



LCA STUDY

Barnhardt Natural Fibers Group

Fact-based approach to continuous improvement (LCA STUDY completed April 2010)



Bleached Cotton Fiber

The Barnhardt Manufacturing Company produces bleached and purified cotton fiber products from raw cotton input using a proprietary process at its Charlotte, North Carolina and Colrain, Massachusetts manufacturing facilities. The bleached and purified cotton fiber is used in medical, pharmaceutical, health, personal and home care applications. The bleaching process involves a chlorine-free hydrogen peroxide process. This wet process involves the removal of contamination in and on the cotton fiber followed by the removal of its natural color. The process changes fundamental fiber properties such as pH, biodegradability, softness, surface friction, and absorbency. The bleached cotton fiber provides a variety of functions in products that clean, exfoliate, wipe, absorb, remove, protect, filter, apply, abrade, polish, contain, and deliver.

Life Cycle Assessment Study

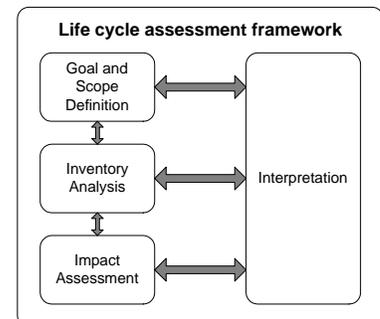
Barnhardt commissioned a comprehensive ISO 14040 conforming Life Cycle Assessment (LCA) study in response to customer requests for comprehensive and detailed environmental performance information. Barnhardt's intent is to support fact-based environmental decision making by disclosing the scientific results to its customers and to the general public in an open and transparent manner. The results of this study can be used for the purposes of product design, material selection, and manufacturing decision-making.

- Understanding the life cycle impacts associated with bleached and pure cotton fibers.
- Prioritizing and implementing effective continuous improvement initiatives of our process.
- Working with cotton producers and customers to identify areas of improvement across the supply chain.
- Communicating the environmental performance of our product based on internationally accepted quantitative methods.

What is Life Cycle Assessment?

LCA is an internationally accepted standardized approach to assess the environmental aspects and potential impacts associated with a product, process, or service, by:

- compiling an inventory of relevant energy and material inputs and environmental releases;
- evaluating the potential environmental impacts associated with identified inputs and releases;
- interpreting the results to help make a more informed decision.



ENVIRONMENTAL POLICY

Barnhardt Manufacturing Co. is committed to protecting the environment as a part of its business practices. We do so by adhering to the principles of:

- Compliance
- Prevention
- Communication, and
- Continuous Improvement

QUALITY & TECHNICAL EXPERTISE

Barnhardt Manufacturing Co. is committed to incorporating the highest quality standards into every facet of our company's operations.

BARNHARDT SERVICES

Barnhardt Manufacturing Co. provides a number of services for bleached cotton fiber customers. We have a team of highly trained individuals that can be a tremendous resource for those new to processing cotton and established companies in need of problem solving.

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Key Results

The LCA study of bleached cotton fiber examined contribution to environmental impact for three life cycle stages of bleached cotton fiber production:

- (1) **Cradle-to-Gate** – which includes cotton growing and ginning to produce raw cotton fiber;
- (2) **Gate-to-Gate** – this includes Barnhardt's bleaching processing of raw cotton fiber, including all process materials used and energy consumed;
- (3) **Gate-to-Output gate** - shipping and distribution based on average shipping distances to the customer.

As shown in the graph below, the LCA study examined a comprehensive set of 21 life cycle impact assessment categories. A key finding is that the bleaching process is not a major contributor to impact across many of the impact categories. In most categories, raw cotton fiber is the largest contributor due to activities associated with cotton growing, including: herbicides, pesticides, fertilizers, water consumption, and energy use. Results on a per metric tonne basis for the production of bleached cotton fiber are summarized for energy, GHG emissions, water and agricultural land occupation.

ENERGY USE

-8%



Barnhardt has reduced energy consumption per product output by 8% since 2007.

GHG EMISSIONS

-6%



Barnhardt has reduced process GHG emissions per product output by 6% since 2007.

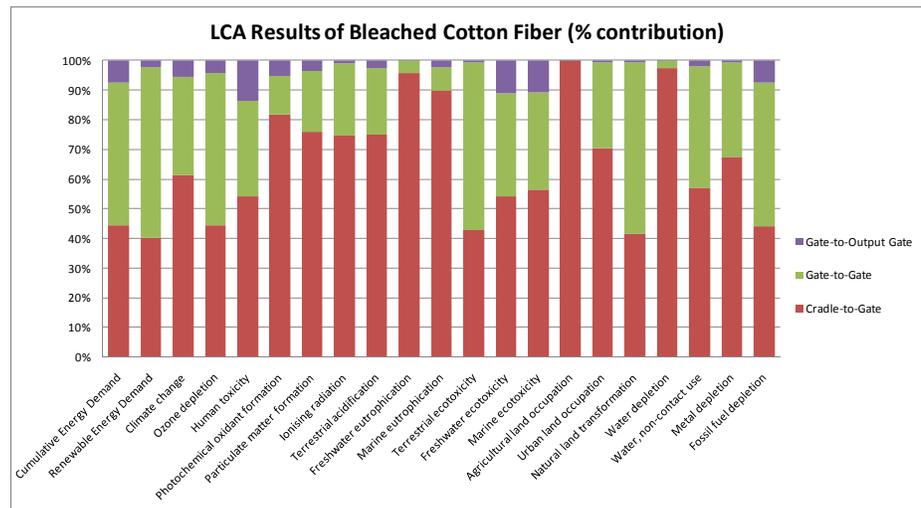
WATER USE

-33%



Barnhardt has reduced process water consumption per product output by 33% since 2007.

For more information on any of our products or services please visit us on the Web at: www.barnhardt.net



Gloria, T (2010) Life Cycle Assessment Study of Bleached Cotton Product, Industrial Ecology Consultants, Newton, Massachusetts USA

Looking to the Future

- Major improvements have been achieved through process improvements of water consumption, fuel use, and electricity use that have resulted in a reduction of impacts to the environment.
- This study is a first effort for Barnhardt to establish a baseline of environmental performance from a comprehensive set of scientifically based life cycle assessment impact categories.
- Barnhardt will continue to strive to create a more sustainable bleached cotton fiber product by working with suppliers and customers.

Results per 1 metric tonne of Bleached Cotton Fiber (from cradle-to-output gate)

- 55 GJ of energy
- 5,200 kg CO₂-e
- 1,240 m³ of water
- 1.35 ha of agricultural land occupied.



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