

FOCUSING ON QUALITY WHILE MOVING TO SUSTAINABILITY: INTERFACEFLOR

InterfaceFLOR® was a company in the midst of a major transformation when biomimicry was introduced to its design team. In the mid-1990's, Ray Anderson, the company's founder and CEO, had begun to reorient all aspects of Interface's operations toward making the company a model of sustainability. Anderson remained focused on creating a top-notch product, while committing to finding ways for environmental stewardship and corporate profits to go hand in hand. Over time, biomimicry became one of the company's best methods for executing Anderson's twin goals of enhancing profit while moving towards a "renewable, cyclical, and benign business model".

The Company

In the 1970's, most carpet was broadloom-woven; Interface was built on the introduction of carpet tiles as an alternative to the United States market. Modular carpet tiles were cheaper and more efficient to install than broadloom carpet, and Interface overcame initial resistance to their use, becoming the largest manufacturer of modular carpet in the world.

In 1994, InterfaceFLOR® was a well-established financial success. Upon reading Paul Hawken's *The Ecology of Commerce* that year, Anderson suddenly realized that he had the power to make the company an environmental success as well, by addressing the company's enormous footprint of energy and waste. Anderson often describes his reading of Hawken's book as an "epiphany" that led him to establish a very different set of values for his business. That year, Interface launched what is now known as Mission Zero®, a large-scale overhaul of all aspects of the company designed to achieve 100 percent sustainability by 2020. In keeping with Anderson's focus on profits, however, he intended to do this while maintaining the financial success of the company.



InterfaceFLOR's® Atlanta showroom displays the i2™ modular carpet line, which draws biomimetic inspiration from the inhomogeneous pattern of a forest floor.



Embracing Biomimicry

It was during this period of transition that Janine Benyus published *Biomimicry*, the foundational text on using nature as a model for human products, processes, and systems. Paul Hawken, who was by then a member of the “Eco Dream Team” that was advising Interface on its new sustainability mission, recommended the book to David Oakey, a freelance textile designer whose company was responsible for InterfaceFLOR’s® carpet designs. Oakey had been struggling with the company’s transition to sustainability – he was worried about what it meant for the company and the design processes, and was unsure if Mission Zero® would mean genuine change or if it would be a distraction.

Skeptical of the role biomimicry could play in the design process, Oakey nevertheless began to investigate whether biomimicry could allow him to incorporate the company’s new environmental goals into his work. A defining moment in his investigation came during a workshop organized by Janine Benyus, who had also become a member of the “Eco Dream Team.” InterfaceFLOR’s® design team was asked to take a walk through the forest in search of ideas. It was not the shapes of flowers or leaves that stood out as the team examined the natural world around them, but the pattern of leaves on the forest floor. In nature, the team realized, a surface that appears homogeneous is actually made of many unique parts, arranged in a pattern of “organized chaos”. Just as no two leaves on a forest floor have to be same for the forest floor to appear homogeneous, the team imagined that no two modular tiles had to be the same for a carpeted floor to appear homogeneous.

Following this revelation, InterfaceFLOR® launched their world famous Entropy® design, which spawned the equally famous i2™ line. The i2™ line (which includes Entropy), is a line of modular carpet that uses non-uniform design schemes. Traditional carpet tiles must all match exactly, and must be installed uniformly and in the same direction. i2™ carpet tiles, on the other hand, are manufactured with a variety of patterns. Patterns that have a similar look are mixed and matched within each carpet installation, and are arranged in random order, creating the visually pleasing “organized chaos” that the design & development team observed on the forest floor. Because the tiles do not need to be identical, carpets in the i2™ line can be composed of dye batches that are similar, but not necessarily identical. This eliminates an enormous amount of waste generated during the manufacturing process, since the requirement that all tiles be identical had previously resulted in the rejection of batches that looked slightly different. Because the i2™ line’s modular tiles do not require a perfect fit or matching colors when fully assembled, the line also reduces waste generated during installation, going from approximately 4% wastage for standard carpet tiles to approximately 1.5% for i2™ tiles. With this innovation, InterfaceFLOR® greatly improved their manufacturing efficiency. The i2™ line achieved sensational popularity in the modular carpet industry, while Entropy® became the company’s most popular product in the shortest amount of time in InterfaceFLOR’s® history.

The invention of Entropy® changed Interface’s entire design philosophy – the design and development team stopped seeing sustainability as a distraction from the design process, realizing that sustainability could go hand-in-hand with high-quality, well-designed products. Oakey now points out that, in nature, we see beauty in variation with materials such as marble, wood, and stone. In the industrial world, variation has traditionally



It was a walk through the forest that made David Oakey and the design team realize that just as no two leaves were alike on a forest floor, no two carpet tiles had to be identical to achieve an aesthetically pleasing effect.



TacTiles adhere modular carpet tiles to each other rather than the floor, and gravity holds them in place, eliminating the need for VOC-emitting carpet glue.

been seen as imperfection. Using biomimicry, Oakey was able to incorporate our natural admiration of variation into an industrial process that was traditionally intolerant of it.

Biomimetic Transformation

At this point, InterfaceFLOR® had transformed into an open-minded proponent of biomimicry, and began seriously investigating other applications to their products and processes. The company's research & design department began organizing internal "out-of-the-box" brainstorming meetings every quarter, encouraging each attendee to teach the group on a different topic. The Biomimicry Guild also continued to assist in the application of biomimicry to other products at InterfaceFLOR®.

Problem

One problem that had plagued InterfaceFLOR's® design and development team was how to eliminate glues that off-gas volatile organic compounds (VOCs) and impede the recycling of carpet tiles. InterfaceFLOR's® design and development team had been wrestling for some time with the elimination of glues from their carpet tiles. Conventional modular carpets were glued to floors using liquid glues that issue volatile organic compounds as they cure. VOC's can contribute to poor indoor air quality.

Challenges

Designing a carpet installation without glue was challenging. The research and design team involved in InterfaceFLOR's® brainstorming meeting began to question how nature "does glue." The team initially focused on a compelling example of "glue" in nature- the way gecko feet manage to stick to surfaces with enormous strength and without leaving any type of residue. The team hoped to mimic the powerful adhesive forces in gecko feet with a new carpet glue. Such a project, however, would have been an enormous undertaking involving years of research and development. The technology to mimic gecko feet was simply not available; the design team began to think that they needed to pursue another avenue of thought.

Solution

With the help of the Biomimicry Guild, the team at InterfaceFLOR® realized that they had been asking the wrong question all along. The team should have been asking not how nature makes glue, but how nature keeps a surface covered. Nature uses the simplest method available -- rather than using a complex glue, gravity holds things in place on a surface. If each modular tile in a carpet is held together, gravity can do the work of keeping the tiles on the floor, and there should be no need for conventional glued carpets.

Chief Innovations Officer John Bradford and his design team realized that they needed to find a way to stick the carpet tiles together rather than finding a way to stick to the carpet tiles to the floor. Drawing inspiration from a flexible stamp of PVC plastic, the team invented the TacTile®, a slim, post-it sized stamp that uses a thin layer of resealable glue on one side to adhere tiles to each other, creating conglomerates of tiles that act as wall-to-wall carpeting or area rugs.



Since the tile construction itself prevents them from curving and bending at the corners, and gravity holds the carpet down, TacTiles® eliminate the need to glue each tile to the floor, also eliminating damage to the floor and exposure to volatile organic compounds. In fact, the elimination of liquid glue in carpet installation virtually eliminated emissions of volatile organic compounds that normally off-gas from these components.

Outcomes

The revelation that sparked the i2™ line led to InterfaceFLOR’s® first experience with the full biomimetic design process start to finish, resulting in TacTiles®. The company’s unique skills at incorporating biomimicry into its design processes have dramatically improved the company’s environmental and financial standing.

Entropy and i2 Products

The design of Entropy® and i2™ products follows nature’s logic in similar but not identical designs that result in a homogeneous overall look. Since the process of manufacturing these products no longer requires the rejection of mismatching dye batches, recycling and disposal costs for raw materials have decreased significantly. The emphasis on this biomimetic process also ensures that more tiles pass quality assurance checks, virtually eliminating “off-quality” tiles.

For the Consumer

Entropy®, unlike conventional modular carpeting, does not have to be installed monolithically- tiles can be installed non-directionally to contribute to the pattern of “organized chaos.” While previous installation methods required each tile to fit the machine direction during installation, the i2™ line could be installed in any direction, enabling previously wasted pieces to be fit into the finished carpet. Because of this, installation became much easier for the consumer.

However, the major source of savings for the consumer is the avoided cost and waste of backstocking identical, replacement tiles. Before the release of the i2™ line, InterfaceFLOR®, like all modular carpet manufacturers, recommended that the customer purchase a certain amount of attic stock, in case a tile had to be replaced, because exact replicas could not be guaranteed. After the release of the i2™ line, the company could reproduce tiles that were close enough in appearance without worrying about identical dye batches, freeing their customers from attic stock. Because patterns no longer need to be matched, customers had 70% less installation waste and no longer needed to maintain a large stock of spare tiles to match dye lots. Because modular carpeting is priced at approximately \$22 a yard, and a normal attic stock is about 5%, this could save the customer approximately \$110 for every 100 yards ordered.

For InterfaceFLOR

The following table compares waste from the i2™ Non-Directional line to ordinary modular carpet, 12-foot broadloom, and 12-foot patterned broadloom.

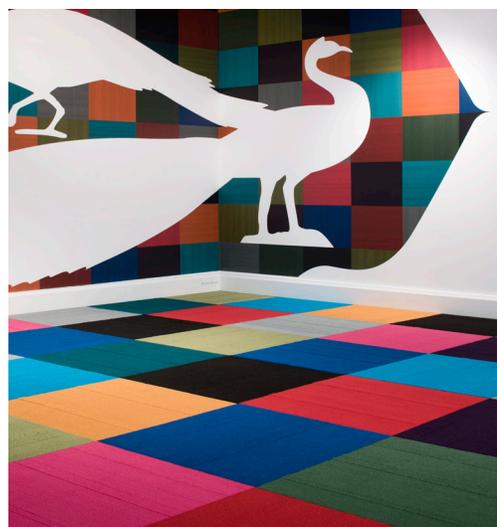
Factors	i2 Non-Directional	Modular Carpet	12-Foot Broadloom	12-Foot Patterned Broadloom
Size of facility (ft)	41,715	41,715	41,715	41,715
Carpeted area-70% (sq. ft)	29,200	29,200	29,200	29,000
Installation waste (sq. ft)	1.5%	3.8%	10.3%	18.2%
Total waste (sq. ft)	438	1,110	3,008	5,314

The environmental benefits of Entropy® and other i2™ products are clearly enormous. The avoided waste due to the introduction of i2™ products has contributed to Interface’s ability to reduce the total waste sent to landfills from manufacturing facilities by 77% since 1996. Financially, these material waste reductions make an enormous difference in the bottom line. For example, in the 29,200 sq. ft carpeted area described in the previous table, InterfaceFLOR® saves \$24,420 in production costs by manufacturing i2 products rather than



conventional modular carpet tiles. This allows them to be more competitive in the marketplace and increase their profit margins.

Entropy's® ingenious design and resulting savings for both the company and the consumer have made it a runaway success in the modular carpet industry. According to Ray Anderson, founder of Interface Inc., Entropy® became the most popular product in the company's history, faster than any other product in the company's history. Sales of i2™ products have increased steadily since their release. From 2005 to 2008, InterfaceFLOR's® i2™ sales increased by 3.1 million yards, and by 2009, the company's accumulated avoided costs from its waste elimination activities, including the substitution of standard carpet tiles with the i2™ line, equaled \$433 million. InterfaceFLOR's® 2009 sales of i2™ products equaled \$128,770,000. The company's modular sales continue to account for around 25-30% of the modular carpet market.



InterfaceFLOR's AwareHouse Customer Center uses both i2 and TacTiles technologies.

TacTiles

TacTiles® have formed a similar track record of success. Since TacTiles® use a non-liquid glue to hold tiles to each other rather than gluing them to the floor, the device eliminates damage to flooring when the time comes to remove the carpet. From an environmental perspective, TacTiles® provide a wonderful alternative to the volatile organic compounds (VOCs) that off-gas from conventional liquid glues. The environmental impact of using TacTiles® is 90% lower than that of traditional glue adhesives, as they perform the same function with dramatically less material, and furthermore require much less packaging: TacTiles® are packaged in small cardboard containers, rather than the large plastic buckets used for liquid glue. TacTiles® contributed to more effective recycling at Interface in two ways. The company's Re-Entry® program, in which the company reclaims old, worn products and recycles them into new products, now accepts TacTiles® for recycling, adding another recyclable component to the carpet installation. Even more significantly, the use of TacTiles® has eliminated the largest obstacle to recycling carpet tiles, residual glue on the product.

For the Consumer

The innovation behind TacTiles® have made it a huge success, since carpet installation is now easy enough for clients to tackle at home, and the environmental benefits appeal to concerned consumers. One of the most appealing benefits of TacTiles® is that clients can install tiles by themselves, without the aid of an installation crew.

For InterfaceFLOR

Sales of TacTiles® have skyrocketed since their launch in 2006. In 2006, InterfaceFLOR® sold 1.5 million TacTiles®, but that number rose to 8.9 million in 2007, and then to 14.8 million in 2008. As of the third quarter of 2009, 25% of all InterfaceFLOR's® orders used TacTiles®.

The following table tracks the dollar value of TacTile® sales from 2007 until 2009, highlighting TacTiles'® growth in sales despite the economic downturn.

Sales of TacTiles	2007	2008	2009	2010
Percent Increase in Sales Revenue from TacTiles	--	79.9%	11.3%	210%
Number of TacTiles Sold	8.9 million	14.8 million	16.5 million	33 million

The release of TacTiles® also gave Interface a dramatically better product in the residential market. Modular



tiles were normally glued down to concrete slab flooring, a practice that could not be applied to the polished hardwood floors of residential buildings and single family homes. FLOR®, Interface’s residential carpet company, had previously used a product called Sticky Dots, which could be used to stick tiles to the floor in homes. However, TacTiles® eliminated gluing the tiles to the floor at all, allowing modular carpet tiles to be laid down with no risk of damaging the flooring underneath. This was much more appealing in the residential market than installing carpet tiles with even a small amount of adhesive.

TacTiles® also yielded a higher profit margin than the glue InterfaceFLOR® previously sold along with its carpet tiles. The brand called GridSet, owned and sold by InterfaceFLOR® along with its modular carpeting, was more expensive to manufacture than TacTiles®. Thus, while InterfaceFLOR® gave up revenue in glue sales, they more than made it back in the sale of TacTiles®.

Lessons Learned

- Embracing and applying biomimicry can transform design possibilities for products and processes, and dramatically improve the bottom line.
- Skepticism is a common but surmountable obstacle in the design process. People instrumental in the biomimetic process can and have shown initial skepticism.
- Not all ideas necessarily lead to biomimetic innovation.
- Sustainability and attractive design go hand in hand.

Source Notes:

- Interviews with Lindsay James, Connie Hensler, Erin Meezan, Greg Colando
- InterfaceFLOR’s® i2™ and Entropy® brochures
- An Ecological Modernist Interpretation of Sustainability: The Case of Interface Inc. *Business Strategy and the Environment*. 17, 512–523 (2008)

