



The Future of Shipping Solutions in Modern Medicine: Reusable vs. Single-Use Shippers

The ability of biologic drugs to deliver better targeted therapies for a wide range of unmet medical needs is a primary reason this area of drug development has seen a significant increase over the last decade.¹ As drug manufacturers continue to advance medicine with new discoveries in technology and science, the dominance of biologics is expected to continue, with experts predicting them to comprise more than a quarter of the pharmaceutical market by 2020.²

However, with the cost of developing a new pharmaceutical drug now exceeding \$2.6 billion,³ drug manufacturers must explore new technologies and strategies to help protect these innovative medicines. Specifically, safeguarding a drug's journey from the facility to the patient is a critical part of securing the efficacy and safety of products that involve the use of living organisms. Various temperature-controlled shipping solutions, such as single-use shippers, are available that can maintain a product's temperature from 48 up to 120 hours.

Yet, while many companies still rely on this type of solution for shipping, another option exists in reusable shippers. These typically multi-use thermal packaging solutions provide customers with a potentially more cost-effective way of improving payload volume efficiency while lowering distribution costs and reducing the carbon footprint of drug delivery. And with asset management systems available that can track the location of a reusable shipper, concerns about returns are mitigated, opening up a new opportunity for any manufacturer seeking a greener way to transport their temperature-sensitive payloads.

THE ENVIRONMENTAL IMPACT OF SINGLE-USE VERSUS REUSABLE SHIPPERS

Traditional single-use packaging containers rely on layers of insulation comprised of either polyurethane (PUR) or extruded polystyrene (EPS) insulation and gel pack heat sinks to maintain product temperatures throughout shipping. These materials allow for temperature control between 24 and 72 hours. At the end of the single-use shipper's journey, all components of the container, except for most of the cardboard corrugate, are sent to a landfill. Reusable shippers, though, are constructed with high-end vacuum-insulated panels and phase change materials (PCMs) contained in some fashion, i.e. bottles, etc., that are returned to the manufacturer's service centre for inspection, cleaning, and general prep for next use once their journey is complete. These shippers can maintain a 2° to 8° Celsius temperature range for up to 96 hours and sometimes beyond.

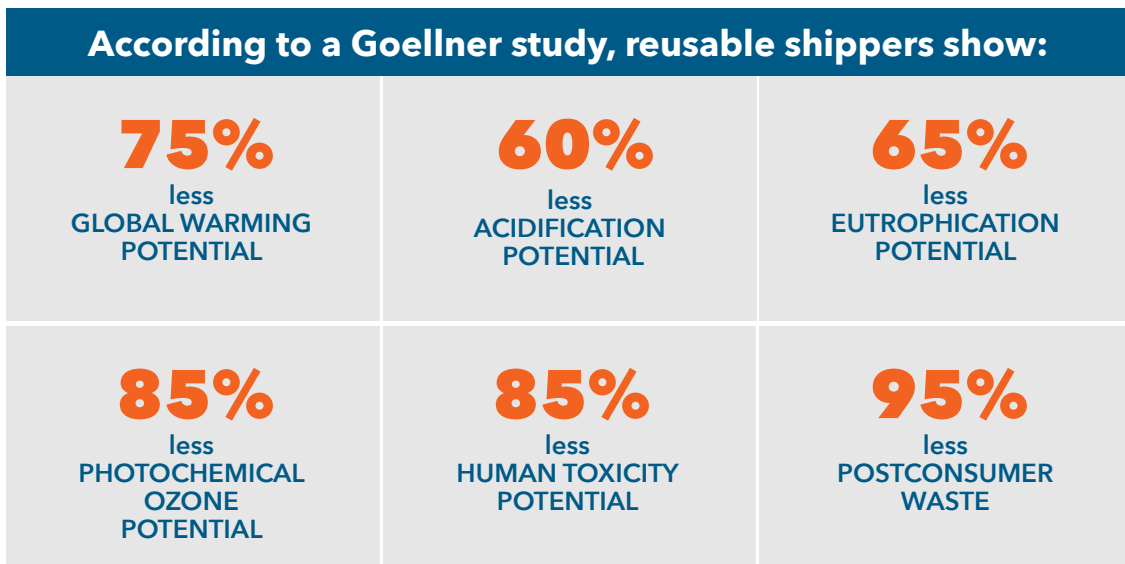
In the controlled setting of the Goellner study it was found that reusable shippers also weigh less and have considerably larger usable payload space (due to the thin, yet efficient insulation compared to thick-wall single-use shippers), which means they can hold a financial advantage when it comes to transportation and storage costs. Nevertheless, the most noteworthy advantage reusable shippers have is the benefits they offer when it comes to lightening the environmental burden other shippers may impose.⁴



GOELLNER STUDY

To review the environmental impact between the two shipping options (reusable versus single-use), a study was performed over the course of two years for a pharmaceutical clinical trial requiring individual shipments within the contiguous United States.⁴ It is the first to focus on thermal packaging used in cold chain logistics for the life sciences industry.⁵ Looking at the carbon footprint of the reusable and single-use options from cradle-to-grave, Goellner assessed the global warming, eutrophication, acidification, photochemical oxidation and human toxicity potential, as well as the amount of postconsumer waste of the two shipping solutions. Emission calculations use an equally weighted function of mass and distance, so the weight difference between the two solutions became a key factor in determining their environmental impact.

The single-use container used for this study—made up of insulation, gel packs, gel bricks and corrugate—had a total weight of 17.85 kilograms (kgs) when PUR was used and 19.07 kgs when EPS was used. The reusable shipper's weight, which totaled only 9.49 kgs, included the vacuum-insulated panels, thermal insulation chamber, phase change materials, outer corrugate and tape. Over the course of the study, 30,000 single-use shippers were required to satisfy the clinical trial material needs, as opposed to only 772 reusable shippers. After two years, the reusable shippers had emitted 241 tonnes of carbon dioxide (CO₂) during transport versus 1,122 tonnes from the single-use shippers. According to Goellner, this is roughly a 75 percent difference in global warming potential between the two approaches. In addition, the reusable approach showed 60 percent less acidification potential, 65 percent less eutrophication potential, 85 percent less photochemical ozone potential, 85 percent less human toxicity potential and 95 percent less postconsumer waste.

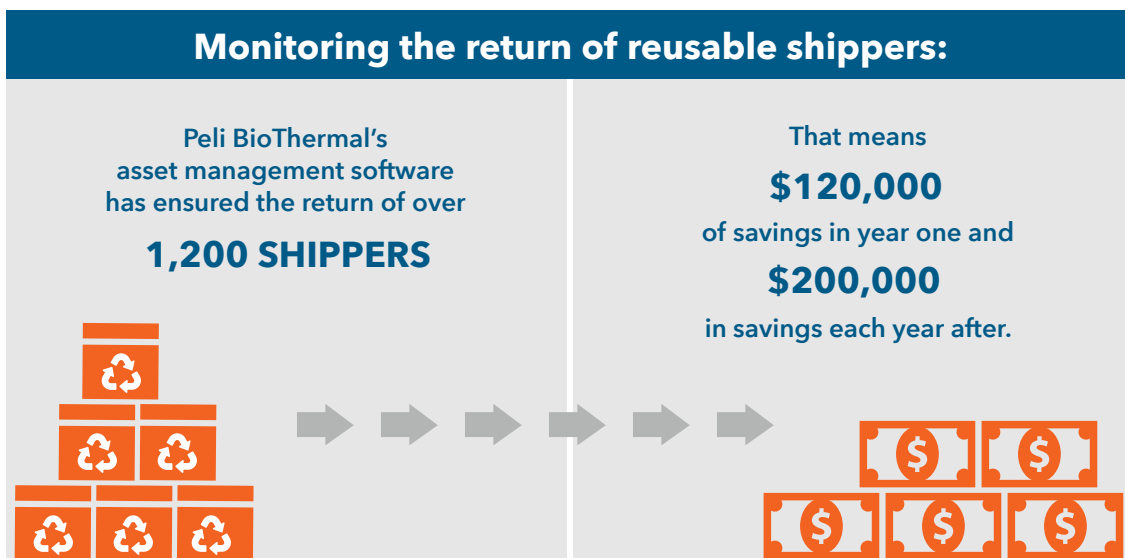


The study also considered the return rate of the reusable containers. Though the initial investment for them is higher than that of a single-use container, a manufacturer receives a return on their investment over time as the shipper is returned after every shipment for reconditioning and reuse.⁶ Over the two years following the reusable shippers, Goellner assumed they were shipped twice a month with a 90 percent annual recovery rate.⁷ Ensuring a successful recovery rate of a reusable shipper such as this is dependent on a reliable asset management system, integration with carriers and enterprise resource planning (ERP) systems and open communication and cooperation between supply chain stakeholders.

MANAGING THE RETURN OF REUSABLE SHIPPERS

When utilising reusable shippers, getting the containers back is critical not just to avoid delays in shipping your products to the patients who need them but also to your bottom line, as one pharma company found when it discovered it had a large number of shippers sitting at its delivery location in Asia.⁸ Upon discovering this need to track its reusable shippers, the company contacted Peli Biothermal (PBT) to implement asset management software and organise the return of their containers.

First, the company worked with its local vendor for each country in the region to send shippers to a consolidation facility. Each reusable shipper at PBT is equipped with a bar code and identification number (similar to the vehicle identification number on a car). That bar code is scanned into the software and, by integrating with carriers like FedEx, DHL and UPS, the shipper's country of origin, each stopping point in its route and, finally, when it arrives at the consolidation facility can all be tracked by PBT. The company and the vendors worked together to monitor the returns coming from the consolidation facility and the rate at which they were being returned. To date, the use of PBT's asset management software has organised the return of over 1,200 shippers to the client, resulting in a savings of over \$120,000 in the first year and \$200,000 in savings in each year after.



The benefit of the software is not limited to managing the return of shippers. The data from the scanned bar codes also provides the shipper recovery rate, number of uses, the damage rate (to determine amount of total repair costs) and average lane length. Not only does this provide supply chain transparency that is vital to tracking and protecting a drug product shipment, but it can also help when determining if and where temperature excursions may have occurred. For example, if an asset is qualified to be in a shipping lane for four days but the tracking information shows it took eight days for delivery, the customer can look back at the route and pinpoint where something went wrong. Identifying when and where errors occurred is vital during an investigation, so corrective measures can be put in place to prevent them from happening again. Standard industry performance qualification and cleaning ensures reusable shippers can deliver consistent results over the lifetime of the equipment, which is typically about five years.

As the pharmaceutical industry continues its pursuit of new therapies for unmet needs using biologic drugs, manufacturers will need to lean on innovation and efficiency to reduce the cost of drug development and distribution. By making sure you have a solution that maintains the temperature of your product in its critical journey to the patient and manages the return of the vehicle that delivered it, you preserve the intent of the medication, the safety of your investment, and the lives of the patients who depend on them.

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