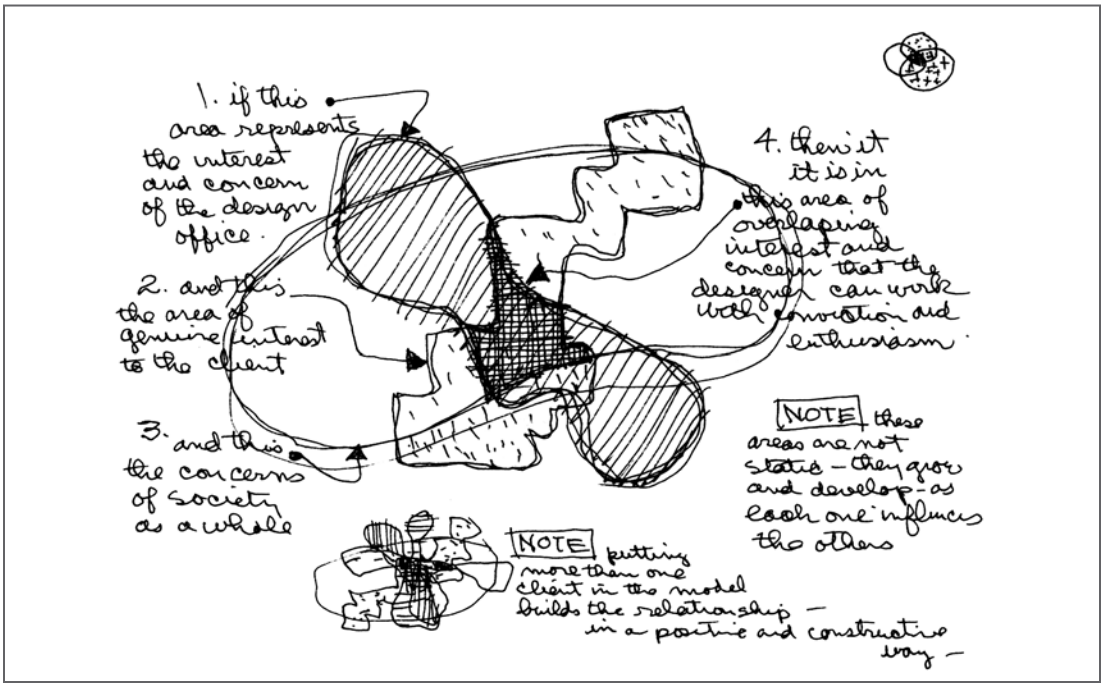
Designed for the Environment— The Mirra Chair

To integrate environmental goals into products Herman Miller established its DfE program in 1999. "Only by incorporating environment into design," explains Gary Miller, chief development officer at Herman Miller, "can we create value rather than cost." Herman Miller worked with McDonough Braungart Design Chemistry (MBDC) to create its "DfE product assessment tool," which evaluates the environmental performance of its products.

The DfE product assessment tool evaluates new product designs in three key areas: material chemistry, disassembly and recyclability. "Material chemistry" involves three core steps: 1) identifying all the chemicals in a material used to manufacture a product — such as the steel shaft in a chair — down to 100 parts per million, 2) evaluating the hazards posed by the chemicals in the material and 3) assigning the material a score of green, yellow, orange or red. "Green" is little to no hazard. "Yellow" is low to moderate hazard. "Orange" is incomplete data. And "red" is high hazard.

"Disassembly" evaluates the ease of breaking a final product — e.g., office chair — down into its constituent parts for recycling or reuse. "Recyclability" evaluates whether a part contains recycled material and, more important, whether that part can be recycled at the end of the product's useful life.

The first product Herman Miller ran through the entire DfE process was the Mirra™ chair.



Charles Eames Design Diagram (made for the 1969 Exhibition, What is Design?— at the Musée des arts Décoratifs, Paris)

HermanMiller

Over the course of the chair's development the DfE process generated a number of design changes, including: eliminating all PVC plastic, increasing recycled content in a number of components and designing the chair for rapid disassembly using common tools.

Gaining data on the chemical content of all materials used in the Mirra chair proved to be a major challenge. Suppliers, especially of plastic parts, coating finishes and colorants, were reluctant to supply the data. Only after face-to-face meetings explaining the program and signing non-disclosure agreements were most suppliers willing to provide chemical content data. In the course of designing the Mirra, one supplier did refuse to disclose the additives used to manufacture its polypropylene plastic. Herman Miller dropped the uncooperative supplier after it found an alternative supplier willing to provide the data.

Eliminating all PVC plastic from the Mirra proved to be a significant challenge. The most difficult PVC part to eliminate was the plastic "skin" used to cover the armrests. While armrests may seem like trivial components, the actual performance requirements are substantial. They include: abrasion resistance, tear resistance, UV stability and most important, comfort. The PVC-free alternatives initially evaluated included plastics made from styrene and polypropylene. But none of these plastics provided the abrasion resistance required.

As the Mirra moved closer to launch date, no alternative material had been found to PVC armrest skins. The pressure was on the Design for Environment team to find a suitable alternative. The purchasing team wanted to stay with PVC because it was a known entity on performance and cost. The product team wanted to launch the Mirra with PVC armrest skins and then develop an alternative. Yet the DfE team knew that changing design after product launch would be difficult: engineering resources for evaluating alternatives would be reallocated to new projects and the cost baseline would be established using PVC.

At the last moment, the DfE team found a thermoplastic urethane (TPU) plastic that met all the performance measures, although at a slightly higher cost than PVC. Senior management decided that the somewhat higher costs of the TPU armrests were justified to have a completely PVC-free chair and were offset by other material choices that had lowered costs.

Based on the DfE product assessment tool, which creates a scale of 0-100 percent, with 100 percent being a truly cradle-to-cradle product, the Mirra chair achieved a score of 71 percent. The areas of greatest success were in the use of recyclable parts (96 percent of the parts by weight are recyclable) and ease of disassembly (93 percent of the product by weight can be readily disassembled).

The areas of greatest challenge were in the use of recycled content (42 percent pre- and post-consumer recycled content by weight) and the use of materials with a green chemistry composition (the chair has 69 percent green chemistry composition).

The recyclability score reflects the availability of materials, especially metals (which account for a greater percent by weight of a chair than plastics), that have an established recycling infrastructure. The disassembly score reflects the high degree of control that Herman Miller has over how the product is assembled. The design team increased its disassembly score from 40 percent to 93 percent over the course of product development by making assembly adjustments such as moving from adhered and stapled covers to slip on/off covers.

Increasing recycled content proved to be a challenge because of the plastics used in chairs. Unlike metals, which often contain some recycled content, very few plastics are made from recycled material. Additionally most post-consumer recycled plastics do not meet the performance specifications of virgin plastics. The materials chemistry score reflects the limited range of green chemicals and materials on the market. Very few chemicals have been designed to meet the second of 12 Principles of Green Chemistry: "to be fully effective, yet have little or no toxicity" (see Anastas & Warner 1998).

Redefining the Terrain of Competition

The Mirra chair met with widespread acclaim upon its release in 2003: receiving a Gold Award in the Best of NeoCon 2003 (the premier conference for the interior furnishings sector), a GOOD DESIGN™ Award from the Chicago Athenaeum Museum of Architecture and Design in 2003, a "Top 10 Green Building Product" in 2003 from the *BuildingGreen* magazine, named one of the best new products of 2003 by *Fortune* magazine and a Silver-

Mirra Parts. Left: recyclable parts, 96% by weight. Above: non-recyclable parts (4% by weight)—mixed plastic armpads (white parts), seat pan, and leaf springs (black parts)

HermanMiller

Award from the 2004 Industrial Design Excellence Awards (IDEA).

The model of product design developed for the Mirra is being extended to other products. Most notable is "Kira," a proprietary office panel fabric made from 100 percent renewable, bio-based fiber derived from the plant sugars of corn (see Interface case study). The 2004 launch of Kira netted Herman Miller another Gold Award at NeoCon.

Since DePree set Herman Miller on the path to environmental stewardship in the 1950s, senior management support for the environment remains high. On the DfE side, Herman Miller has committed to using the DfE product assessment tool for evaluating all future products and for re-examining existing product lines. A challenge goal set by President and CEO Brian Walker is that 50 percent of all sales in 2010 must be from products that meet the DfE protocol, including:

- Contain no "red" materials — i.e., contain no highly hazardous chemicals.
- Are easily disassembled.
- Maximize recycled content and recyclability of materials.
- Contain no PVC.

Sixty years after the first Eames chair, Herman Miller is still redefining the terrain of competition, this time with quality design that meets demanding environmental specifications.

Avalon Natural Products: Consciousness in Cosmetics

Since its founding in 1989, California-based Avalon Natural Products has been a leader in making cosmetics from natural and organic ingredients. Avalon sells mainly in the organic and natural foods market, through stores such as Whole Foods and Wild Oats, but is seeing increased interest from mainstream retailers who wish to attract the growing numbers of health-conscious consumers. The company initially developed two major lines of cosmetic products — Avalon Organics, using a high proportion of organic ingredients, and Alba, with exotic fragrances that can't be fully achieved with organic ingredients. And in 2006, Avalon introduced a complete line of safe, hypo-allergenic baby products.

AVALON ORGANICS®

In spite of Avalon's commitment to natural and organic ingredients, the company still used several industry-standard chemical preservatives and surfactants at the time the founders sold Avalon in 2002 to North Castle Partners (an investment firm specializing in "healthy living" companies). The sale, and the formation of a new management team over the next 18 months, coincided with a series of events that drew increased attention to the risks of toxic chemicals in cosmetics.

Europe Bans Use of Toxic Chemicals in Cosmetics

In 2004, the European Union (EU) banned the use of over 1,100 carcinogens and reproductive toxics in cosmetic products. The cosmetics industry in Europe argued unsuccessfully that the bans would be costly because of the expense of reformulating products and unnecessary, since the amounts of these chemicals in any single cosmetic product were minuscule. In the U.S., which lacks similar legal

AVALON NATURAL PRODUCTS

Avalon Natural Products sells environmental and health cosmetics primarily through health food stores such as Whole Foods and Wild Oats.

- **Founded in 1989 by Mark and Stacey Egide**
- **Based in Petaluma, California, employs 50 people**
- **$90 million annual retail sales**
- **2004–2005 sales growth rate of over 20%**

requirements and only bans nine cosmetic substances, the Campaign for Safe Cosmetics launched an effort to eliminate toxic chemicals in cosmetics, in-cluding the use of chemicals that cause cancer and birth defects. In addition, the Breast Can-cer Fund drew attention to studies suggesting that the principal family of preservatives —parabens—used in cosmetics might be asso-ciated with cancer or endocrine disruption.

While many cosmetics companies pointed to uncertainties in the evidence and the potentially high costs of reformulation, the new management team at Avalon believed their responsibility to their customers compelled them to take precautionary action and reformulate in the face of the new scientific findings. As a result, they ended up differentiating Avalon products from competitors and increasing Avalon's leadership position by making customers more conscious of the need for healthy skin and of Avalon cosmetics as a leader in healthy cosmetics.

Avalon's Health Screens for Cosmetic Ingredients

Avalon's initial step was to become one of the first companies to sign the Campaign for Safe Cosmetics' Compact for Global Production of Safe Health & Beauty Products — agreeing that all their cosmetics sold in all markets would meet the EU standard. Avalon then developed a formulation methodology requiring a series of four screens for approving ingredients in their products. These screens included restricting hazardous substances, using renewable resources, and incorporating certified organic ingredients where possible (see box below).

Avalon provides these guidelines to the laboratories that formulate their products. Beyond these guidelines, assessment of

AVALON NATURAL PRODUCTS FORMULATION SCREENS

1. **Prohibit chemicals banned under the EU cosmetics directive.**
2. **Avoid additional chemicals based on information from sources such as the Breast Cancer Fund and the Environmental Working Group's "Skin Deep" analysis of chemicals in cosmetics. This has led Avalon to work on removing the following chemicals:**
   - **Parabens: A family of preservatives commonly used to prevent cosmetics from deteriorating in hot, steamy bathrooms, intense sunlight or other extreme conditions.**
   - **Phthalates: The EU banned two of the six phthalates commonly used for making fragrances longer-lasting or nail polishes chip-resistant. Avalon decided to eliminate all phthalates in their products.**
   - **Formaldehyde donors: Preservatives in cosmetics that can react with other chemicals to form formaldehyde.**
   - **Sodium laurel/laureth sulfates: Harsh surfactants used as cleansers in soaps and shampoos, which can be irritating to the skin.**
3. **Follow Natural Product industry standards by avoiding the use of non-renewable resources. Specifically, don't use any petroleum-based ingredients.**
4. **Use certified organic ingredients (from plant sources only), such as essential oils for fragrances, to the greatest extent possible – especially for the Avalon Organics.**

alternative ingredients also involves reviewing literature and examining whether chemicals with similar structures have toxicity issues since full information on toxicity characteristics of alternatives isn't always available. Avalon established a Scientific Advisory Board — including industry leaders, chemists, suppliers, consumer health advocates and university scientists — to provide guidance for the initiative. The Advisory Board recommended that Avalon conduct testing on ingredients and finished products, such as repeat-insult patch testing and hypo-allergenic testing. Avalon carried out both of these tests on its new line of baby products.

"Consciousness in Cosmetics"

Along with screening chemicals in company formulations, Avalon launched a public "Consciousness in Cosmetics" campaign to increase public and customer awareness of the role of cosmetics in health. According to Avalon Vice President Morris Shriftman, "We want our customers to be conscious of what they put on their skin. We want them to understand that it's not just about the small amount of a chemical in a single cosmetic. It's about the cumulative risk for a woman applying and re-applying cosmetics 15, 20, even 25 times in a single day — shower gels, cleansers, toners, shampoos, conditioners, moisturizers, mascara, lipstick, deodorants, creams with penetration enhancers and so on."

"Consciousness in Cosmetics" highlights the safety of Avalon products due to the avoidance of toxic chemicals, the environmental benefits from organic ingredients grown with sustainable agricultural practices and the effectiveness and sensuality of cosmetics made from natural products.

Meeting the Challenge of Eliminating Parabens

Parabens (para-hydroxybenzoate compounds) are the most common class of preservatives in cosmetic products — designed to kill damaging bacteria. They are cheap and effective, widely used throughout the cosmetics industry and well understood by the chemists who mix cosmetic ingredients in the laboratory. A 1999 study by Creative Developments (Cosmetics) Ltd reports parabens as the dominant preservative in cosmetics for decades.

While parabens were not included in the EU ban, some studies have shown the presence of parabens in breast cancer tumors (though

AVALON ORGANICS®

AVALON ORGANICS TIMELINE

1989
Founding of Avalon Natural Products

August 2002
North Castle Partners buy Avalon from founders

January 2003
European Union (EU) proposes directive banning use of over 1100 toxic chemicals from use in cosmetics

2004
North Castle Partners brings in new management team for Avalon

Spring 2004
EU Directive goes into effect. Campaign for Safe Cosmetics asks cosmetics companies to adopt the EU restrictions for all products in all markets. Avalon one of the first to sign

Fall 2004
Avalon launches Consciousness in Cosmetics, pushes to increase organic content in Avalon Organics products, adopts screens to eliminate toxic chemicals

June 2005
Lavender Renewal and Vitality paraben-free skin care formulations released

Late 2005
All Avalon Organics products paraben-free

March 2006
A quarter of Alba products paraben-free. Research and development on alternative preservatives continuing for remainder.

May 2006
Release date for line of organic-based, hypoallergenic, paraben-free, fragrance-free baby cleansers and moisturizers

December 2006
All Avalon Organics & Alba products expected to be paraben-free, EU compliant

without any evidence of a causal relationship), breast milk and umbilical cord blood,and have indicated that parabens could disrupt early development of reproductive systems in male animals. These studies were not definitive but, adopting the precautionary principle, Avalon chose to find replacements for parabens as preservatives.

Replacing parabens is not a simple process. Parabens are effective as preservatives in a wide range of cosmetics applications, and no single alternative replicates that performance. Instead, formulators must develop different preservative systems for each application — a lengthy and expensive research and development effort. Notes Shriftman, "Some people thought we were crazy. We were already the leader in health-conscious, organic cosmetics. Why should we go through this reformulation effort?"

Avalon began working closely with its manufacturing partners and suppliers to develop alternative preservatives. Initially the chemists at the manufacturing partners expressed serious reservations about formulating alternatives. They knew how to work with parabens rather than with the alternative preservatives Avalon wanted to create. But they rose to the challenge.

By early 2006, Avalon had invested over $1 million in formulating alternative preservatives. Focusing first on its Avalon Organics line, the company replaced parabens in over 150 products, including its entire Avalon Organics line and about a quarter of its Alba products. To continue driving the reformulation effort, as well as to develop additional ingredients meeting the company's standards, Avalon hired an in-house research chemist in 2006.

TABLE 6. **Avalon Natural Products: Percent Change in Sales (February 2005 – February 2006)**

Product Area	Average all Cosmetics Companies (% change)	Avalon Organic (% change)
Body Lotions & Cremes	14	20
Facial Cleansers & Exfoliants	19	37
Facial Lotions & Cremes	16	37
Mists & Toners & Astringents	22	37
Shaving Cremes & Lotions & Aftershaves	10	29

Helping to Grow the Market for Organic Cosmetics

As part of its program to reduce synthetic chemicals in cosmetics, Avalon aggressively pursued organic ingredients and worked with an industry task force to more clearly define what counts as an organic constituent. In its efforts to increase available sources of organic materials, Avalon goes beyond the usual role of giving specifications to its manufacturing partners — who then find the necessary supplies, mix ingredients and manufacture the final product. Instead, Avalon goes directly to its suppliers and spells out the organic ingredients the suppliers should provide to the labs.

Determining what constitutes an organic constituent for a cosmetic product, however, can be controversial. The United States Department of Agriculture's National Organic Program standards for organic foods do not neatly apply to cosmetic ingredients. To make surfactants from coconuts or soybeans, for example, processors must use non-organic chemicals to extract ingredients. Avalon's Shriftman points out the uncertainty of whether firms can use these kinds of non-organic processing aids for a product that is labeled organic. To resolve this, Avalon participates with a range of industry and other representatives on the Organic Trade Association's Personal Care Task Force. A final resolution is likely to be some time away.

Business Benefit of Avalon's Strategy for Reducing Toxic Risks

Avalon ranks first in cosmetics brand in the health food channel and is the fastest growing brand in this market segment — a clear indication of the bottom line benefit of Avalon's strategy for reducing chemical risks and expanding the use of organics. Annual data for the period ending February 2006 shows that Avalon outpaced the market-average growth rates for a range of products in the health food channel by anywhere from 37 percent to 300 percent (see Table 6).

An additional, unanticipated, benefit has been the enthusiastic internal response at Avalon. The employees feel proud of their company's actions and proud of their role. They see themselves as helping health as well as beauty. They feel connected with something important. In the words of one of the Avalon employees, "I enjoy working at Avalon and am proud of its high sense of purpose, because it is not only focused on making safe, natural products but also gives so much back to the community."

Dell, Inc.: Mainstreaming the Precautionary Principle

In the mid 1990's, Dell shipped its first computers and displays free of a host of toxic brominated flame-retardants. Since then, Dell has worked with its customers, regulators, investors and environmental advocates to develop a broader list of restricted materials and implement a program with suppliers to reduce their use in Dell products.

Dell's efforts are beginning to bear fruit. The company has eliminated all halogenated flame-retardants in all desktop, notebook and server chassis plastic parts and has recently expanded these restrictions to include all products designed after June 2006. The company maintains a list of more than 50 banned or restricted substances and works with its product development team and suppliers to choose designs and materials that avoid these substances. Furthermore, Dell's suppliers are contractually prohibited from using these substances. To police its supply chain, Dell periodically tests products and components for compliance with its policies.

According to Mark Newton, Dell Senior Consultant for Environmental Policy and Global Requirements, the company's chemicals management system is really just the first step in a long journey towards responsibly managing chemicals: "We, and the other companies in our industry, realize we are at the beginning of a journey in this area. We're a relatively young industry, but we're learning quickly how to meet both business and environmental goals and how to effectively manage these issues with our supply chain."

While other U.S. electronics manufacturers have introduced environmental programs, what sets Dell apart from many other companies is

DELL

Dell, Inc. and its subsidiaries engage in the design, development, manufacture, marketing, sale and support of various computer systems and services to customers worldwide.

- **Founded in 1984 by Michael Dell**
- **Headquartered in Round Rock, Texas**
- **$55.9 B annual revenue**
- **55,200 employees worldwide**

its chemicals policy. Dell was among the first U.S. electronics manufacturers to publicly adopt a precautionary approach to materials selection when it finalized its Chemicals Use Policy in 2005. In it, the company states that "to act responsibly, Dell believes that if reasonable scientific grounds indicate a substance could pose significant environmental or human health risks, even if the full extent of harm has not yet been definitively established, precautionary measures should be taken to avoid use of the substances in products unless there is convincing evidence that the risks are small and are outweighed by the benefits. Dell considers these to be 'substances of concern.'"

Listening from Outside/Listening from Within

Dell's Chemicals Use Policy and support of the Precautionary Principle did not come about overnight. The policy was a product of a deliberate and careful process involving both external and internal stakeholders.

When it came to listening to external investor, customer, and environmental advocacy stakeholders, Dell learned from an earlier experience with its computer take-back program. Back in 2002 when Dell first introduced its asset recovery program, advocates criticized Dell for the program's shortcomings. According to Mark Newton, "At first, we didn't listen closely enough to the input of all stakeholders. When we realized that this input could help improve the solutions we were trying to bring to the marketplace, our environmental momentum increased. People throughout the company realized the benefits of developing an open and transparent dialogue with environmental advocates just like we do with customers and investors."

With this new perspective, Dell began vetting its restricted materials policies with each of its important external stakeholder groups. According to Newton, "we found ourselves doing what we should have done all along – managing a transparent and open dialogue." Over the past few years, this dialogue has changed the perception with many advocates that Dell does care about chemical use. When Dell first shared a draft of its Chemicals Use Policy, one advocacy group "redlined much of it with edits and suggestions" according to Newton. But the back and forth process of exchanging comments on drafts established greater trust and sharpened the company's positions.

As this process developed externally, internal debates within Dell were no less controversial. The company's Worldwide Environmental Affairs group was clear that there were chemicals in products, such as brominated

EXCERPT FROM DELL'S CHEMICAL POLICY

Dell identifies substances of concern with consideration for legal requirements, international treaties and conventions, specific market demands, and by the following criteria:

- **Substances with hazardous properties that are a known threat to human health or the environment;**
- **Substances with hazardous properties that show strong indications of significant risks to human health or the environment;**
- **Substances with hazardous properties that are known to biopersist and bioaccumulate in humans or the environment.**

To enforce the company's precautionary measures, Dell strives to eliminate substances of concern in its products by: (1) Maintaining a Banned and Restricted Substance Program; (2) Choosing designs and materials that avoid the use of substances of concern, (3) Prohibiting supplier use of these substances contractually, and (4) Substitution of viable alternate substances.

"Several years ago, Dell challenged us to develop chlorine and bromine-free products. Our product development team successfully developed three new LEXAN resins to met Dell's strict environmental requirements."

— Pius Thrivini, Program Manager,
GE Plastics Product Compliance & Stewardship

flame-retardants, that were hazardous. They cited evidence where burning certain brominated compounds in so-called 'backyard burning' operations resulted in the formation of persistent, bioaccumulative, and toxic pollutants. And since Dell could not control whether someone in the U.S. or abroad burned the product in an open fire to recover copper or other valuable metals, the company decided to design these substances out of their products, even though it was not required to do so by law. In addition to the environmental case, there was a growing business case to be made for moving in a precautionary manner. Institutional customers such as hospitals, banks, and government agencies in Northern Europe and Japan were soliciting computer companies for products free of brominated flame-retardants and other toxic compounds — a trend that was likely to expand. If Dell failed to provide these solutions, its competitors would. But despite the growing market and clear scientific basis for action, there was little precedent in Dell or in the wider U.S. electronics industry for a company publicly committing itself to a precautionary approach.

Dell Environmental Affairs group received positive feedback throughout the company when it proposed the new Chemicals Use Policy. Nonetheless, various departments expressed concerns consistent with their position in the company. Legal articulated concern over the open-ended nature of the precautionary principle. For example, what level of risk would be sufficient for the company to act? The product development team supported the effort, but was sensitive to making technology commitments ahead of the supply chain's readiness, and to not wanting to inject higher costs into Dell products. The procurement team wondered if suppliers could meet new requirements without affecting quality and delivery. Corporate communications, however, saw the policy as an opportunity to reinforce the company's environmental reputation. Dell's Executive Team left the issue to the experts in the company, and held back until the internal debate concluded in favor of a precautionary approach. The policy was approved at the senior Vice President level and then reviewed by Michael S. Dell, Chairman of the Board, and Kevin B. Rollins, President and Chief Executive Officer.

Shortly after making its chemicals policy public, Dell followed with two public statements.

The first written statement advocated for the European Commission to maintain a proposed ban on the use of the toxic brominated flame-retardant DecaBDE in electronics. The second statement supported the proposed Registration, Evaluation, Authorization, and Restrictions of Chemicals (REACH) regulation, explaining that a precautionary approach is an essential element of an effective chemicals regulatory system. Dell's new policies broke ground for a major U.S. multinational. They meant the company decided to go beyond compliance with legal requirements, and instead recognize non-binding international conventions on hazardous materials. The policies also reinforced the company commitment to weeding Dell products of materials which posed environmental risks.

An Open Source Solution

To successfully implement its chemicals use policy, Dell has had to align its materials restriction goals with its business model. Different companies use different strategies to develop new materials and chemistry for their products. Some firms such as Fujitsu Siemens are large conglomerates and are backward integrated into basic materials research and development. Others such as Hewlett Packard have a storied history of internally funded research and development. But Dell's success as a company is built around a business model that does not rely on so-called closed-source technology, but instead on open-source standards. Dell's advantage springs from its ability to lower the cost of production in its supply chain. The company could invent its own path to cleaner materials, but instead chooses to lead and collaborate with its suppliers to develop *standardized solutions* to replacing brominated flame-retardants, PVC and other restricted materials. Once standardized solutions become available in the marketplace, Dell can wield its cost reduction

DELL RESTRICTED MATERIALS (IN CERTAIN APPLICATIONS)

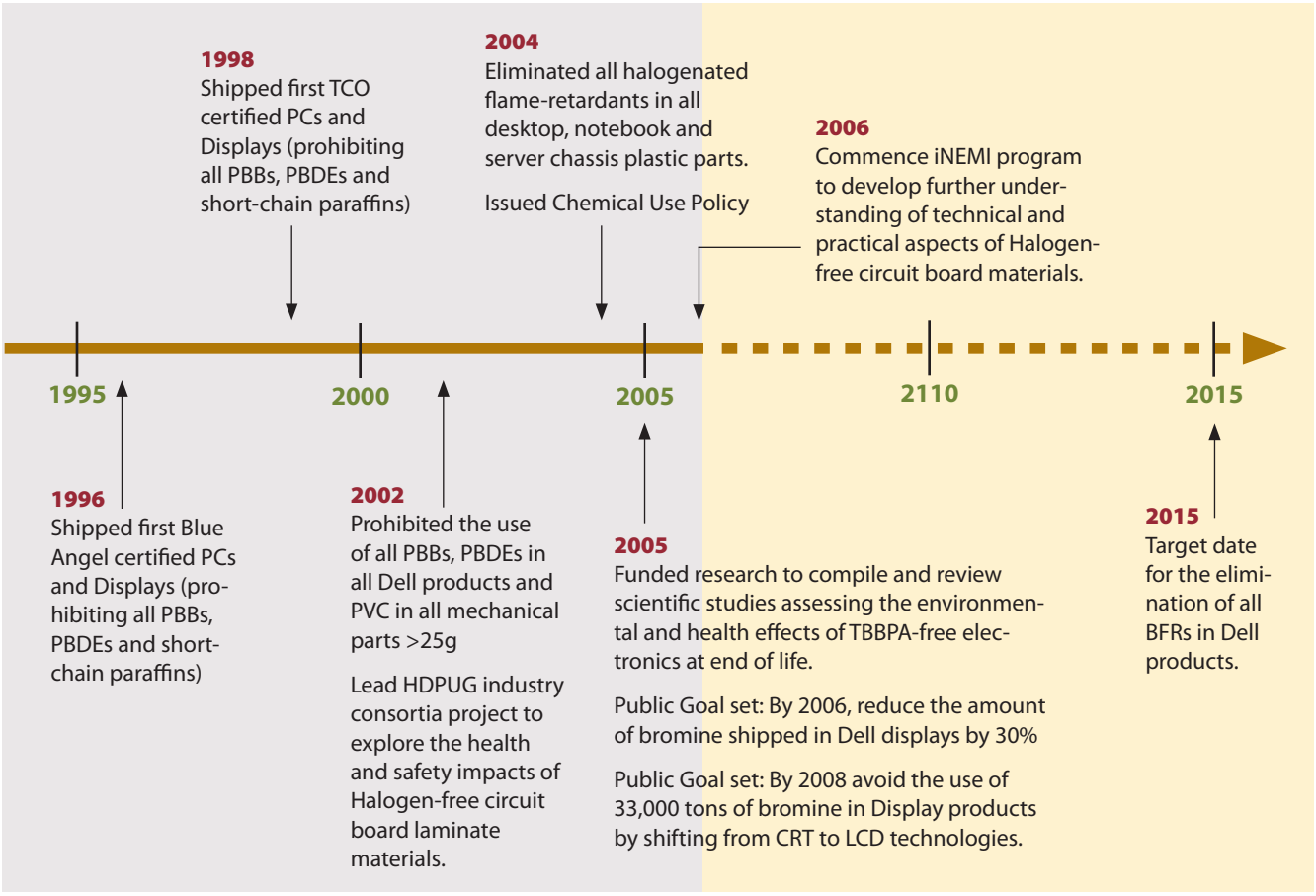
- **Asbestos and its compounds**
- **Azo dues/colorants**
- **Cadmium and its compounds**
- **Chlorofluorocarbons (CFCs)**
- **Short Chained Chlorinated Paraffins (SCCPs)**
- **Chromium VI and its compounds**
- **Halogenated flame-retardants in chassis plastic parts**
- **Hydrochlorofluorocarbons (HCFCs)**
- **Lead and its compounds**
- **Mercury and its compounds**
- **Nickel and its compounds**
- **Polychlorinated Biphenyls (PCBs) and Terphenyls (PCTs)**
- **Polyvinyl Chloride (PVC)**

In addition to the restricted substances, in mid-2006, Dell will begin collecting information from suppliers on the use and non-use of the following substances:

- **Antimony and its compounds**
- **Arsenic and its compounds**
- **Beryllium and its compounds**
- **Bismuth and its compounds**
- **Brominated/Chlorinated flame retardants used in any application**
- **Certain Phthalates**
- **Selenium and its compounds**

expertise to make the solutions affordable to the global computer hardware market. Dell used this approach with its plastics suppliers, challenging them to develop cost and performance equivalent plastics free of bromine and chlorine. It's also using this open-source model to comply with 2006 European Union regulations restricting cadmium, hexavalent chromium, lead, mercury and certain halogenated flame retardants. Keeping with its precautionary approach, Dell will not sell these compliant products only in Europe. Instead, Dell will switch its global manufacturing to meet these standards.

Since 2001, Dell has led several industry consortia to develop standardized solutions for greener chemistry. For example, Dell developed and sponsored the International Electronics Manufacturing Initiative (iNEMI) on brominated flame-retardants and led iNEMI's ROHS supply chain transition taskforce. As Mark Newton explains it, Dell is just starting out on its journey to be an environmentally responsible market leader. The company sees its environmental leadership coming from its ability to influence a supply chain comprised of roughly 400 companies where Dell buys $100 million of materials a day, 350 days a year (Terry 2005). You won't see Dell introducing a specialized "green" computer for a niche market anytime soon. Dell's volumes are too great. Instead, Dell's unique contribution is to push customer, investor, and environmental advocacy concerns in the market, to work on industry principles and standards, and to drive the larger market towards widespread adoption of safer electronics.



FIVE

Lessons for the Journey

Improving corporate chemical consciousness is not like turning on a lightswitch — the case study companies show that real investments in research, testing, product development and marketing are necessary.

When drawn together, our six case study companies each show leadership in its industry sector, its efforts to eliminate high hazard chemicals and materials from products and its investments in protecting and enhancing the brand.

Their motivations for creating healthier products range widely (see Table 7). Many are motivated by deeply held corporate convictions regarding sustainability and health. Each has invested in the past five to ten years in corporate program development and goal setting. Their investments have paid off, whether they are cost savings, the creation of new sub-markets, product differentiation, reduced reputation risk or improved quality and employee loyalty. For companies interested in achieving similar results, their efforts show a clear path forward for companies to better manage chemicals in their supply chains and products.

All the companies highlighted in the report are aware of the dangers posed by toxic chemicals and are taking action to reduce their use. While their individual actions to address toxic chemicals vary, their best practices, when gathered together, define the terrain of healthy chemical strategies (see Table 8). These

TABLE 7. **Summary of Company Motivation and Benefits**

Firm	Motivation for Change	Business Benefits
Avalon	Protect health of consumers, product differentiation	Brand Enhancement, Increased Market Share, Product Differentiation, Sector Leadership
Dell	Reputation management, to be a leader, corporate goals	Sector Leadership, Brand Enhancement
H&M	Smart thing to do, ahead of regulation, protect customer health, corporate goals	Improved Quality, Cost Savings, Sector Leadership
Herman Miller	Values, innovation, corporate goals	Product Differentiation, Brand Enhancement, Sector Leadership
Interface	Values, innovation, market differentiation, corporate goals	Cost Savings, Brand Enhancement, Employee Loyalty, Sector Leadership
Kaiser Permanente	Values, protect health in health care facilities, corporate goals/program	Brand Enhancement, Sector Leadership, Member Satisfaction, Employee Loyalty

strategies, which reflect the journey from Toxic Chemistry to Green Chemistry outlined in Table 4, range from public support for chemicals policy reform to developing and using complex chemical evaluation and assessment tools.

A striking characteristic of the firms profiled here is how they no longer externalize environmental concerns. Rather then viewing chemical hazards as a requirement hoisted on them by the government, they've integrated environment issues into the company values, strategy and business systems. The outcomes of such integration is profound when compared to laggard companies. Corporate strategy changes from delaying action on chemicals until forced to, to finding ways to procure green chemistry. In doing so, companies invest in meeting — as opposed to denying — consumer demand for healthier products.

TABLE 8. **Case Study Company Strategies on the Journey to Green Chemistry**

Strategy	Case Study Companies
Corporate Chemical Policy	Avalon, Dell, H&M and Kaiser Permanente
Product Re-design	Herman Miller — bio-based materials, new furniture designs Interface — bio-based materials, new dye development Kaiser Permanente — catalyzed new carpet design
Targeted Chemicals & Materials	High hazardous chemicals — all six firms PVC — Dell, H&M, Herman Miller and Kaiser Permanente
Green Chemicals	Herman Miller and Interface
Preferred Materials	Bio-based / compostable materials — Avalon, Herman Miller, Interface and Kaiser Permanente Recyclable materials — Herman Miller, Interface and Kaiser Permanente
Chemical Evaluation and Assessment Tools	Herman Miller and Interface
Monitoring and Assurance	Avalon, Dell, H&M, Herman Miller and Interface
Collaboration with Environmental Advocates	Avalon, Dell, H&M and Kaiser Permanente
Significant Engagement with Suppliers	Partnership in new product development: Avalon, Dell, H&M, Herman Miller, Interface and Kaiser Permanente
Product Takeback	Dell and Interface
Public Policy Position — publicly support government reforms	Avalon, Dell, H&M and Kaiser Permanente

SIX

Recommendations for Healthy Business Strategies

The six case studies highlight how businesses are changing their strategies to design healthy products. They are representative of a growing number of companies with the will and desire to transform our toxic chemical economy. Given the assault that toxic chemicals convey upon the environment and our bodies, we need all manufacturers and retailers — not just the few profiled here — to adopt environmentally healthy business strategies for their chemicals, materials, products, supply chain and stakeholders.

To achieve healthy products Clean Production Action recommends the following business strategies:

Chemicals

- **Develop a corporate chemical policy** that includes the precautionary principle.
- **Know what's in your products.** Require suppliers to: a) disclose the chemical (down to 100 ppm) and material content of their products and b) provide comprehensive safety data for all chemicals used in products.
- Strive to **use only green chemicals** in products.
- **Target high hazardous chemicals** for elimination, especially PBTs and OSPAR (Oslo Paris Convention for the Protection of the Marine Environment of the North-East Atlantic) Priority Chemicals.
- **Publicly support government reforms** that promote green chemistry, eliminate high hazardous chemicals and require manufacturers to provide comprehensive safety data for all chemicals on the market.

Materials & Products

- **Take responsibility for products** from cradle-to-cradle. Along with addressing the upstream issues of using green chemicals and healthy materials in products, take responsibility for the product at the end of its useful life. This can range from literally taking the product back to financially ensuring that the product finds its way into a closed loop recycling or composting system.
- **Commit to product re-design.** Along with designing in green chemistry, design products for disassembly into component parts that can be either: reused, recycled or composted (into healthy nutrients for the soil).

  - For recycled products, design them to be **"closed loop recycled"**— recycled back into the same product.
  - For compostable products, **use renewable materials that are sustainably grown and harvested.**
- **Use renewable energy** in manufacturing and design products for very high energy efficiency.

Partnerships

- **Engage supply chain.** The use of only green chemicals and healthy materials in products requires on-going collaborations (as well as compliance evaluations) with suppliers.
- **Work collaboratively with environmental advocates and other non-profit organizations.** Advocates keep up to date with chemical toxicity science and corporate green chemistry practices and they can be insightful collaborators on the journey towards green chemistry.
- **Be socially responsible.** Operate and contract from facilities that meet basic human rights for workers, including: livable wages, health care and dental insurance, right to form unions, safe and healthy workplaces, environmentally responsible production, no forced labor, no worker harassment, no discrimination and no child labor.

Much has been learned about benign and safe chemistry over recent decades and these six profitable and well known companies are proof that safer chemicals use in products is a goal whose time has come. As our case studies show, different tools and approaches can be used. But as with all journeys fraught with difficulties and set backs there must be commitment that the effort will be worth the price. Companies can no longer neglect the opportunity they have to stop the ongoing assault of hazardous chemicals into our common environment. Consumers are waking up to corporate responsibility. Market share will increasingly go to those companies who show leadership and commitment to safe chemical use in their products. In 10 years time, we hope to look back on the many companies that saw and met the challenges of chemical hazards, and celebrate the successful transition to a healthy materials economy.

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Healthy Business Strategies
for Transforming the Toxic Chemical Economy

Business leaders are creating value by embedding concerns for human health and the environment into their products. Healthy business strategies differentiate a company's brand from its competitors — lowering costs, enhancing consumer and employee loyalty and increasing market share by creating healthier products for people and nature. For these leading companies, using environmentally preferred chemicals and materials is a core value, not a secondary assignment relegated to the periphery of the company.

This report profiles six companies that are crafting healthy strategies for using chemicals and materials in their products. While their individual actions to address toxic chemicals vary, their best practices, when gathered together define the terrain of healthy chemical strategies:

- Identify all chemicals in products.
- Eliminate high hazardous chemicals.
- Strive to use only green chemicals.
- Commit to product re-design.
- Take responsibility for products from cradle-to-cradle.
- Adopt internal chemical policies, including the precautionary principle.
- Work collaboratively with environmental advocates.
- Publicly support government reform of chemical policies.

These strategies exemplify the approaches companies must take if they are serious about creating a healthy chemical economy.

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