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Manufacturers are now thinking about the entire life cycle of their products and finding ways to make them less harmful to you and the earth

By Sarah Scott

This is still a disposable world, as anyone can see from the vast amounts of garbage dumped every day into landfills around the globe. But a growing number of manufacturers and designers want to change their methods. By rethinking how things are made, they hope to eliminate waste, or recycle it back to the earth or to industry. To do this, the entire life-span of a product is being reconsidered, from initial design to the end of its useful life. They call it cradle-to-cradle thinking. It may sound utopian, but it is actually becoming a 21st-century reality.

In 2002, Steelcase, the world's largest office furniture manufacturer, took up the green design cause and set to work on making a chair that was good for people and the environment. Office chairs, it turns out, are not as benign as one might think. They have been accused of depleting the ozone, polluting air in offices, even disrupting hormones and raising the risk of cancer. What's



Taking landfill out of the loop



more, they are rarely built to last. According to the U.S. Environmental Protection Agency, an estimated three million tons of office furniture is chucked into landfills each year in the United States alone.

To make Steelcase's new chair green, German designer Glen Oliver Löw was brought in to work with a team of Steelcase designers and consider the chair's impact throughout the manufacturing process. They called it Think, "the chair with a brain and a conscience," and, unlike most office chairs, it uses only water-based adhesives, and its seat is made of stainless steel flexors cushioned by a recyclable polyester pad. Every bit of material – aluminum, steel, plastics, cardboard and rubber – was chemically analyzed to make sure it poses no danger to human health. "Our goal was: whatever we put in the chair, we don't want to be part of a class action suit 20 years from now," says James Ludwig, Steelcase's director of design. Think – launched in June 2004 – is a small but significant step, according to Ludwig: "We knew we were setting a new benchmark," for the company and the industry.

Steelcase and other furniture manufacturers, such as Haworth and Herman Miller, are pioneers in what architect William McDonough and chemist Michael Braungart call the "next industrial revolution," green product design. Authors of the 2002 green manifesto *Cradle to Cradle* and founders of the consulting firm McDonough Braungart Design Chemistry (MBDC), the duo is urging designers and manufacturers to stem the massive flow of waste to incinerators and landfills. They say designers should mimic nature and turn waste into food – food for the earth through safe composting, or food for industry through 100 per cent recycling. And they are not talking about remaking the plastic covers of printers into clothes hangers and fence posts, as Hewlett-Packard does. Among other things, that kind of recycling – or "downcycling," as they call it – wastes useful materials and ultimately leads to landfill. Design for disassembly is a key part of making a safe and sustainable product. If materials can be taken apart, they can be recycled. If they are mixed together, that can't happen. Formerly valuable materials end up being remade into other products, such as park benches, still just one step away from the local dump.

To design for disassembly, Steelcase used fewer materials (mainly steel, aluminum and plastics) and relied on mechanical fasteners instead of glue to put the chair together. Think is 99 per cent recyclable and can be taken apart in just a few minutes using a hammer, a screwdriver and a pair of scissors.

But disassembly was only a start for the furniture maker. It hired environmental expert Niki Bey, of the Institute for Product Development in Copenhagen, to measure the chair's impact on the environment throughout its life cycle. Among other things, Bey's analysis considered the ecological effect of procuring raw materials, and manufacturing, transporting, using and disposing of the chair. This long view is important: life cycle analyses have shown that in some cases it can be more harmful to use recycled materials because of the additives required to repurpose them.

1. Steelcase's Think Chair is 99 per cent recyclable and can be taken apart in less than five minutes. Disassembly is a key element of the cradle-to-cradle design ethos.

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Fabric Smart

Almost half of the synthetic fibre produced each year is polyester, which is recyclable. But there is one problem: most of it is made with antimony, a carcinogenic chemical that can seep into the air, water and earth during manufacturing and recycling. The Quebec-based fabric company Victor Innovatex is changing that story, by developing the world's first polyester fabric produced and dyed with safe ingredients. Called Eco Intelligent Polyester, it is designed to be recycled forever. The company recruited experts from MBDC to analyze the 57 chemicals used in production, whittle them down to 15 and replace some with greener alternatives. The product is now antimony-free and has been certified clean and green by MBDC. Fabrics made with Eco Intelligent Polyester have become the fastest-growing segment of the company's business. One hitch remains: there is no workable system to recycle polyester into new fabric. Despite the efforts of Victor Innovatex and other manufacturers, polyesters are still being "downcycled," usually as cushion filling or felt.



Good Wood

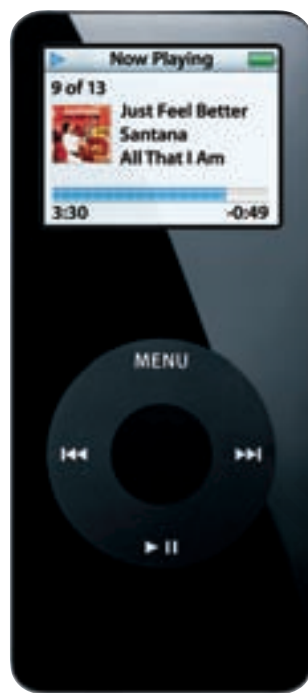
The Forest Stewardship Council sets stringent standards for sustainable forest management around the globe. In January, Loewen, a Winnipeg-based manufacturer of door and window frames made of coastal Douglas fir, became the first North American company to be certified by the FSC; the Chain of Custody Certification recognizes that Loewen's wood products cause the least environmental and social harm possible.



Sourcing the Sun

Solar battery chargers - made by various companies, including Sollo - are becoming sleeker, smaller and more portable than the clunkers of a decade ago. The new chargers collect sunlight or indoor light on solar panels and convert it into energy, which then charges batteries for free, without electricity. One hour of sunlight provides approximately an hour of play time on your iPod.

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Founded in 1995 in Charlottesville, Virginia, MBDC has been helping such clients as Steelcase become eco-effective without compromising on quality or profits. MBDC has distinguished itself from the rest of the green design world by demanding from its clients a rigorous accounting of what's in its products. "It's surprising, but most companies don't know what is in the things they make," says MBDC's acting CEO, Ken Alston. Suppliers aren't always keen to share their recipes. And once MBDC gets the recipe (with a promise of complete confidentiality), the effect of some of the chemicals on humans may still be unknown. (Only 3,000 of 80,000 defined chemical substances and technical mixes have been studied for their effect on living systems, according to McDonough and Braungart.) The impact of everyday products may be more noxious than one might think. Ordinary household products could potentially cause cancer or malformations in embryos, the authors say. An electric hand mixer spews tiny amounts of chemical gases that can work their way into cake batter. "So be careful," they warn. "You might be unintentionally eating your appliances."

2. Loomstate jeans have become popular because the company first sells customers on high style, then on the fact that the 100 per cent organic cotton it uses is free of pesticides, herbicides and synthetic fertilizers.

3. While iPods don't biodegrade and cannot be recycled, they are an example of dematerialization - manufacturing with fewer materials and, in this case, replacing physical products with virtual ones.

4. The tops and shells of Michigan-based Jonas Hauptman's reSeat line are made of reconstituted North American aspen wood flakes held together with formaldehyde-free adhesive. The furniture isn't strictly cradle-to-cradle, because not all the materials are recyclable. But the small amount of wood it uses will quickly biodegrade when composted.

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Bottled Clothing

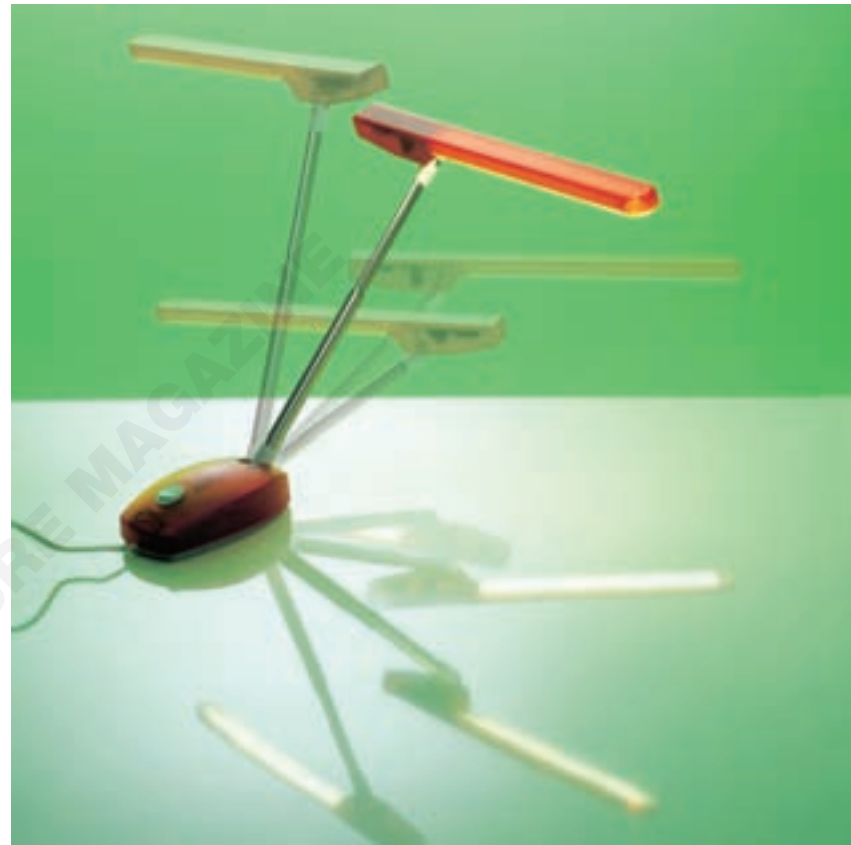
Patagonia's PCR Synchronilla fleece is made out of used plastic bottles - hence the term PCR (post-consumer recycled). It takes about 25 two-litre plastic bottles to make one PCR fleece garment, according to Patagonia, which uses the material in many different items. The purveyor of all things outdoors says 150 Synchronilla snap T-shirts save 3,700 two-litre bottles from landfill, plus one barrel of oil and half a ton of toxic air emissions. But, as the company notes, Synchronilla fleece garments don't quite make it as models of cradle-to-cradle, because the material can't be recycled into new garments. Patagonia's Capilene line of base layers, on the other hand, is now completely recyclable, thanks to a new green facility. Once you've worn out your long johns, you can return them to the company for recycling.



Green Since Birth

Disposable diapers have a long history of burdening municipal landfills and depleting natural resources. In Canada alone, more than four million diapers are discarded every day. First developed in Australia in 1991 and manufactured in the U.S. since 2004, the gDiaper is flushable and biodegradable. The cotton outer layer is reusable, while the liner goes right into the toilet, leaving no diaper, no diaper pail and no smell. Last March, gDiapers became the first packaged consumer product to receive cradle-to-cradle certification from MBDC.

5. Ernesto Gismondi's **E.Light** fluorescent lamp uses six-watt micro-light technology, which is free of any harmful emissions from heat or ultraviolet rays. It also saves energy, with five times more light output per watt than the average incandescent bulb. The light is designed to last 20,000 hours - three times longer than most other fluorescent sources.



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Last October, MBDC announced the first six recipients of its Cradle to Cradle Environmental Certification award, given to products that have passed strict health and environmental safety tests. Steelcase has won the award, for Think, as have: Haworth, for its equally green Zody office chair; textile manufacturers Victor Innovatex and Pendleton Woolen Mills; Hycrete Technologies, which produces concrete additive; and Athletic Polymer Systems, makers of indoor track material. More recently, other inventive products have received certification, including the flushable gDiaper, an architectural paint made by Energy Barriers Inc., and a biodegradable surfing wax made by Wet Women International.

The certification awards are significant. Up until now, there has been no benchmark for green products along the lines of LEED, a certification program for builders and architects initially set up in 1998 by the U.S. Green Building Council and since adopted by other countries. Nor are there laws in North America that oblige producers of things to be financially responsible for the waste they generate. That's changing in Europe, though. The European Union has approved directives aimed at reducing electronic and electrical waste. Under the new WEEE (Waste Electrical and Electronic Equipment) regulations, expected to be implemented sometime in the next year, producers are responsible for recovering and recycling electronic products, such as TVs, computers, fridges and fax machines. How this will work in practice remains to be seen.

Many designers aren't waiting for governments to lay down standards. Internet sites devoted to reporting on eco-friendly design and initiatives are flourishing. Such sites as Treehugger, Biothinking and Greenmarketing are showcasing ingenious new green products on a daily basis. On any given visit, you'll find high-style organic clothing, no-tree paper, wheat-based disposable cutlery, furniture made of sugar or offcuts, and software that allows you to use old computers to search the Internet instead of throwing them out.

While these innovations might not adopt MBDC's approach, product designers are aiming to make things healthier and less wasteful by finding new ways to recycle old material; or use sustainable



The Edible Bottle

Think about this the next time you down a bottle of water: plastics make up 11 per cent of the municipal waste dumped in the U.S. So wouldn't it be a good idea to make water bottles from biodegradable plastic? Biota, of Ouray, Colorado, thought so. Its pure spring water bottle is made from NatureWorks PLA packaging, derived from corn, biodegradable and as safe as food. One acre of corn yields the equivalent of 188,000 yogurt cups, and one bottle of Biota optimally biodegrades within 75 to 80 days.



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6. **Emiliano Godoy's table lamp** is part of the Mexican designer's **Sweet Disposable** collection, a series of home accessories made out of sugar.

7. Researchers at the University of Warwick have developed a **biodegradable polymer cellphone case** in which a sunflower seed is embedded. Toss the case into your garden, and within a few weeks a flower will grow.

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8. **Bale Chair**, by MIO of Philadelphia, is an ingenious way of reusing old books. It's made of moulded plywood certified by the FSC (Forest Stewardship Council), and the webbing straps are 100 per cent recycled polyester.



Nature's Kitchen

Here's a beautiful example of how less is more. Valcucine kitchens from Italy are designed for disassembly and require less raw material than your average fibreboard and adhesive kitchen cabinets. By using an aluminum frame to support a very thin front panel, Valcucine's signature kitchen cabinetry, Ricicla, uses 80 per cent less material. No solvents are used, all lacquers are water-based, and wood finishes are extracted from natural products, such as soy, flax and orange peels.

materials, such as bamboo; or use less material than they once did, to make things lighter and smaller – the iPod, for instance. Other designers are focusing on making things last longer. Stokke's classic Tripp Trapp chair is designed to adjust as a child grows, and Ernesto Gismondi's E.Light, designed for Artemide, lasts for up to 20,000 hours (or two to three times longer than most fluorescent sources) and requires 94 per cent less power than your average desk lamp.

But one of the biggest obstacles to achieving MBDC's cradle-to-cradle vision lies outside the designers' ordinary scope of interest – in the recycling system. Although bottles, tins and newspapers are routinely recycled, furniture and carpets still usually end up in landfill, even if they have been designed to be recycled. "That's what we find so frustrating," says Jackie Evans, an account executive for Canada's Interface Flooring Systems. As part of its greening, Interface recycles carpet backing and has found other uses for its nylon carpet surfaces – that is, if it gets the carpet back, which it usually doesn't. "People don't think about it, and by the time they do think about it it's too late," she says.

At Steelcase, James Ludwig isn't worrying about that end-of-life issue just yet – not when Think is turning out to be a hot seller. Green has turned into a powerful selling story, especially in Europe and Asia. In the U.S. and Canada, however, performance and elegance still count for more than environmental impact. **AZ**