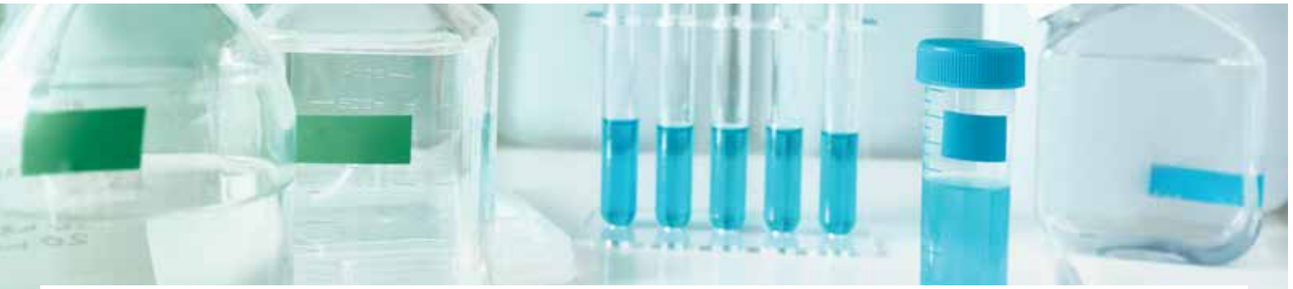

Sustainable Labware

HOW LABWARE CHOICES IMPACT A LAB'S ENVIRONMENTAL FOOTPRINT

by Lorie Bedell

Sustainability is one of the top priorities for laboratory managers. Incorporating sustainability goals into laboratory processes is key to ensuring compliance with relevant organization-wide strategies. In addition, lab managers are under mounting pressure from regulatory bodies and society as a whole to minimize their facility's environmental footprint.

Sustainability diffuses into the design, construction, and operation of laboratories, with lab managers looking for ways to reduce energy and water use and waste, as well as to decrease the volume of hazardous or infectious chemicals that could accidentally be released into the environment. With labware being a key component of the laboratory workflow, it is important for lab managers to choose products that meet their site's sustainability objectives, while also fulfilling their primary role of preserving the quality and integrity of the chemicals and solutions stored within the site.

When it comes to labware, plastic containers such as bottles, beakers, vials, and carboys demonstrate benefits over their glass counterparts, as they are shatterproof and lightweight. On the contrary, glass labware is heavy and more difficult to handle. Glass containers also break when dropped, which may pose a health hazard for laboratory personnel, potentially exposing them to the release of harmful substances. In addition, broken labware needs to be replaced, adding to the laboratory's overall operational costs.

> "It is vitally important that only lab-grade plastic materials are used to make plastic labware."

With sustainability as a key driving force behind labware choices, those same attributes could potentially discourage lab managers from choosing glass containers. The fact that glass labware is heavier than plastic means that when it is shipped, it may generate a greater carbon footprint. In addition, because it is fragile, glass labware must be carefully packaged using multiple layers of protective wrapping. While this ensures products are safely delivered to laboratories, it also results in the generation of much more packaging waste.

Glass containers are most commonly made from borosilicate glass because it is resistant to chemicals, contaminants, and drastic temperature changes, and thus can withstand the toughest laboratory conditions. However, borosilicate glass is a nonrecyclable material, meaning that its disposal is adding to landfill waste. Finally, the manufacture of glass labware requires the use of much more energy than is needed to produce plastic containers, increasing the carbon emissions of production facilities.

Plastic labware that fosters sustainability

Plastic labware is most commonly produced using polypropylene (PP) or high-density polyethylene (HDPE) materials. In addition to being noncytotoxic and thus suitable for direct contact with pharmaceutical products, these high-quality polymers are also recyclable. Recyclability alone, while very important, is not sufficient to classify plastic labware as sustainable. Plastic containers also should be produced using materials free from unnecessary additives, such as plasticizers, fillers, and mold-release agents, and should contain only minimal amounts of required heat stabilizers and antioxidants. Because additive materials have the potential to leach out of the plastic and into lab solutions under the right conditions, it is vitally important that only lab-grade plastic materials are used to make plastic labware.

Being shatterproof means plastic labware can be safely transported using minimal packaging, helping lab managers reduce the waste their facility produces. To make for an even more environmentally friendly choice, plastic containers are often packaged in cartons with a high percentage of recyclable content. Such cartons are deemed unsuitable for packaging glass labware, as the mechanical strength to support the weight and protect the glass is not sufficient.

Manufacturing best practices

The direct impact of plastic labware and its packaging on a laboratory's environmental footprint is a key consideration when making purchasing decisions. In order to fully embrace sustainability, it is also important to consider the practices implemented by labware manufacturers to reduce their own footprint. For example, the production of plastic labware typically requires the consumption of large amounts of electricity, resulting in increased carbon emissions. Whenever possible, vendors should use renewable energy sources, such as hydroelectric power or wind energy, that do not pollute the environment. Having a strict plastic and paper scrap recycling process in place, aimed at minimizing landfill waste, is also key. Some manufacturers take this a step further and reuse a high percentage, sometimes even 100 percent, of their own postconsumer paper waste to produce cartons for packaging their products.

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Most recently, My Green Lab, a nonprofit organization focusing on improving the sustainability of scientific laboratories, launched the ACT (accountability, consistency, transparency) program designed to help lab managers make more informed purchasing decisions that could reduce their facility's footprint. The program provides an environmental impact factor assessment of laboratory consumables, chemicals, and equipment, rating each product's manufacturing, user, and end-of-life impact, including energy and water use, chemical management, packaging, and shipping. The lower the score, the lower the impact on the environment. Scientists, procurement specialists, and sustainability directors across laboratories can rely on this comprehensive program to determine whether certain products could meet their sustainability requirements. Following the decision to purchase a specific product based on its ACT score, lab managers can further benefit from the program as it provides valuable information about the most appropriate ways to dispose of the product and its packaging. A number of US manufacturers have already recognized the value of the ACT program and are participating in it, selling products that have been independently audited and verified.

Further addressing the sustainability needs of laboratories, the ACT program enables manufacturers to identify areas for improving their own processes. With regard to the materials used to produce plastic labware, there may be cases in which products are awarded a less-than-favorable score within the framework of the ACT program. This is due to the need to balance sustainability efforts against high-product-quality standards that meet the needs of laboratories for containers designed to effectively protect contents from contamination. Labware that has been manufactured using high-purity, "virgin" materials instead of recycled ones typically demonstrates superior protective properties because these materials are free from unknown contaminants that might leach from the plastic. As a result, the solutions stored within such containers can safely retain their chemical characteristics and purity until use. In cases like this, product quality takes priority over sustainability in order to ensure the container is fit for purpose. The manufacture of plastic labware using virgin materials requires more energy and natural resources compared with containers produced using recycled materials.

Laboratory best practices

When assessing a container prior to purchase, lab managers also should be looking for high-quality, durable containers that can be used repeatedly over the course of many years. Heavy-duty, leakproof containers such as carboys, bottles, and graduated cylinders can last more than 20 years, depending on how rigorous the application requirements are. In addition to promoting sustainability, durable plastic labware that eliminates the need for frequent replacement makes for a more cost-effective solution.

There will still be applications requiring the use of disposable products, such as pipette tips. In those cases, recycling is key to meeting sustainability goals. Laboratory plastics recycling, however, is not without its own challenges. First, it is imperative that these disposable plastics are cleaned and decontaminated following use, so they can be safely recycled. And given the many different forms of plastics made from various types of polymers, it may be difficult to sort these for reprocessing. While some plastics (such as HDPE) are readily recycled in most communities, recycling programs for other lab plastics (such as polypropylene) might not be found in smaller communities. Although recycling plastic labware may prove challenging for laboratories with no recycling facility nearby, reduced environmental pollution outweighs the cost of transporting discarded containers to the nearest reprocessing center.

> "Heavy-duty, leakproof containers such as carboys, bottles, and graduated cylinders can last more than 20 years."

Conclusion

Managers of scientific laboratories are well aware that today's plastic labware purchasing decisions will have a direct impact on their lab's environmental footprint. However, navigating through the wide array of products available on the market can be a daunting task. Initiatives such as the ACT program from My Green Lab are designed to ease this process by providing a platform for lab managers to draw direct product comparisons, make educated choices, and purchase labware that promotes sustainability.

With plastic labware manufacturers becoming increasingly environmentally conscious, laboratories can benefit from plastic labware that is recyclable and durable, requires minimal packaging, and has been produced in facilities where sustainable best practices form an integral part of manufacturing processes.

While there is no questioning the importance of adhering to sustainable processes, ensuring the quality of the research results they produce is the main goal of laboratories. In order to generate accurate, dependable data that can be used to drive scientific discoveries and innovations, it is crucial for laboratories to use high-quality plastic labware designed to safeguard the viability and integrity of the stored compounds. Although sustainability is a high priority, plastic labware manufacturers cannot afford to compromise quality.

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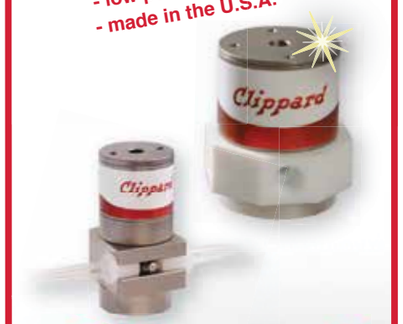

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