

Forward-Recycling of Synthetic Contract Textiles: A Vision of the Sustainable Future

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Background

For nearly a decade, fabrics have been woven from recycled polyester fiber. Recycled fiber is made from polyester waste that has been through one useful life in the form of packaging or other consumer products (discarded soft drink bottles are the best-known example of post-consumer waste) or produced as the by-product of a manufacturing process (such as x-ray film trimmings, an example of post-industrial waste).

Over time, the quality of recycled polyester fabrics has steadily improved. This has occurred largely because market demand for environmentally responsible products has justified investment by the supply chain of companies who produce contract fabrics.

We have arrived at a point where recycled content fabrics are commonplace. In most respects, recycled polyester fabrics perform aesthetically and technically as well as virgin polyester fabrics. Virtually every fabric distributor, or jobber, now offers products advertised as “green” or “sustainable.” With the exception of Climatex Lifecycle® products offered by The Designtex Group and Carnegie, the majority of products promoted in the North American marketplace as sustainable are conventional polyester fabrics woven with yarn made from recycled polyester.

So far, so good. The widespread use of recycled polyester is a benefit to the environment because it conserves non-renewable resources and reduces the release of harmful emissions into the biosphere. This is primarily accomplished by reductions in the amount of energy and oil needed to make virgin polyester, along with reductions in the accompanying releases of greenhouse gases into the atmosphere.

Recycling, as long as the original value of the material involved is preserved, is a very good thing. Recycling by

itself, however, only postpones the arrival of the discarded material at the landfill, where it may never biodegrade, may biodegrade very slowly, or may add harmful materials to the environment as it breaks down.

This is true of every contract fabric made with recycled polyester content today. A genuinely sustainable future depends on creating closed loops, or cycles, for all industrial commodities, including polyester. In a closed loop, materials would never lose their value and would recycle indefinitely. At present, it is not possible to recycle polyester fabrics.

A Vision of a Sustainable Future

In the marketplace for goods marketed with green or sustainable claims, the metaphor of a “journey to sustainability” is often used. The Designtex Group and Steelcase believe that a journey must have a destination to be meaningful. Our vision of the future is a closed-cycle polyester economy; a future where all polyester fabrics are recycled perpetually. We have coined the term “forward-recycling” to differentiate the process of using recycled fiber to make fabrics (“traditional recycling”) from the direct recycling of polyester or other synthetic fabric to make new fabric.

In a closed-cycle polyester future, apparel, industrial and contract textiles would all feed reprocessing facilities that break polyester down into its chemical building blocks. This is necessary to remove the chemical dyestuffs that color fabrics. The technology by which this is accomplished is called depolymerization. Once the color has been removed, polyester can be reconstructed in a process called repolymerization.

Depolymerization-repolymerization processes for polyester will be similar to those used today for nylon. Nylon 6

A Vision of a Sustainable Future (cont.)

fiber used in commercial carpet, under the brand name Savant, is already being depolymerized and repolymerized by BASF. The polyester process is more complex and more expensive, but it has been successfully piloted.

As the available supply of oil is depleted, or becomes more difficult to get out of the ground, its price will inevitably climb. At some point, the economic cost of producing new polyester fabric via forward-recycling will equal the economic cost of virgin polyester. And recycling fabric itself will become a profit-making opportunity.

Polyester and nylon 6 profoundly differ in the scale and complexity of the supply chain. Major carpet manufacturers today are so vertically integrated that they form complete, stand-alone supply chains. A small group of related companies can control every process and business transaction by which a carpet tile is made, and then recycled. In this setting, it is still not easy to shift to a closed cycle or loop, but it is possible. And it is being done today.

Polyester contract fabrics have a much more complex supply chain. A relatively small group of companies account for most fiber, yarn and weaving operations. But after fabric is woven, things get very complicated. Dozens of fabric distributor or jobber companies sell fabric to hundreds of commercial and residential furniture manufacturers. Fabrics are woven to a broad range of specifications created by the distributors. Furniture manufacturers then apply their own specifications for finishing fabrics before they are installed on seating and architectural products. The processes used in finishing the fabrics often include chemical backings. Backings are contaminants, most of which in use today are incompatible with breaking down polyester and repolymerizing it.

The supply chain for polyester used in the contract and residential furniture industries, in large part due to the use of chemical backings, is inherently unsustainable. Even if a company existed to reclaim used polyester contract fabrics, the backing on the discarded fabric would make it impossible to recycle them.

Chemical backings are an excuse for not implementing sustainable practices elsewhere in the furniture industry. With the backing barrier removed, it becomes feasible and worthwhile to design and make furniture using sustainable practices. The key principle is “design for disassembly,” which results in products that can be taken apart without destroying the value of the component parts.

Steelcase and The Designtex Group Partner to Overcome the Key Barrier to Sustainable Synthetic Fabrics

The Designtex Group is the leading innovator in sustainable fabrics. The Climatex Lifecycle® branded fabrics, created in partnership with McDonough Braungart Design Chemistry, are the world’s first sustainable contract fabrics. Beginning in late 1999, The Designtex Group partnered with Steelcase in an effort to develop polyester fabrics that overcome the most difficult obstacle to fabric recycling — the need for chemical backings.

Backings, in the form of acrylic and other poromeric compounds, are almost universally used by furniture manufacturers. Backings help in the manufacturing process in a number of ways, including:

- Keeping yarns aligned to prevent bowing and skewing
- Improving seam strength and durability
- Prevention of raveling during cutting and gluing
- Improving opacity

The challenge of developing fabrics that work without backings was complicated by the demanding processes used to manufacture furniture at Steelcase. A company whose name and reputation rests on the quality and durability of its seating and architectural products, Steelcase could not afford to compromise the quality of the fabrics it uses to achieve sustainability goals.

The collection of fabrics developed in partnership by The Designtex Group and Steelcase had to deliver excellent physical properties, including exceptional abrasion resistance, and suitability for unique Steelcase applications like steam-activated molded seating.

A multidisciplinary team was established to take on the challenge. For over 26 months, a task force made up of Steelcase, The Designtex Group, and four mill suppliers pursued the project. The team included experts in manufacturing, engineering, sourcing, design and marketing.

The joint Steelcase-Designtex team overcame obstacles through trial-and-error design experiments. A small group of mill suppliers, each with a strong commitment to achieving sustainability through innovation, wove and finished prototype fabrics over and over again. With each weaving experiment, progress was made.

Beginning with seating, designers Kristie Strasen and Susan Lyons investigated constructions with inherent characteristics that avoided the need for backing. **Bee**, a product with a

Steelcase and The Designtex Group Partner to Overcome the Key Barrier to Sustainable Synthetic Fabrics (cont.)

honeycomb appearance, was one of the early break throughs. The structure of the fabric provided a useful balance between stretchiness and stability.

Innovative mills new to the contract industry were also invited to participate in the program. A leading provider of nonwoven products developed two panel fabrics with breakthrough stability, opacity and inherent non-raveling properties. The resulting products, **Bracken** and **Moors**, deliver remarkable performance at affordable prices.

A woolen supplier was tapped to produce a recycled polyester crepe with the hand and lustre of worsted wool. The result is **Prairie**, which delivers the luxury of wool, but also 100,000 double rubs Wyzenbeek.

Among the remarkable “firsts” achieved by the 26-month program are the antimony-free products **Lagoon** and **Seabreeze**. These two products were developed using the McDonough Braungart Design Chemistry protocol. They are the first textiles to be classified as technical nutrients under the MBDC criteria.

The joint Steelcase-Designtex Group team perfected nine fabric styles, called the Environmental Collection. Each is available in a long color line, 131 specific choices in all.

Benefits of the Environmental Impact (EI) Collection

The achievement returned by the investment in time and money by Steelcase, The Designtex Group and their mill partners is evident in four key areas:

1. *Beauty, durability and practicality.* EI fabrics make no compromises — they are great-looking, highly usable products that meet the demanding physical properties and application requirements of Steelcase. They are available in an abundance of style and color choices, all coordinated using the Steelcase Textiles Color Logic System. EI fabrics pass application tests on most Steelcase seating and panel products (always check www.steelcase.com for specific product approvals.)
2. *Sustainable fabrics that fit into any project budget.* EI fabrics are all at Price Grade 3 and below. Cut yardage prices range between \$16/yard and \$28/yard. There is no premium to be paid for sustainability.
3. *An act of leadership and a commitment to a sustainable future.* Steelcase and The Designtex Group have removed a key obstacle to the future recycling of polyester fabrics, and are making public our vision of a sustainable future. The next step in implementing a sustainable model for synthetic contract textiles is the adoption of furniture designs and manufacturing processes that will permit reclamation of fabric from retired furniture.
4. *Empowering individual specifiers and customers to make a difference, and a positive impact, today.* By selecting EI products, individuals are doing more than promoting the health of the environment through recycling. Measurable benefits of recycling include petroleum savings, greenhouse gases reduced, energy conserved, process water conserved and landfill spaces savings. Individual specifiers and purchasers can also lend weight to our vision of the sustainable future. Market demand for products designed for sustainability will accelerate the adoption of sustainable practices in the industry, hastening the day when polyester fabrics are not only recycled, but recyclable.