

***Potential of Ingeo[®] in
Fashion Industry***

Source: Textile Review

Potential of Ingeo® In Fashion Industry

By: Ankur Saxena & Eshika Sharma

Source: Textile Review

Ingeo biopolymer - High-Performance Synthetic Fiber is an innovative performance fiber ideally suited for apparel, furnishings and nonwovens applications. The natural versatility of Ingeo fibers gives us the opportunity to design new yarns, fabrics and garments for a contemporary wardrobe. Ingeo fiber works in both pure qualities and innovative blends for everything from dress shirts to draperies. Ingeo biopolymers are already proving themselves in success commercial applications in the areas of fiber and nonwovens. Ingeo fiber isn't just about another t-shirt, pants or sweater. It looks either like natural cotton or even lustrous techno-performance wear. This natural versatility means that not only is it beautiful to look at and wear, it comes with a conscience too because it's made from Ingeo fiber an ingenious nature-based material made from plants instead of oil.

The high cost of oil continues to reinforce the growing need for renewable-resource-based alternatives. The cost of Ingeo biopolymer is comparable to other conventional plastics materials. Longer term, Ingeo biopolymer has the potential to even be cost advantaged compared to petroleum-based resins. Choosing your clothes made from Ingeo fiber is a real step in the right direction, because it means that one has become part of a whole new buying power that's focused on being more responsible in how we choose to live our lives. No matter how small your action, combined with others, you can effectively help change the world for the better, even if it's just one t-shirt at a time.

Biotechnology which can simply be defined as the application of living organisms and their components to industrial products and processes is not an industry in itself, but an important technology that will have a large impact on many different industrial sectors in the future.

The close cooperation of the garment and fashion industry with biotechnology has, in recent years, led to many innovative projects. Until the 20th century, textile production involved the exclusive use of natural fibers: cotton, hemp, flax, etc. The invention of synthetic fibers in the 20th century broadened the application range of textile materials enormously.

Invention of Modern Fabrics specific interdisciplinary partnerships between the most diverse scientific fields enables the industry to combine several functionalities in one material. The new fabrics may be breathable, temperature-regulating, lightweight, shock-proof, water and dirt repellent and a lot more. It is, in particular, this multi-functionality which broadens the application of these modern fabrics, which, are being used as clothing material.

Through the course of evolution, nature has come up with surfaces to which dirt is unable to attach, thanks to complex micro- and nanostructures. Polylactide (PLA) is one such innovative material, which can be found in biodegradable catering dishes or packaging and which has become a popular material among clothing manufacturers. Polylactides or Ingeo biopolymers, as they are popularly known, are a natural product, made from plant carbons. In contrast to nylon and polyester fibers made from non-renewable petrol, PLA uses carbon that is absorbed by maize plants during photosynthesis from the air ^[10].

Ingeo (PLA)

Ingeo fiber is the first and only man made fiber created from 100% renewable resources: a novel product that combines the best of both worlds: the performance of a synthetic fiber and the advantages of a natural material because it is derived entirely from natural sources. Ingeo fiber is the newest biotechnology fiber made from ingredients from the earth, hence the name. The fiber is made entirely from annually renewable plant sugars derived from corn and has many benefits. Unlike many of today's synthetics, the raw material used to create Ingeo can be re-grown every year. And, when products made from Ingeo reach the end of their usefulness they will, under the right conditions, fully degrade into natural ingredients that add nutrition to the soil.

It completely revolutionizes the garment and fashion industry by limiting the collective impact oil based products have on the earth's natural resources. In addition, Ingeo fiber production emits 60% to 80% less greenhouse gases into the atmosphere and still meets the performance requirements of petroleum based products like polyester filled down alternative comforters. Ingeo is ideally suited for use in a range of apparel, carpet, fiberfill, non-woven, furnishings and industrial applications. Currently, more than 75 leading brand owners and manufacturers in each of these key segments are actively developing and introducing new products made from Ingeo. Products made from Ingeo are available today in stores across the United States, Europe and Japan. And a host of additional retail launches are planned throughout 2003 on five continents ^[7].

Story of Ingeo

Ingeo is a NatureWorks LLC's trademark for a man-made fiber made from renewable resources (plants), as opposed to oil.

In 1997 two of the world's industry giants came together to make the is story possible by creating Cargill Dow LLC, a stand-alone company headquartered in Minnetonka, Minn., USA. The company invested approximately \$750 million in research, development and manufacturing capabilities to bring its revolutionary new technology to commercial reality. Through their combined agricultural and chemical expertise, the company created a process that harnesses the carbon naturally stored in plants from the process of photosynthesis, and used it as the basis to create a resin called NatureWorks PLA. The resin can then be spun into Ingeo fiber for use in a wide range of textile applications. The resin to make Ingeo originates from the first world-scale PLA plant located in Blair, NE, USA. Encompassing more than 16 acres of Missouri River bottomland, the facility stands on a site that was once, itself, a cornfield. At capacity, the plant produces more than 300 million pounds of PLA annually, requiring 40,000 bushels of locally grown field corn per day and employing up to 100 workers. In 2003, the company signed master licensing agreements with some of the world's foremost textile manufacturers to produce and sell Ingeo fiber products to the world. By 2004 they had the fashion industry's attention. Just one year after the launch, Ingeo was in the spotlight at Moda, one of the most important Italian textile shows in Milan. Before long, prominent designers and fashion labels such as Bagutta, Versace, Diesel, Moby and more began using 100% Ingeo or Ingeo blends because of its performance and environmental story. In early 2005 Cargill bought out Dow Chemical interest in the program and changed their name to Natureworks LLC. About the same time two brothers, Dennis & Don Lenz, who had spent most of their lives manufacturing and selling apparel to the uniform and promotional products markets found out about Ingeo? They decided to create an apparel line made from 100% Ingeo fibers for the US market they knew so well. Since the new fiber posed several new

challenges for making apparel, their progress would prove to be slow, arduous and demand their best effort. The brothers worked tirelessly and after many setbacks they introduced the line in January of 2007. Dennis Lenz's company, Mill Direct and Don Lenz's Future Products combined with the help of a proven marketing partner, New Z Lander Brands in Troy, MI, now offer the marketplace the first real 100% Ingeo fiber performance apparel line you see here today^[8].

From Corn to Apparel

The process to create Ingeo essentially "harvests" the carbon plants remove from the air during photosynthesis. So, instead of using carbon from limited petroleum sources to make the base polymer (as all other synthetic fibres do), Ingeo derives its carbon from an annually renewable resource, such as corn (maize).

To make Ingeo, plant starches are broken down into natural plant sugars. The carbon and other elements in these natural sugars are then used to make a polymer, called NatureWorks PLA. The development and manufacturing of PLA polymer relies on basic fermentation and distillation as its core chemical process, followed by simple polymerization. Once the resin is converted into a fibre, it becomes Ingeo. The raw materials for this eco fiber are made by fermenting sugar extracted from corn. It is then turned into pellets that are converted into fabric and sold to makers of apparel. The fabric is designed to combine the advantages of natural materials with the performance of synthetic fiber^[9].

The Natural Choice

Ingeo combines the most desired physical characteristics of natural fibres, such as wool, cotton and silk with those of conventional, petroleum-based synthetics. In addition, the fibres have environmental benefits that result from using renewable resources as their origin, including reduced CO₂ emissions and less fossil fuel usage than incumbent materials (estimated at up to 50 percent reduction).

At the end of their useful life, products made from Ingeo, will fully degrade in industrial compost systems, similar to cotton. Where composting is not an option, Ingeo is compatible with standard waste disposal systems including recycling, landfill and incineration.

The power of the Ingeo brand concept is remarkable and never ceases to amaze me," said Eynon. "The vision for Ingeo extends far beyond the textile industry and represents a lifestyle that appeals to partners like the Buddha Bar and Ingo Maura. Visionary companies such as these see Ingeo as an important statement of their belief in essentially helping change the world without changing it all."

Ingeo is a new fibre brand concept based on the principles of sustainability - economic viability, social responsibility and environmental soundness. It represents the world's first man-made fibre derived from 100 percent annually renewable resources. The process to make Ingeo is based on the fermentation of simple plant sugars to create a proprietary polymer that can then be spun into a fibre. Ingeo is ideally suited for a range of textile products and applications where it competes with traditional fibres on a price and performance basis^[7].

Performance

Performance apparel is the fastest growing segment of clothing markets worldwide.

Moisture Management or Wicking refers to how the fabric moves moisture away from the body and allows it to evaporate on the other side of the fabric. This allows the body to more effectively regulate skin and body temperature and keeps the wearer warmer in cold and cooler in the heat. This makes the wearer more comfortable and more productive. Anyone who is subject to extreme heat or cold or who sweats in the course of the day will love this feature. Athletes, firemen, golfers, and anyone whose appearance has been compromised by those tense sweaty moments, will find moisture management to be their best friend.

The fact that Ingeo won't absorb water also means you can skip the dryer and its energy costs when laundering. Any uniform company will love this characteristic alone. UV Resistance is not just a buzz word. It's a real need for millions of people. The damaging effects of the sun are bad for our skin, and it also takes its toll on how your clothes look. The fading and bleaching affects of the sun will not affect clothing that is UV resistant nearly as it does those that are not. So the UV resistance that is inherent in Ingeo helps you and your clothes both live longer, happier, more colorful lives. The Colorfast and Strength features of Ingeo make this apparel the least expensive you can buy. The colours in Ingeo do not fade and the fabric is actually 10% stronger after 100 washes. This means your shirts will look better longer than almost anything else you can buy.

Non-microbial fabrics will not allow the proliferation of microbes such as viruses, fungi or odour causing bacteria. While most anti- or non-microbial apparel is treated with chemicals that wash out over a short time, Ingeo does it naturally-forever. Medical, veterinary, restaurant applications are perfect for this type of fabric. Wrinkle Free fabrics are all the rage and not just for the convenience. Energy and time savings alone make Ingeo and other wrinkle free products the new standard, not just a perk. Soil Release and Stain Resistance keep clothing better looking and longer lasting. Once again Ingeo ends up saving you dollars in the end ^[8].

Case Studies

Following are some examples, of Ingeo fiber being used in fashion industry, the detail of which would be studied during the course of this project.

- 1) Ingeo fiber and Paris plus (9-12 March, 2005). NatureWorks debuted in 2005/2006 with an exciting agenda that combines important new developments with a strong dose of business as usual ^[5].
- 2) Ingeo Fiber Debuts at Olympus Fashion Week- Spring 2007 shows included prominent designers using the world's first man-made fiber from 100% annually renewable resources ^[5].
- 3) Ingeo fashion at the London Science Museum exhibit "Trash Fashion"- designing out waste. The organization C.L.A.S.S. (Creativity, Lifestyle, and Sustainability Synergy) has worked with the London Science Museum to create a forward-thinking and edgy Ingeo display, which demonstrates that sustainability and creative design can be truly cutting edge ^[5].

- 4) Ingeo Fiber debuts at Designers and Agents (D&A). It has been a trade exhibition and a market place for thousands of retailers who define the cutting edge in fashion and lifestyle, Nature Works had put twenty four t-shirts on display as a testament to what can be done when an innovative fiber is put in the hands of talented young designers and give their imaginations free rein ^[5].
- 5) Fabric Innovations with "Ingeo" Fibers- The latest commercial fabrics with "Ingeo" fibers - presented at the most important textile fairs on the international calendar, showcasing the latest commercial innovations in fabrics and textiles. Its success has been furthered by the official approval from the Commission of the European Community acknowledging the fiber product polylactide, allowing the public labeling on all products containing "Ingeo" fiber ^[5].
- 6) Ingeo featured at Copenhagen Fashion Summit- Dec, 2009. Creativity, Lifestyle, and Sustainable Synergy (CLASS), a unique organization that gathers and promotes creative and responsible materials and collections, demonstrated that sustainable fabrics are innovative and fashionable at the Nordic Initiative Clean and Ethical Fashion Summit that took place on December 9th at the Royal Opera House in Copenhagen. This event was organized to help raise awareness about sustainability within the fashion industry and to present a 10 year action plan. CLASS was appointed as the official supplier of all the eco-responsible textile developments at the fashion summit ^[5].

Carbon Footprint Analysis

Carbon footprint is the total amount of carbon dioxide (CO₂) and other greenhouse gases emitted over the life cycle of that product, expressed as kilograms of CO₂ equivalents. An individual product's carbon footprint can be measured by undertaking a green house gases (GHG) emissions assessment. Once the size of a carbon footprint is known, a strategy can be devised to reduce it, e.g. by technological developments, better process and product management, changed Green Public or Private Procurement (GPP), Carbon capture, consumption strategies, and others.

The footprint considers all six of greenhouse gases: Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF₆) ^[2].

Factors behind Textile CO₂ Emissions

There are many reasons that the environmental impact of the textile industry is such a problem ^[3].

- The vast majority of fibers produced are synthetic. These materials, such as petrochemical-based nylon and polyester, and chemical-treated rayon, use massive amounts of energy to create. Not only that, but the chemicals used during the manufacture of these materials end up as toxins polluting the air, soil, and water.
- Conventional cotton, which makes up the next largest percentage of worldwide fiber production, is also heavily detrimental to the environment. Cotton growth requires intensive use of pesticides, chemical fertilizers, and water. Cotton manufacturing also requires the heavy use of chemicals and energy.

- The dyeing and bleaching of fabrics involves chemicals, energy, and huge amounts of water. Approximately one million tons of chemical dyes are used every year.
- The wet finishing process uses huge amounts of water and energy.

CO₂ emissions per kg of fibre for the following materials

Fibre	CO₂ Emissions (per kg of fibre)
Nylon	9
Cotton	6
Polyester	4
Organic Cotton	2
Wool	2
Ingeo	2

As clearly depicted in the above table, as compared to other traditional fibers, the amount of CO₂ emission by polyester is double and cotton is even more than double. Cotton has reached its peak of production, so fiber requirements have increased, thus this is the right opportunity to use Ingeo fiber ^[1].

Industrial manufacturing accounted for 18.5 percent of carbon dioxide emissions. The textile industry, which outputs 60 billion kg of fabric annually around the globe, is responsible for a significant portion of the industrial carbon footprint. Through the production of fibers, both natural and synthetic, dyeing, bleaching, and finishing, 132 million metric tons of coal are burned every year and six to nine trillion liters of water are used.

The textile carbon footprint is as enormous and overbearing as the elephant in the room. It is estimated that on average each person is responsible for 19.8 tons of carbon dioxide emissions during their lifetime. One of those tons is because of the clothes you wear ^[4].

References

1. Vink, E.T.H., Rabago, K.R., Glassner, D.A. and Gruber, P.R., Polymer Degradation and Stability, 2003, 80 (3), 403.
2. "UK Launches First Carbon Footprint Label for Retail Clothing." (Environmental Leader, March 27, 2009) <http://www.environmentalleader.com/2009/03/27/uk-launches-first-carbon-footprint-label-for-retail-clothing/>
3. BSTONE, Carbon footprint and textile industry, www.brightbulb.com
4. LARSENTOM, Polyester- good or great, www.tomlarsen.typepad.com
5. www.NatureWorksLLC.com
6. www.ingefibers.com
7. <http://www.plushcomforters.com>
8. http://www.ingeosales.com/our_story.php
9. <http://www.wearcorn.com>
10. <http://texprocil.com/articles/application-of-biotechnology.html>

Originally Published in Textile Review, April-2011

About the Authors

Ankur Saxena is Assistant Professor with NIFT, Jodhpur & Eshika Sharma is pursuing Master of Fashion Management from NIFT, Jodhpur.

Image Courtesy: folktalefibers.blogspot.com