GREEN SEAL'S GREEN LEASE REPORT

OFFICE FURNITURE

Office furniture is an $11-billion industry, and its impact on the environment is significant. It contributes to the depletion of forest and mineral reserves through the extraction of natural resources. Volatile organic compounds (VOCs) can pollute the air and water during the manufacturing process. In addition, when furnishings are installed in the workplace, they may continue to release VOCs and contribute to indoor air pollution. Finally, desks, chairs, cubicle dividers and filing cabinets may wind up in the landfill at the end of their useful lives.

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Customers have the power to greatly reduce the impact of office furniture on the environment by choosing environmentally responsible products. Several companies already offer customers choices in the marketplace, and as demand for such products increases, a greater selection at more competitive prices will become available.

Despite the slow economy that has resulted in a decreased demand for all office furniture, two main factors have helped counteract that decrease in the more sustainable office furniture sector. First, federal, state and local governments have passed mandates requiring the purchase of recycled content products. Second, with voluntary Leadership in Energy and Environmental Design (LEED) incentives, contractors are encouraged to specify environmentally preferable furniture for their products. However, we still have a long way to go in making these products the standard. This report will help customers make better choices for the environment when they are shopping for new or refurbished office furnishings.

In our research, we contacted over 25 companies that manufacture office furniture and asked them to identify the materials they use-from wood and metal to foams and paints-and to provide information on emissions in the manufacturing process and in the environment as well.

From the information they provided, we were able to identify and recommend seating, desks and workstation options from nine

manufacturers. These products are listed in the enclosed tables. In this issue, we also explain the environmental impact of the manufacturing process for different materials to help consumers make informed purchasing decisions.

Environmental Impacts of Office Furniture

- Wood Products

Harvesting wood in a non-sustainable manner contributes to soil erosion, deterioration of watersheds and the loss of biodiversity. It also represents a threat to the economic future of many communities. In addition, loss of tropical rainforests may contribute to global warming.

One way to reduce these negative impacts and to enhance the long-term economic future of communities is to purchase wood from certified, well-managed forests (See "Certified Wood", page 3).

The *Choose Green Report* is published for Green Seal Environmental Partners. To become an Environmental Partner or to receive a copy of this report, contact Green Seal at (202) 872-6400 or greenseal@greenseal.org.

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Design, *Cutting Edge Graphics*

Original printed on Green Seal-certified Mohawk Satin Cool White Recycled paper, 30% post consumer content.

Be aware that not all certification systems are equally meaningful. For a comparison of different certifications, see www.certifiedwood.org. While the market share of certified wood in the U.S. is small, it is increasing. In Europe, however, certified wood products are relatively easy to find.

As part of their advertising strategy, manufacturers often

boast that they use certified wood. When ordering, specify that you want a product made from certified wood because it lets manufacturers and suppliers know that you care about where and how the wood is produced. Also, some companies offer both certified and non-certified wood; let them know that you prefer the certified wood products.

Conventional fiberboard products such as plywood and particleboard typically use a urea-formaldehyde binding agent in the manufacturing process. These products can emit formaldehyde throughout their life cycles. The Environmental Protection Agency (EPA) classifies formaldehyde as a probable human carcinogen.

There are better alternatives to conventional binding agents on the market. One common substitute is methylenediphenyl cyanate (MDI). Unlike formaldehyde, products made with MDI do not emit a toxic gas during the use of the product, although there are still safety concerns for workers during the manufacturing process. MDI is often used in products where formaldehyde is not suitable, including wood based fiberboard and products made with agricultural resins. In products that are manufactured with formaldehyde, note that phenol-formaldehyde and resorcinol-formaldehyde, though not completely harmless, emit much lower amounts of formaldehyde than urea-formaldehyde.

An even better choice is a product made with naturally derived adhesives and resins. While not yet widely available, concerns over public health have prompted research on the viability of their widespread use in the marketplace. Some office furniture on the market is constructed from alternatives to wood products, including fiberboard made from agricultural waste or recycled paper (see "Beyond Particleboard", page 4). If these products incorporate formaldehyde-free binding agents, they serve as a good alternative to conventional fiberboard.

Solid wood products, especially is they have been produced from certified, sustainably managed forests, are a good choice because they don't require any binding agent, and consequently don't require formaldehyde.

Certified Wood

The Forest Stewardship Council (FSC) is an independent, international, non-profit organization that sets standards and provides certification for responsibly managed forests. In addition, they provide trademark assurance for individual certification organizations.
To qualify for the FSC seal, forests must be managed in a manner consistent with FSC principles, including protecting the environment, for example by promoting watershed protection or conservation of biological resources; implementing programs that incorporate sustained-yield production; and working with and contributing to the well being of local communities.

- Cushioning Foams

Hydrofluorocarbons (HCFCs) are often used as blowing agents for polyurethane foam. HCFCs replaced chlorofluorocarbons (CFCs), which were banned from the developed world in 1996. However, due to their own ozone depleting potential, HCFCs are similarly being phased out. With the first of the three main types of HCFCs used in foam banned in 2003, the phase out of the other two is set for 2010. Alternative blowing agents, including water, isoproprene, acetone, pentane and carbon dioxide with limonene and terpene, are being used more commonly. These products are less harmful to the environment.

Fire safety is another concern with the highly flammable polyurethane foam. To prevent fires, the foam is usually treated with polybrominated diphenyl ethers (PBDEs) as a flame retardant. While greatly reducing the risk of death and injury from fire, there is an emerging debate about the impacts of PBDEs on human health and the environment. PBDEs persist in the environment and are potential carcinogens. Discarded furniture is a major source of PBDEs in the environment—yet another reason to refurbish older furniture and discard it properly at the end of its useful life.

- Metal Coating

Metal plating produces a bright, durable and corrosion-resistant finish for metal furniture. A common plating process uses hexavalent chromium (CrVI) with a copper/nickel-plated undercoat. Releases of heavy metals, such as chromium, nickel and cyanide compounds, from electroplating processes are of environmental concern because of their toxicity. Hexavalent chromium and nickel dust are both classified by the EPA as human carcinogens. If metal plating is required for a piece of office furniture, tin-cobalt alloy, nickel-alloy or trivalent chromium (CrIII) is recommended over hexavalent chromium plating.

It is relatively simple to design office furniture that does not require metal plating. For example, powder coating is a dry finishing process using finely ground pigment particles and resin that are electrostatically charged and sprayed onto a part to be coated. This is an excellent alternative because it does not involve the use of heavy metals, and there are no VOC emissions. It is also possible to design uncoated metal furniture or to use water-based, low-VOC metal paints.

- Adhesives

Adhesives can cause VOC emissions during manufacturing and later contribute to indoor air pollution. Many of the manufacturers surveyed have switched to adhesives that have no, or very low, quantities of VOCs. These include hot-melt glue and double-sided tape. For some processes, such as gluing a plastic laminate to a fiberboard surface, a solvent-based adhesive is still required. (For more information on VOCs, see "Furniture and Indoor Air Quality", page 5).

- Paints and Finishes

Paints and finishes can cause air-polluting VOC emissions as they are applied. In addition, over the lifetime of the furniture these coatings may continue to emit VOCs, contributing to indoor air pollution. Most of the manufacturers surveyed have converted to finishes with no or low levels of VOCs.

However, our survey indicated that many manufacturers are not satisfied with the performance of VOC-

free clear top coating for wood surfaces, so most manufacturers still use solvent-based topcoats. Other finishes that produce low emissions of VOCs include a two-component, catalyzed coating that uses a polyester or polyurethane base, supercritical carbon dioxide/solvent-based finish and a coating that uses ultra-violet light as a curing agent.

- Reusability, Recyclability and Useful Life

In general, products with a long useful life—the length of time they are in service—are better choices environmentally than products with a short life. They do not need to be refurbished as often or thrown away as soon, thus reducing demand for raw materials from the start and waste at the end of the product's useful life.

Refurbishing furniture is an excellent way to extend the useful life of a product. In fact, most products can be refurbished and reused, thus reducing the amount of material sent to the landfill. Refurbishing is a growing industry with approximately $1 billion in sales per year.

Refurbished furniture costs 25 to 70 percent less than comparable furniture. It is virtually indistinguishable from new furniture and has a similar useful life. And when it does become worn, it can be refurbished again. Typically, refurbishing firms replace worn fabric, refinish metal and wood surfaces and relaminate work surfaces. You may be able to find a local refurbisher in the Yellow Pages. Also, some manufactures either refurbish their own lines or can provide contact information where you can purchase their products. While refurbished office furniture in itself is an environmentally preferable choice, you can further mitigate the environmental impact by finding a refurbisher that:

- Recycles the parts they can not use
- Uses materials with recycled content
- Uses wood certified by a reputable organization, such as the Forest Stewardship Council FSC)
- Offers water-based paints and finishes
- Uses VOC-free adhesives.

For an example of an office refurbisher that focuses on minimizing their net environmental impact, see Creative Office Systems (www.creativeoffice.com).

One final consideration is recyclability. Products should be easy to disassemble and should not contain co-injected plastics, which are materials that contain two types of plastic or a plastic and a fiber, because this makes recycling difficult. However, even if only one type of plastic is present, not all plastics can be recycled, so it would still be necessary to ask whether the product can be recycled.

Beyond Particle Board

Both Olive Designs' and Baltix are leaders in the use of alternative materials. Olive Designs innovative use of materials includes using those that are generally difficult to recycle or find other uses for such as recycled tires, salvage glass and salvage boiler tubes. Their designs also incorporate rapidly renewable plant-based materials including industrial hemp, wheat board, and meadowood- a rye grass straw particleboard substitute. Baltix uses wheat straw, sunflower hulls, soy flour / recycled newsprint as well as more common recycled products in their furniture. In addition to using alternative materials, both companies exclusively use adhesives, coating and resins that are free from formaldehyde, heavy metals and VOCs.

Furniture and Indoor Air Quality

With 90% of our time spent indoors, indoor air quality has the potential to greatly impact our health. Compared to outdoor air, indoor air is generally two to five times more polluted, and can lead to heath effects such as irritation of the eyes, nose and throat, fatigue or dizziness, to more debilitating conditions such as heart disease, respiratory disease or cancer. While the sources of pollution are many, office furniture, especially pressed wood products, is a main culprit. Greenguard was established specifically to address indoor air quality and the impact of building materials. For more information visit www.greenguard.org.

What's Out There

Larger manufacturers offer hundreds of choices, from wool or ramie fabric for office chairs, to water-based paints. Customers can select from products containing recycled content and low- or no-VOC finishes. Some smaller manufacturers offer products made from recovered wood or agricultural fiberboard.

In our research, we contacted over 25 U.S. manufacturers of office furniture. Specifically, we asked them to identify the materials they use in their office furniture, to assess the recyclability and useful life of the furniture and to provide emissions information. The results of our survey are summarized in the tables below. To be included in this report, a product must meet at least 4 of the following criteria where applicable:

- Minimum average 30% recycled content
- Powder coating (or electrodeposition without Cr VI)
- Formaldehyde-free adhesives
- Biodegradable or recycled content fabric option
- Leasing or buy-back option
- FSC certified wood option
- Easily disassembled for refurbishing or recycling

Recommended Office Furniture Products

MANUFACTURER	PRODUCT(S)	WASTE MINIMIZATION	NONTOXIC	AIR POLLUTION	SUSTAINABILITY
Allsteel	Work Chair #19	100% recycled content aluminum, 21% recycled content plastic	Polyurethane foam; water-based adhesives	Powder coating; meets indoor air quality standards for State of Washington	Large orders are blanket wrapped
	Sum Chair	100% recycled content aluminum, 30% recycled content steel	Polyurethane foam; water-based adhesives	Powder resin; meets indoor air quality standards for State of Washington; Greenguard certified	Large orders are blanket wrapped
	All Workstation Systems	90% recycled content particle board; 30% recycled content steel	Water-based adhesives	Powder coating; meets indoor air quality for State of Washington	

Recommended Office Furniture Products

MANUFACTURER	PRODUCT(S)	WASTE MINIMIZATION	NONTOXIC	AIR POLLUTION	SUSTAINABILITY
Baltix	EcoBuzz Workstation	96% recycled content plastics; 40 % recycled content paper; wheatboard; sunflower husks		No VOCs	Majority of materials are agriculturally based and/or rapidly renewable resources
DAR-RAN	All Desks	25% recycled content particle board			Custom products in sustainable materials available; MDF and Smartwood Certified mills
	All workstations	25% recycled content particle board			Custom products in sustainable materials available; MDF and Smartwood certified
HAG	HAG H03 HAG H05 HAG Conventio	30-35% recycled content for aluminum and steel; recycled plastics		Powder coating	Packaging can be reused; contains 35% recycled material
Herman Miller	Ethospace Workstation	For work surfaces, recycled content >70%; 100% recycled aluminum content	Water-based adhesive for HPL covered work surfaces	Meets indoor air quality standards for State of Washington; Greenguard certified	Fiber is sustainably harvested; SFI[1], SCS[2] certified
	Action Office Workstation	For work surfaces, recycled content >70%; 100% recycled aluminum content	Water-based adhesive for HPL covered work surfaces	Meets indoor air quality standards for State of Washington 15 g/l; Greenguard certified	Fiber is sustainably harvested; FSC, SCS, SFI certified
	Aeron Chair	100% recycled content for Al; 55% for steel	Polyurethane foam	Powder coating; electrodepostion (no Cr VI); Greenguard certified	Large orders are blanket wrapped
	Equa2 Chair	100% recycled content for Al;>23% for steel	Polyurethane foam	Powder coating; electrodepostion (no Cr VI); Greenguard certified	Large orders are blanket wrapped
Humanscale	Freedom Chair	100% recycled content for Al	Polyurethane foam; hot melt adhesives	Powder coating	Large orders are blanket wrapped; will take back any packaging for reuse
Knoll	Life Chair	Uses agricultural waste and salvaged material; 64%recycled content for Al version; 52%recycled content for plastic model	Non-toxic maintenance	Emits no VOCs; meets Greenguard standards	Blanket wrap available

[1] SFI = Sustainable Forestry Initiative
[2] SCS = Scientific Certification Systems

Recommended Office Furniture Products					
MANUFACTURER	**PRODUCT(S)**	**WASTE MINIMIZATION**	**NONTOXIC**	**AIR POLLUTION**	**SUSTAINABILITY**
Knoll	Morrison Laminate System Workstation				Available as FSC certified; product can be salvaged after useful life
	Equity System Workstation	Composite wood from recycled materials; 60% of gypsum used from waste treatment by-products; overall minimum 40% recycled content		Powder coating	Available as FSC certified; product can be salvaged after useful life
	Reff Laminate System Workstation	Composite wood from recycled materials; overall minimum 40% recycled content		Greenguard certified; VOC-free adhesives	Available as FSC certified; product can be salvaged after useful life
	Currents Laminate System Workstation	Composite wood from recovered materials; salvaged strawboard; overall minimum 40% recycled materials			Available as FSC certified; product can be salvaged after useful life
Olive Designs	All Chairs	Uses salvaged materials that are not otherwise easily recyclable	All glues formaldehyde-free		See text box "Beyond Particleboard" (page 4).
Steelcase	Chair Products (e.g. Leap Chair)	30% recycled content steel; 100% recycled content fabric; steel, fabric, foam, and polypropylene components 100% recyclable	Water based adhesives	Powder coating; meets indoor air quality standards; Greenguard certified; contributes to LEED certification for green buildings	Blanket wrapped for domestic shipment; designed to be easily repaired and upgraded to extend life
	Desk Products (e.g., Everest)	30% recycled content steel; 90% recycled content particle board; 97% recyclable by weight	Water-based adhesives		Wood core is certified for sustainable management
	Systems Products Workstations (e.g., Answer)	90% recycled and recovered wood content particle board; 15-30% recycled content steel; 65% recycled content aluminum; steel and fabric components 100% recyclable; 94% recyclable by weight	Water-based adhesives	Powder coating; Greenguard certified; contributes to LEED certification for green buildings	Designed to be easily upgraded and repaired to extend product life

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HAG	800-334-4839	www.haginc.com
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