

Life Cycle Inventory Packaging Options for Shipping Soft Goods in E-Commerce and Catalog Sales

Businesses have many different packaging options to choose from when shipping non-breakable items such as clothing. Different options have advantages or disadvantages in performance, cost, and environmental burdens.

This fact sheet summarizes key results of a study, funded by the Oregon DEQ, Metro, and U.S. EPA, that evaluated natural resource use and environmental burdens from production to disposal for 26 different packaging options for non-breakable items.

You can view the entire study (and appendices) on line at:

<http://www.deq.state.or.us/lq/sw/packaging/LifeCycleReport.htm>. A longer summary with answers to commonly asked questions can be viewed at (<http://www.deq.state.or.us/lq/pubs/docs/sw/packaging/lifecycleinventorylong.pdf>).

Boxes or Bags?

All packaging options studied fell into two general categories:

- **Corrugated boxes with void fills**, which include polystyrene or corn starch “peanuts”, inflated air pillows, bubble wrap and paper.
- **Shipping bags**, which can be unpadding or padding and made entirely from paper, a variety of plastic resins, or combinations of paper and plastic components.

Shipping bags almost always have lower environmental burdens than boxes.

Because they use much less material in their manufacture and ship more compactly, bags typically have significantly lower energy requirements, solid waste, and greenhouse gas production than boxes with void fill. This is true for all shipping bags, even padding bags with little to no recycled content and few convenient recycling options.

Increasing post-consumer content can reduce environmental burdens . . .

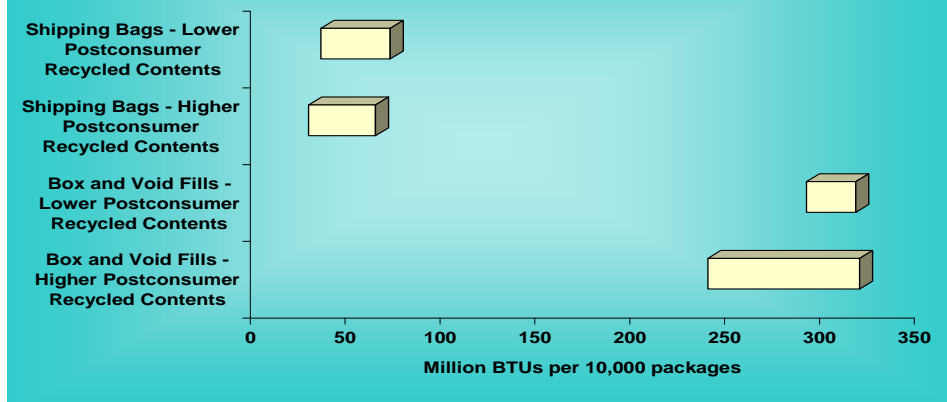
Using post-consumer recycled content in packaging reduces the consumption of virgin resources and provides markets for recyclable materials. In many cases, it also reduces total energy use and associated pollution, including life cycle greenhouse gas emissions.

. . . but it isn't the only consideration.

Because bags require fewer materials and energy, the use of bags often requires less energy than any box with void fills, even if the bags are made from virgin resources and the box and void fills have high levels of post-consumer recycled content. Using bags achieves similar reductions in raw materials use, solid waste, greenhouse gases, and many of the other atmospheric and waterborne wastes studied.

So be wary of choosing a packaging material *only because* it contains high levels of post-consumer recycled content. But once you've chosen a packaging material, it usually makes good environmental sense to try and increase the level of post-consumer recycled content.

This chart compares the total energy consumed from production to disposal for bags and boxes evaluated in the life cycle study. Similar results are found when comparing solid waste, greenhouse gases, and most other emissions.



Did you know?

All packaging materials come from raw materials that have to be grown and harvested or extracted from the earth.

Significant amounts of energy are used to manufacture and transport packaging in the U.S. Fossil fuels (coal, natural gas, petroleum) are often a major energy source.

A variety of atmospheric and waterborne pollutants are generated during fuel combustion and manufacturing. Some of these pollutants are released into the environment where they may harm human health and natural ecosystems and even alter the planet's climate.

Minimizing box size and total fiber content can result in significant environmental savings.

If you use boxes, reducing “empty space” by making sure boxes are no larger than needed can yield significant environmental savings. The total energy used in manufacturing and transporting packaging to the order fulfillment center averaged 6.8 times higher for the cardboard box than for the purchased void fills. Reducing the size of the box saves both resources, since smaller boxes use less fiber and also require less fill. It can also lead to environmental benefits in shipping, as more packed boxes can fit into each truck. In contrast, changing void fills alone does nothing to lessen the environmental burdens associated with the box. For more information about optimizing box sizes and fiber content, [click here](#).

Upstream impacts may be significantly greater than downstream impacts.

Many people focus on packaging as a solid waste problem, but the manufacturing and transportation burdens “upstream” of the consumer may be more important than “downstream” waste issues. Take a corrugated box with newsprint fill as an example. If used once and thrown away, only 8% of the net total greenhouse gas emissions emitted over its entire life cycle occur at the landfill. 92% of the emissions occur upstream in resource extraction, manufacturing, and transportation.¹

Packaging recyclability is important, but not the only consideration.

Just because a packaging material is easy for consumers to recycle in curbside or other recycling programs, it may not have lower environmental burdens over its life cycle than materials for which widespread recycling programs are not readily available.

The study did not compare recycling against other options for end-of-life management of waste. Rather, the study evaluates options from a purchaser's point of view. The benefits of recycling (relative to landfilling) have been well documented elsewhere. Although DEQ strongly supports efforts to recycle materials, using less in the first place prevents waste and is a higher priority.

Alternative formats (such as large type, Braille) of this document can be made available. Contact DEQ's Office of Communications & Outreach, Portland, at (503) 229-5317

¹Assumes 50% landfill gas recovery and 10% surface oxidation. Issues of carbon storage in forests are excluded from this analysis.