A Product Lifecycle Approach to Sustainability

Levi Strauss & Co.
San Francisco, CA
March 2009
Why a Product-Lifecycle Approach?

• In 2006, we had several programs in place to address environmental impacts associated with the production of our products and the operation of our facilities
  – Environmental compliance programs
  – Supplier Code of Conduct program
  – Global Effluent Guideline program
  – Levi’s® eco products (e.g., using organic cotton)

• We needed a credible, science-based method for measuring the full environmental impact of our products so that we would be able to identify a vision and set of priorities for our environmental work going forward

• We commissioned a lifecycle assessment (LCA) of two of our core products, which yielded some surprising results

• By taking a product-lifecycle approach to our work, we were able to develop a set of strategies to address the greatest impacts of our business on the environment

• Our product-lifecycle approach addresses both environmental sustainability and the sustainability of our business
What Is a Product-Lifecycle Assessment?

• Quantitative method to evaluate the environmental impact of products using:
  – Lifecycle perspective (system analysis) – e.g., from the cultivation of cotton to the end of the product’s useful life (“cradle to grave”)
  – Mass and energy balance (input/output inventory)
    • Direct Data – inputs and outputs associated directly with product
    • Indirect Data – inputs and outputs used to make the direct inputs (often using extensive industry-average data sets)
  – Impact assessment categories
    • To translate the input and output data to the environmental impacts of the system

• Typically, does not include:
  – Social impacts
  – Economic impacts
Definition of LCA from ISO 14040* Series:

“…the compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its lifecycle”

*Details the requirements for conducting and administering a Life Cycle Assessment (LCA)
A Credible Methodology

• Forty-year history
  – 1969: Glass bottle recycling vs. one-use PET bottles
  – 1970s: Energy crisis prompted energy-efficiency studies

• Consensus on LCA practice
  – University graduate programs
  – LCA professional certification (LCACP)
  – LCA to be integrated into LEED program for certification of green buildings
  – United Nations Environmental Program (UNEP) Lifecycle Initiative
  – European Union Integrated Product Policy (IPP)
  – National Institute of Standards and Technology (NIST) – using LCA for preferable purchasing by U.S. federal government
Our Project Scope

• Selected high-volume product:
  – Levi’s® 501® jean, medium stonewash
  – Produced for the U.S. market during the 2006 production year

• Studied the full lifecycle - cradle to grave

• Data compiled from
  – LS&CO. suppliers
  – GaBi 4 software datasets (used by LCA professionals, academics, government and other objective parties)

• Followed ISO 14040 series standards for results intended for internal use only

• Additional review (Phase 2) enables LS&CO. to share select data publicly and refer to LCA findings in conversations around our sustainability story and programs

• Conducted by PE Americas, Boston, MA
The LCA Results of the Studied Levi’s® 501® Jean

- Shrink to fit fabric
- 0193 Finish
- Medium stone wash
- U.S. Market, 2006 production year
Levi’s® 501® Jean System Boundary

Studied product produced for U.S. market during the 2006 production year using 0193 medium stone wash finish.
For the studied Levi’s® 501® jeans (cradle to grave), the climate-change impact was highest at the consumer-use phase (58%).
For the studied Levi’s® 501® jeans (cradle to grave), the energy-use impact was highest at the consumer-use phase (58%)
For the studied Levi’s® 501® jeans (cradle to grave), water consumption was highest at the cotton-production and consumer-use phases (49% and 45% respectively)
Product-Lifecycle Impact of Studied Levi’s® 501® Jean

32.3 kg of CO₂

- 78 miles driven by the average auto in the United States
- The carbon sequestered by six trees per year (based on EPA representative sequestration rates of tons of carbon per acre per year)

3480.5 liters of water

- Running a garden hose for 106 minutes
- 53 showers (based on 7 minute showers)
- 575 flushes of a 3.78 liter/flush low flow toilet

400.1 MJ of Energy

- Watching TV on a plasma screen for 318 hours
- Powering a computer for 556 hours, which is equivalent to 70 work days (based on 8 hours of computer use per day)

Data from LS&CO.’s Life Cycle Assessment on Levi’s® 501® jean for U.S. Market, 2006 production year
How water temperature and the type of machine(s) you use can make a difference

<table>
<thead>
<tr>
<th>Water Temperature</th>
<th>Machine Type</th>
<th>CO₂e Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Line Dry</td>
<td>Top-Loaded</td>
<td>1.9</td>
</tr>
<tr>
<td>Warm Line Dry</td>
<td>Top-Loaded</td>
<td>6.7</td>
</tr>
<tr>
<td>Cold Machine Dry</td>
<td>Top-Loaded</td>
<td>13.7</td>
</tr>
<tr>
<td>Warm Machine Dry</td>
<td>Top-Loaded</td>
<td>18.6</td>
</tr>
<tr>
<td>Cold Line Dry</td>
<td>Side-Loaded</td>
<td>1.1</td>
</tr>
<tr>
<td>Warm Line Dry</td>
<td>Side-Loaded</td>
<td>2.7</td>
</tr>
<tr>
<td>Cold Machine Dry</td>
<td>Side-Loaded</td>
<td>12.5</td>
</tr>
<tr>
<td>Warm Machine Dry</td>
<td>Side-Loaded</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Washer information derived from the following sources:

Consumer Care – Reducing Energy Use Impact

How water temperature and the type of machine(s) you use can make a difference

MJ

0 50 100 150 200 250 300 350

Cold Water, Line Dry 48.1
Warm Water, Line Dry 123.0
Cold Water, Machine Dry Top-Loaded 220.5
Warm Water, Machine Dry 295.4
Cold Water, Line Dry 34.8
Warm Water, Line Dry Side-Loaded 60.3
Cold Water, Machine Dry 201.2
Warm Water, Machine Dry 226.6
Consumer Care – Reducing Water Consumption

How water temperature and the type of machine(s) you use can make a difference

- Cold Water, Line Dry
- Warm Water, Line Dry
- Cold Water, Machine Dry, Top-Loaded
- Warm Water, Machine Dry
- Cold Water, Line Dry
- Warm Water, Line Dry, Side-Loaded
- Cold Water, Machine Dry
- Warm Water, Machine Dry
Denim is a hearty fabric. We don’t need to wash our jeans after every wear.

52 Washes
Consumers can decrease the climate change impact by about 32 percent by decreasing the number of times they wash their jeans to once every two weeks from once per week.

24 Washes
Consumers can decrease the climate change impact by about 48 percent by decreasing the number of times they wash their jeans to once per month from once per week.

Comparison of Climate Change Impact, by Number of Washes

*Based on top loaded/warm water/machine dry
*LCA assumed 104 washings (once per week for two years)*
Denim is a hearty fabric.
We don’t need to wash our jeans after every wear.

**52 Washes**
Consumers can decrease the amount of energy used when caring for their jeans by about 20 percent by decreasing the number of times they wash their jeans to once every two weeks from once per week.

**24 Washes**
Consumers can decrease the amount of energy used when caring for their jeans by about 40 percent by decreasing the number of times they wash their jeans to once per month from once per week.

*Based on top loaded/warm water/machine dry
*LCA assumed 104 washings (once per week for two years)
Denim is a hearty fabric.
We don’t need to wash our jeans after every wear.

52 Washes
Consumers can decrease water consumption by about 23 percent (799.2 liters) by decreasing the number of times they wash their jeans to once every two weeks from once per week.

24 Washes
Consumers can decrease water consumption by about 35 percent (1,223.3 liters) by decreasing the number of times they wash their jeans to once per month from once per week.

Comparison of Water Consumption, by Number of Washes

Cradle-to-Grave Totals (Number of Washes)

*Based on top loaded/warm water/machine dry
*LCA assumed 104 washings (once per week for two years)
What We Learned from Our Product Lifecycle Assessment

• When we look at the full product lifecycle, the majority of environmental impacts occur in lifecycle phases outside of our direct control.

• In order for us to decrease our overall environmental impact, we need to continue our efforts within our own sphere of influence in addition to focusing on:
  – Cotton production: the cultivation of our most important raw material.
  – Consumer engagement: we are a consumer-facing company, in constant conversation with the consumer about style and quality. We will engage and educate our consumers on the environmental impact of their fashion choices and the responsible care of their washable garments.
Examples of Our Product Lifecycle Approach in Action

• Engaging consumers:
  – Levi Strauss & Co. partnered with the Alliance to Save Energy and Proctor & Gamble, makers of Tide® Coldwater, to co-promote our Signature by Levi Strauss & Co.™ jeans in Wal-mart stores, encouraging consumers to save energy and money by washing their jeans in cold water
  – Product care labels: The Levi’s® brand is in the process of changing all care labels on the brand’s products, instructing consumers to wash in cold water and tumble dry medium. The new instructions will allow consumers to reduce their own environmental/climate change impact and save money on their utility bills

• Reducing product packaging
• Incorporating resource-efficiency factors in product design and manufacturing, including finishing technologies that allow us to reduce our water and energy consumption
• Addressing cotton sustainability through participation in projects such as the Better Cotton Initiative
Benefits of Our Product Lifecycle Assessment

• Helps us focus on the most significant environmental impacts as we develop and evaluate sustainability programs and policies

• Aids discussions with product designers, product managers, merchandisers and other employees on the concept of designing for sustainability

• Supports engagement with external stakeholders as we describe our environmental priorities and goals
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Appendix
For the studied Dockers® Original Khaki pant (cradle to grave), we found the climate-change impact was highest at the consumer-use phase (59%).
Dockers® Original Khaki – Energy Use

Cradle-to-Grave Energy Use, % by Phase

Cradle-to-Grave Energy Use (MJ), Amount by Phase

For the studied Dockers® Original Khaki pant (cradle to grave), the energy-use impact was highest at the consumer-use phase (63%)
For the studied Dockers® Original Khaki pant (cradle to grave), water consumption was highest at the consumer-use and cotton-production phases (62% and 32% respectively)
## Selected Assessment Methodologies

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Indicator</th>
<th>Description</th>
<th>Unit</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Use</td>
<td>Primary energy demand</td>
<td>Measure of the total amount of primary energy extracted from the earth</td>
<td>MJ</td>
<td>An operational guide to the ISO-standards (Guinee et al.) Centre for Milieukunde (CML), Leiden 2001</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Global Warming Potential (GWP)</td>
<td>Measure of greenhouse gas emissions, such as CO2 and methane</td>
<td>Kg CO2 equivalent</td>
<td>IPCC. Climate Change 2001: <em>The Scientific Basis</em>. Cambridge, UK: Cambridge University Press, 2001.</td>
</tr>
<tr>
<td>Eutrophication</td>
<td>Eutrophication Potential</td>
<td>Measure of emissions that cause eutrophying effects to the environment</td>
<td>Kg Nitrogen equivalent</td>
<td>Bare et al., TRACI: the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts JIE, MIT Press, 2002.</td>
</tr>
<tr>
<td>Acidification</td>
<td>Acidification Potential</td>
<td>Measure of emissions that cause acidifying effects to the environment.</td>
<td>Kg H+ equivalent</td>
<td>Bare et al., TRACI: the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts JIE, MIT Press, 2002.</td>
</tr>
<tr>
<td>Smog</td>
<td>Photochemical Oxidant Potential</td>
<td>Measure of emissions of precursors that contribute to low level smog</td>
<td>NOx equivalent</td>
<td>Bare et al., TRACI: the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts JIE, MIT Press, 2002.</td>
</tr>
<tr>
<td>Toxicity</td>
<td>Human Toxicity Potential; Ecotoxicity Potential</td>
<td>Measure of the potential toxicity of materials based on the chemical condition, original emission place and its fate.</td>
<td>Kg Benzene equivalent, PM2.5 equivalent; Toluene equivalent; 2,4-D equivalent</td>
<td>Bare et al., TRACI: the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts JIE, MIT Press, 2002.</td>
</tr>
<tr>
<td>Water</td>
<td>Water take</td>
<td>Measure of the water consumed. Sources include surface and ground water</td>
<td>Kg water</td>
<td></td>
</tr>
</tbody>
</table>


Selected Impact Categories for Communication

- Energy Use
- Climate Change
- Water Uptake