

Assessing the Environmental Impacts of Industrial Laundering

Life cycle assessment of polyester/cotton shirts



Jane Cartwright, Jean Cheng, Julia Hagan, Christina Murphy, Nicole Stern, Jonathan Williams
Faculty Advisor: Tom Dunne Client: Mission Linen Supply



Background

The industrial laundering sector, with annual revenues of approximately \$12 billion, is one of the most polluting industries in the world, consistently ranking among the top industrial contributors to greenhouse gas (GHG) emissions. Furthermore, creation of the textiles and apparel products laundered by this industry draws heavily on energy and water.

Objectives

Mission Linen Supply, primarily a linen and uniform rental business, launders 5.5 million kilograms of textiles annually at 28 wash-and-dry facilities across the Western U.S. The objectives of this project are to:

- 1) Quantify and establish a baseline for energy and water use and assess the global warming potential for the life cycle of their products and services;
- 2) Recommend changes to yield cost savings and reduce resource use and potential environmental impacts of their operations; and
- 3) Identify future legislation and regulation specific to the textile rental industry in the Western U.S.

Method

Following the guidelines of the ISO 14040 series, a **Life Cycle Assessment** of our client's most popular rental shirt was performed to quantify resource use and identify potential environmental impacts of the shirt's life cycle, from raw material acquisition, through the use phase, to disposal.

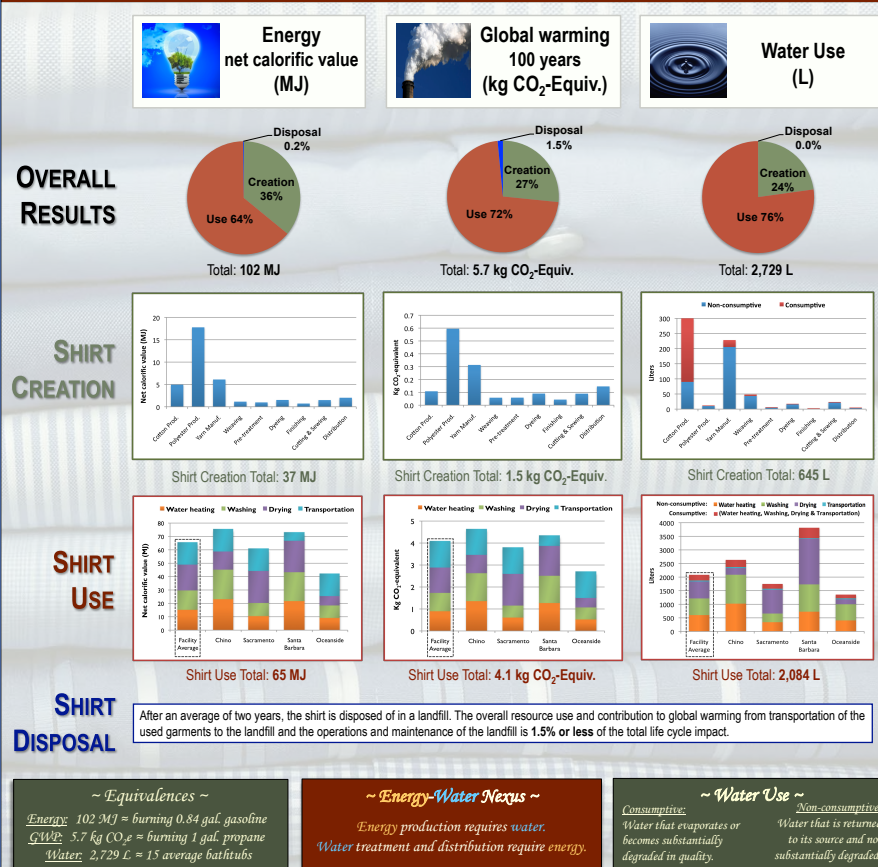
Scope



We modeled a 227 gram short-sleeved **65% polyester/ 35% cotton shirt laundered 52 times, every other week for two years, before it is discarded in a landfill.**

We modeled the processes of 4 out of 28 laundering plants to calculate an overall average for our client's operations.

Results



System Boundaries

Within system boundaries: Raw material sourcing, manufacturing, distribution, use and disposal phases; energy generation.

Outside system boundaries: Capital equipment, buildings, vehicles and maintenance; overhead and labor; packaging; shirt buttons; ancillary and scrap materials.

Conclusions

The use phase is the most resource intensive and largest contributor to global warming potential in the shirt's life cycle. Cotton production uses the most water, whereas polyester production uses the most energy in shirt creation. All four facilities exhibited different efficiencies in each process. The environmental impact from shirt disposal is insignificant. However, reusing or repurposing shirts can displace virgin material production.

Recommendations

- Share project results and collaborate with garment suppliers to focus environmental efforts on identified hot spots.
- Install meters on equipment to monitor and maintain its optimal efficiency.
- Perform economic feasibility analysis on the installation of solar water heating systems.
- Consider alternate fuel delivery vehicles, optimize delivery routes, and maximize vehicle utility rate.
- Investigate ways to repurpose, recycle, or donate garments instead of disposing of them in a landfill.
- Integrate environmental strategy into its business structure and increase environmental awareness among its customers.
- Continue to measure and reduce resource use in anticipation of impending government regulations on GHG emissions.

Acknowledgements

The Bren School, Tom Dunne, Roland Geyer, Brandon Kuczynski, Sangwon Suh, Mission Linen Supply, The Bower Foundation.