About the Author:
Diane Wright

Diane Wright is a marketing professional with over 18 years of experience promoting textiles, finishes and other related products. Diane has overseen the material development of Teknion’s worldwide offering for the past 10 years. During this time she has been communicating material trends through a number of formats including presentations to a global client base.

Diane consults with outside designers and leading Canadian, U.S. and European suppliers to interpret trends and future material introduction opportunities including sustainable options. Her role requires her to visit leading textile mills and other finish manufacturing facilities to learn new capabilities that can be incorporated into Teknion’s award winning Fabrics and Finish Program.

Sustainable Textiles

In the North American textile market, green is all the rage. In fact, a joint survey published by Interior Design magazine and ACT (the Association for Contract Textiles) indicated that 74 percent of projects require textiles, 21 percent of projects are LEED (Leadership in Energy and Environmental Design) Certified or follow LEED guidelines, and 20 percent of textiles specified have sustainable properties.

For firms seeking LEED Certification, fabrics can impact any of the following areas earning the following credits:

- Indoor Air Quality Impact - EQ Credit 4.5
- Recycled Content – MR Credit 4.1 and 4.2
- Regional Materials – MR Credit 5.1 and 5.2
- Rapidly Renewable Material – MR Credit 6
- Innovation in Design or Application

This makes knowing how to properly choose sustainable fabrics an increasingly important consideration for designers.

Pioneers in the Development of Sustainable Textiles

The first sustainable designed contract furniture fabric was introduced by Designtex, which teamed with William McDonough and a Swiss fabric mill to introduce Climatex Lifecycle in 2001. Climatex helped set the tone for many sustainable products that were to follow.

Produced using only renewable resources and non-hazardous dyes, Climatex was developed to be compostable, and turn back into soil at the end of its useful life.

Interface was another early innovator in the sustainable textile movement after previous Chairman and CEO, Ray Anderson, was inspired by The Ecology of Commerce by Paul Hawken. Anderson reported that reading the book was like having a spear through his chest and made him realize his global organization was operating in an unsustainable manner.

A second book, Ishmeal, by Daniel Quinn, helped Anderson realize how a company’s mission could be noble and restorative instead of destructive. These two books not only inspired Anderson, but also resulted in Interface’s entire corporate culture becoming infused with sustainability.

Interface was responsible for introducing the first 100 percent recycled polyester fabric in 1996, although with limited interest. However, by 1998 they converted their number one selling panel fabric (FR 701) to 100 percent recycled and introduced a sustainable dye and chemical protocol creating the Terratex Brand. Today, Interface’s Terratex Brand also includes 100 percent polylactic acid (PLA) fabric, a water-resistant, biodegradable bioplastic resin made from renewable cornstarch.
Attributes of Sustainable Textiles

A sustainable textile considers the affect of product, process and protocol decisions on how the fabric will be designed and what materials will be used in its construction.

Product decisions would include:

- Material efficiency and waste minimization
- Compostability and end-of-life management
- Whether the fabric is made from eg. petroleum sources versus bio-based sources.
- Recycled content (pre-consumer vs. post-industrial)

A sustainable textile aims to have a closed-loop approach, meaning the materials that make up the product should be so safe to humans and the environment that they can be continually used through reuse or recycling.

Throughout the entire product lifecycle, the environmental and human health impact should be minimized — from raw material acquisition, to manufacturing to use/reuse/maintenance, and end-of-life management.

Once the fabric is designed, the process to manufacture it must also be aligned with sustainable practices. Where does the energy come from to run the processing equipment? How much water is used per square foot of fabric? And what types of chemicals are used?

A sustainable process seeks to use less-polluting energy sources and minimize the amount of wastewater returned to the environment — and if it is, ensure that it’s in as clean or cleaner condition that it was incoming. Any chemicals used should have little or no harmful health affect on humans or the environment.

Raw materials account for 99 percent of the end product, while the dye and other additives make up the remaining one percent. So the final consideration is the protocol for screening the ingredients that consist of the remaining one percent of the fabric makeup for any chemicals that may be harmful to human and ecosystem health.
In both the design of the product and the process, some type of filtering mechanism is required to ensure that any remaining chemicals and other inputs meet the challenges of making a sustainable product. In the textile industry, many of the most critical inputs come from the following:

- Dyes & auxiliaries
- Antimicrobials/biocides
- Waterproofing
- Colorants/pigments
- Softeners
- Anti-static
- Anti-wicking
- Lubricants
- Fire retardants
- Odor-impeding chemicals
- UV protection

Sustainable Fabrics — Recycled Polyester/ Antimony-Free Polyester

There are two types of recycled polyester. Pre-consumer (post industrial) is derived from waste generated by the industrial process before the polyester is used by the consumer. Post-consumer polyester is made from waste material left over once a consumer has used a product.

A higher percentage of post-consumer waste content is considered the greener option and LEED guidelines post-consumer content contributes more to the credit than pre-consumer. Using recycled polyester results in less waste going to landfills, decreases the demand for petroleum products and reduces the impact from the processing petroleum into polyester.

In fact, according to life cycle assessments, one leasing mill using recycled polyester fiber saves more energy than it takes to heat over 50,000 homes for one year.

Post-consumer recycled polyester is made from polyethylene terephthalate (PET/PETE) used to make soda and water bottles. PET requires the heavy metal antimony as a catalyst, which has been identified as a chemical of concern with environmental and human health impacts.

In 2002, antimony-free polyester fabric produced using fully optimized dyes and chemicals and free of chlorine and toxins was introduced to the contract furniture market. Other mills are now looking at introducing antimony-free polyester products.

Eco Intelligent® Polyester (EIP) is the name brand for Victor Innovatex’s antimony-free polyester. The first mill to market a product of this kind, Victor Innovatex EIP fabrics have been designated Cradle-to-Cradle™ Material-Gold and certified for eco-effectiveness by McDonough Braungart Design Chemistry (MBDC). Available for both seating and panels, they are marketed as safely and perpetually recyclable and produced using renewable energy.

Experiments show that by removing the antimony, fabrics can even be recycled into new polyester. Victor is currently working to develop a reclamation system that will enable them to close the loop with their Eco Intelligent(R) offerings.
Sustainable Fabrics — Renewable Raw Materials

There are many types of renewable raw materials for fabrics available in the marketplace.

Biodegradable Polylactide (PLA) Fiber is a rapidly renewable bio-based contract fabric that comes from fermented sugars of corn and is therefore compostable and decreases the dependence on oil-based raw materials. Production of PLA fibers requires 20 to 50 percent less fossil fuel resources than it takes to produce fibers from traditional hydrocarbon resins. The net result is lower greenhouse gas emissions.

PLA fiber has been used in the production of products ranging from food service containers to apparel and residential fabrics. For example, Interface’s Terratex fabric is produced from PLA and also employs the Terratex dye and chemical protocol.

Traditional cotton is one such material, but comes embedded with a significant amount of unsustainable attributes. Conventional cultivation practices for cotton have made it one of the most water-intensive and chemical-intensive crops in the world, with the use of synthetic fertilizers and pesticides. Within the U.S., cotton crops alone account for 25 percent of all pesticides used.

For these reasons, ACT has been monitoring the availability of organic cotton for use in the contract furniture market.

The term organic refers to cotton grown according to government guidelines, including the use of natural versus synthetic fertilizers and bio-pesticides. Organic cotton is currently available in a wide range of apparel and there is a growing market for certified organically grown sustainable cotton.

Used to make Egyptian mummy cloths, ramie is one of the oldest sources of raw materials for fiber, having been used for fabric production for at least 6000 years.

Ramie natural fiber can be found in contract seating products and is typically blended with other fibers such as cotton or wool.

Difficulties associated with the extraction, cleaning and processing of ramie present a number of environmental challenges, particularly associated with the extensive chemical treatment to remove gums and pectins. If it is not processed in a sustainable manner, ramie could come embedded with human and ecosystem health issues.

Wool is another natural fiber used in clothing, carpeting, felt, insulation and upholstery. Wool can be recycled or remanufactured and the Gabriel mill in Denmark sells recycled wool to the apparel industry for sweaters.

Wool offers benefits to the indoor environment as it has the ability to absorb volatile organic compounds (VOCs). Yet while wool is inherently sustainable, the use of dyes and chemicals can limit its ability to be recycled or composted.

The demand for organic wool is growing dramatically. Produced by ensuring livestock feed has no synthetic pesticides or fertilizers, hormones or genetic engineering, organic wool standards can also require that washing/scouring be performed without bleach or other chemicals.

Hemp is a natural fiber harvested from the industrial hemp plant variety, which has ultra-low levels of THC, the active ingredient found in Cannabiddies varieties. Hemp requires less water, synthetic fertilizer and pesticides than many other sources of fiber.

In textiles, it hemp usually blended with other fibers like cotton, flax, ramie and wool. It’s gaining popularity as a component of biocomposite materials for automotive parts, and leading North American mills are now working on offering hemp textile options for contact furniture uses.

Bamboo has long been used as a material in construction and as a source of food, and has recently been introduced as a source of fiber to the contract market. Luna introduced a few patterns using bamboo at Neocon 2007 and a number of leading North American mills are designing with the fiber now for introductions in 2009.
Bamboo’s adaptability to different climates and precipitation levels, coupled with its three-to five-year harvesting period, making it rapidly renewable resources. Some species of bamboo are capable of growing up to one meter per day. Under the right conditions, bamboo is 100 percent biodegraded in soil and its natural anti-bacterial properties mean no further chemical processes, which can be irritating to the skin and reduce the environmental friendliness of fabric. Bamboo is available for seating and typically blended with other fibers like polyester.

**Sustainable Dyes and Finishes**

Although the chemicals used in finishes and dyes make up only one percent of the final textile product, they present a major environmental concern.

In addition to dyes, there are several other types of coatings and backing additives that can be added to fabrics to give it specific performance characteristics including cleanability and stain resistance. – for example, Teflon and Crypton.

Sustainable fabric dye and chemical protocols strive to eliminate or minimize the need for backing, coating or other finishes using fibers that offer inherent benefits naturally. For example, wool is naturally flame retardant and bamboo is naturally anti-bacterial.

The aim is to also minimize the life cycle affects of backing, coatings and finishes by performing a chemical assessment. Most leading North American mills have or are currently working on this option.

Sustainable Finishes and Dyes are intended to provide color and other attributes that are socially responsible by using finishes and dyes that are safe to humans and the environment. They should minimize water and energy-use in their extraction, processing and distribution, while maximize the reduction, reuse and recycling of waste.

Crypton Green is an example of ways industry is adhering to his criteria. Only available on 100 percent recycled polyester, the guidelines for Crypton Green exceed industry standards for indoor air quality and optimized materials, as well as have MBDC Cradle-to-Cradle certification.

Many other green stain repellant products are being developed by mills to be introduced in 2008.

**End-of-Life Management**

At the end of a fabric’s intended useful life, it may have other uses if the virgin materials can be recovered. For example, upholstery scraps or fabric removed from furniture systems can be recovered and reused to manufacture sound-deadening material or trunk liners for vehicles.

Interface is currently using scrap fabrics to produce seat cushions. Although Interface is only at the early stages of this initiative, the ultimate goal will be to take back their own fabrics from furniture manufacturers for reuse.

Victor Innovatex is also conducting trials to reclaim their EIP fabrics to produce new polyester.

Under the right conditions, PLA fabrics can be reconstituted back into new fiber or made into compost that can be used as a fertilizer or soil amendment.

**Standards & Certification Systems**

Greenguard™ Certification for low emission standards is perhaps the most well-known third party certification organizations and offers two testing and product certification programs for low-emitting products that can apply to textiles:

1. Indoor Air Quality Certified
2. Emission Standard for Children & Schools

McDonough Braungart Design Chemistry (MBDC) is another private organization that has developed its own certification system and has worked extensively with the contract furniture industry. Using its Cradle-to-Cradle Design paradigm, products or materials are certified as...
being continually reused in an effective manner without affecting human and environmental health. In this certification system, products are evaluated in the following five categories: Material Health and Safety, Material Reutilization/Design for Environment, Energy, Water, and Social Responsibility.

To also help designers make informed choices when selecting sustainable fabric options, the Association for Contract Textiles (ACT) and NSF International are collaborating on the development of a standard for contract textiles expected for release in 2009. It will evaluate fabrics based on the safety of chemical and material inputs, energy efficiency and mix, water efficiency and effluent quality, recycling and actual reclamation, as well as the social equity for workers who produced the fabrics, making it a one-stop shop for designers looking for sustainable fabrics.

References

2  The Natural Step Framework, www.naturalstep.org
3  Interface, Inc., www.interface.com
4  Interface Fabric, www.interfacefabricsgroup.com
5  Instyle, Inc., www.instyle.com
6  NatureWorks, LLC, www.natureworksllc.com
7  Bamboosa, Inc., www.bamboosa.com
8  Scientific Certification Systems (SCS), www.scscertified.com
10  MBDC Cradle to Cradle Certification, www.mbdcc.com
11  Greenguard Environmental Institute, www.greenguard.org
12  Institute for Market Transformation to Sustainability, www.mts.sustainableproducts.com
13  Designtex, www.dtex.com
15  Victor Innovatex, www.victor-innovatex.com