



MAY 2011

ADVANCED ADHESIVES REPORT

Your corrugating newsletter from Harper/Love Adhesives Corporation

The Harper/Love sustainable tote recovery program

Return, reuse, repair, recycle

By Rick Bird

For over a decade Harper/Love has been actively employing and promoting responsible green packaging.

Our primary liquid product containers are reusable 275 gallon and 330 gallon polyethylene bottles protected by steel cages. We offer our customers a fast, easy and environmentally friendly way to return and recycle empty totes.

We begin with the purchase of once-used totes from a tote refurbisher, rather than new ones. This is the first step in reducing raw materials required for manufacturing.

When the tote is empty, we have a very accommodating procedure to allow for the return of the tote to our main manufacturing facility. This can be done as single totes are emptied or empty totes can be grouped together and returned. Then they are cleaned, repaired and reused. Units no longer usable are recycled.

Reuse, repair and recycling of our totes results in an environmentally friendly, sustainable packaging and delivery system for our liquid products.

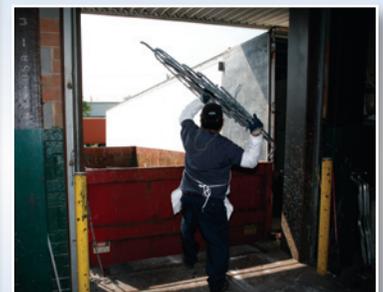
Below: Our program includes 100 percent recycling of units no longer deemed serviceable. The bottles are ground and repelletized to make the HDPE feedstock used in new production of components that do not contact product. Cages are cut into pieces and become recycle scrap steel. This process prevents over 65 tons of waste annually from ending up in a landfill.



Over the past decade, the Harper/Love tote recovery program has eliminated the production of 4 million pounds of virgin resin. That amount of HDPE would have required 23,000 barrels (1 million gallons) of crude oil to produce. Our program also eliminated over 9 million pounds of new steel that is used in the pallet and cage.



When an empty tote is returned to our facility, it is inspected for serviceability. If the tote is determined to be serviceable, it is cleaned, repaired as needed, and tested to ensure fitness for use before being put back into service.



Toward a greener box plant

Changes large and small can make a big difference

By Rex Woodville-Price

Kraft Brown: the new green

The corrugated industry has a lower environmental impact than many imagine. A large portion of the boxes we produce find their way back to a paper mill to be repulped; the fact that OCC (old corrugated containers) is traded as a commodity attests to this. Also, our two main raw materials, paper and starch, have very low carbon footprints since they came from plants, which absorbed lots of carbon dioxide during their lifetime. While this is something we can be proud of, what else can we do to make our operations more ecofriendly and sustainable?

We've heard of one box plant using wind generators to help supply its electrical needs. Some plants have poured concrete in their sewer discharge line as an extreme measure to become zero discharge. While these dramatic measures are certainly green, there are many smaller changes, which can be combined for great impact.

What is our real incentive to be green? Certainly we aspire to be responsible citizens of our planet and make it a better place for following generations. There are immediate practical advantages as well. Many green practices offer the added benefit of saving money. Any cost reduction goes to the sustainability of the business as well.

Although it is generally not viewed this way, running an efficient operation is not only profitable but it is also environmentally sound. Here are some examples:

Reduce waste

Use without waste is good. Less waste means less cost in energy and raw materials. Avoiding reruns saves time and labor as well.

Reduce downtime

When a corrugator is down, it is still using fuel to keep the heated vessels at operating temperature, while not producing anything. To make matters worse, when it starts up again the crew will invariably have to scrap the board in the hot plate section. Although we generally don't think of it this way, reducing downtime will not only reduce waste and lower our operating costs, it also reduces our carbon dioxide emissions.

Use less fuel

Reducing or minimizing our energy consumption, whether electric power or fuel for the boiler, means not only reducing our carbon footprint, it also means spending less money. Here are some ways to reduce energy consumption:

- Insulate steam pipes to reduce radiant heat losses and produce less condensate (which also costs money to deal with).
- Make sure traps are working properly by having an adequate maintenance plan in place that routinely checks and rebuilds them.
- Install a modern boiler controller that makes the most efficient use of fuel in the boilers, which makes sense both economically and ecologically.
- A high pressure condensate return system will allow you to reuse your condensate, eliminating the need to heat up and use more make-up water. Your boiler operates more efficiently.
- Fix steam leaks. Combined with steam pipe insulation, you'll save money and make your operation safer.

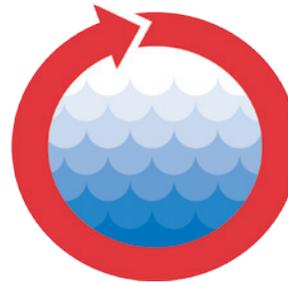
Fix air leaks

Air leaks can affect the proper functioning of pneumatic equipment. They make compressors and drying equipment work extra and waste electric energy. Like steam leaks, pneumatic leaks should be fixed promptly.

Use efficient motors

When replacing electric motors it can pay off to use the newer more energy-efficient motors and to ensure the motor is of the correct type and power for the application.

Use less water



Many modern box plants today treat their wastewater before discharging it; some reuse either treated or untreated water to prepare their corrugating adhesive and thus have zero discharge. A few even use treated water to water their lawn or green areas.

An additional step in conserving water can be the installations of water meters so that when converting equipment crews are washing up a print station for a color change, they can be aware of their water consumption and limit their usage. Meters can also work on the corrugator.

Other opportunities for savings

- Some plants save their good cores and their core plugs and return them to the paper mill to be reused.
- A plant that manages to use out-of-spec preprint inside out will keep that paper from having to be recycled.
- Recycling office waste such as empty beverage containers, office paper, toner cartridges, etc., are things you should be doing to be a good citizen of the planet.

This short list is just the beginning. Many other opportunities will emerge as your team is led to realize there is a profit incentive inherent in green operations.

Using recycled fibers in the corrugating process

Bonding high recycled-content papers can be challenging, but there's always a way

By John Kohl

The good news

The use of recycled fiber in the production of linerboard and medium has been around since the beginning of our industry. Today, recycled fibers from old corrugated containers (OCC), is second only to virgin fibers from trees for these applications.

Approximately 75 percent of all old corrugated containers (OCC) are recycled and repulped. (Some of it is used to make linerboard but more is used for corrugated medium.) This is good because, compared to virgin fiber from trees, it requires less energy and chemicals to repulp fibers from old corrugated. It also reduces the amount of waste sent to landfills: each ton of OCC keeps more than 3 cubic yards of waste out of the landfills.

Newer lightweight container board mills were set up with technology to run virgin fibers in the furnish to produce high-performance liner board grades. These mills have been able to convert to recovered fiber from OCC with little effort. This has helped these mills increase to a higher percentage of recovered fiber content; many use 100 percent recycled content.

The challenges

For all the advantages of recycling, there are limitations. Each time paper is recycled the fibers become weaker and shorter in length. The addition of corrugated medium in the OCC, with its shorter fibers, dilutes the quantity of longer fibers in the liner board, which weakens the sheet. Also, some mills use additional fiber from alternative waste paper sources such as old office waste, which has shorter hardwood fibers. This results in paper with a different strength potential and bonding characteristics on the corrugator.

Along with the wide range of lengths and types of fibers, the paper manufacturer has to add chemicals to the pulp furnish to help the fibers bond to adjacent fibers and give the paper higher tear and ring crush strength. These chemicals also change the bonding characteristics of the liner and medium.

Recycled fibers may cause other box performance problems that can be overcome with changes in the corrugating process. The fibers become shorter with each recycling and lose strength. During the drying process the fiber cell walls collapse and reduce their swelling ability and thus the flexibility and strength of the fibers. This can cause score cracking and liner tearing in the finished box. Most recycled fibers will absorb water faster, resulting in lower strength properties and bonding issues from dewatering the starch glue line too rapidly before gelling occurs.

Mills have been using different treatments to combat these realities, which ultimately creates a sheet that is harder to penetrate with adhesive, creating poor bonding, delamination, and board quality issues.

These sheets also show a tendency for lower internal ply bond strength. This leads to ply separation on liners and medium flute decapping, where the starch adhesive bond is stronger than the internal bond strength of the medium.

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Making it work

Bonding of high recycled-content liners and medium on the corrugator has its challenges. Usually there is a need for changes in the adhesive or the combining process, and sometimes there is a need for additional ingredients in the adhesive to achieve good bonding at acceptable speeds. With some paper there is a need for increased adhesive application, and more conditioning steam, bond enhancers, or penetrants. The need and type will change from mill to mill and basis weight to basis weight.

As the use of recycled fibers in the production of liner board and medium continues to grow, bonding on the corrugator will continue to change and present a challenge for the box plants. Managers will need to keep their starch supplier and adhesive formulator involved until crews learn the best production methods needed for each grade and mill supplier.

- Using recycled paper to make boxes
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- Sustainable tote recovery program

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Leaders in the science
 of making
 good adhesives better™



Sustainability

Beyond packaging: a call for environmental responsibility

Long before sustainability became an industry buzzword, we were actively exploring ways to minimize the environmental impact of our operations — and yours.

Some of our Earth-friendly innovations:

- Very low VOCs in our products
- Formaldehyde-free resins
- Products focused on bonding wax-alternative substrates, to promote their use
- Products to improve rigidity and performance of lighter basis weight liners
- Long-life, returnable totes
- Warehouse locations that minimize shipping distances
- Piggy-back rail shipments to reduce fuel consumption
- Zero-discharge plant consultation

We applaud the current emphasis on sustainability and are proud to be part of it. We welcome your questions and suggestions.

