

Flexible Packaging

Leading the way in packaging innovation

Technology and innovation created flexible packaging, and they continue to define it.

Flexible packaging is at the forefront of important packaging trends in product protection, design, and performance; consumer convenience; and sustainability, all of which positively impact the environment, consumers, and businesses.

Flexible packaging is any package or part of a package whose shape can be readily changed. It includes packaging made with **paper, plastic, film, foil, metalized or coated paper and film, or a combination of any of these materials.** Annual sales for the U.S. flexible packaging industry were reported to be approximately \$39 billion in 2021—the second largest segment in the U.S. with a 20% share of the packaging market.¹

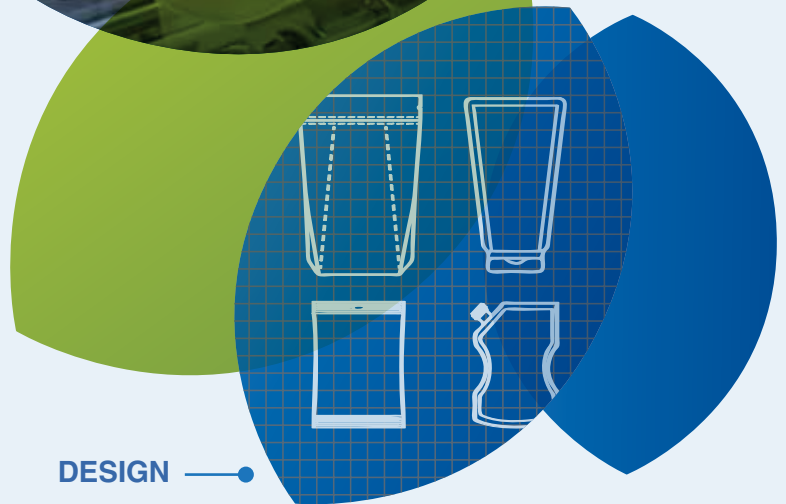
Flexible packaging includes:

Rollstock | Bags | Pouches |
Liners | Shrink Sleeves | Shrink Wrap
and Stretch Wrap | Bulk Shipping
Sacks | Flexible Lidding |
Film Wrap Around Labels

PROTECTION —●

PERFORMANCE —●

DESIGN —●



Innovation – Technology and Collaboration

Flexible packaging facilitates many of the products in our stores today, whether retail or e-commerce, food or cosmetics, medical or pet supplies—it is the perfect packaging: packaging second only to nature's original.

Today's shoppers buy a wide variety of goods that use flexible packaging, as it provides the best protection for products with the least amount of material, *creating less waste in the first place*®. Examples include bagged salad greens that stay crisp for days, frozen vegetables that steam right in their packages, pouches of dog and cat treats kept fresh with zipper closures, antibacterial wipes and other personal protection products that protect against viruses, easy-to-use and refillable solutions for laundry detergent, and health and beauty products—all of which can last longer on store shelves and in consumers' homes when contained in flexible packaging.

Consumers are conscious of the products they purchase and the packaging that holds and protects those products. They are seeking the convenience, extended shelf life, and sustainability features that flexible packaging provides.

Innovating to Meet Needs

Innovation and technology led to the development of flexible packaging, which provides barrier properties from moisture, oxygen, odors and bacteria, utilizes a variety of printing options, and creates lightweight packaging that includes clarity, strength, product protection, extended shelf life, and the ability to be resealed and microwaved, among other attributes. As a result, flexible packaging leaves a smaller environmental footprint when compared to traditional packaging types, including less greenhouse gas emissions from the manufacture and transportation of the packaging, less water and energy usage, less product waste and spoilage, and ultimately less packaging material to be managed after use.



Flexible Packaging Sustainability

Today, shoppers, brands, and retailers are all focused on more sustainable packaging solutions. Flexible packaging meets this rising demand through:

- Source reduction and less packaging waste
- Reduced environmental footprint from transportation, storage, and use
- Sterility and product protection
- Prevention of food waste and contamination
- Freshness and extended shelf life
- Consumer convenience and portion control



Collaborating to Innovate

Flexible packaging manufacturers work with machinery manufacturers and brand owners to achieve new levels of package functionality. Packages fill faster thanks to equipment improvements, which also enable next-generation films to be used, including films with post-consumer recycled (PCR) content. Advanced printing press technology delivers high impact, razor-sharp graphics and bold colors that build brand recognition. New flexible packaging innovations, like bio-based and recycled materials and recyclable packaging, have to work with product packaging machinery, and material changes often require machine modification. Ultimately, the packaging innovation must protect the product, so the supply chain has to collaborate to innovate.



Flexible packaging is also integral to medical and pharmaceutical packaging, keeping lifesaving drugs and devices sterile. The Sterilization Packaging Manufacturers Council (SPMC) focuses on the development of test methods and guidance documents for the flexible packaging medical devices sector.

Flexible Packaging Innovations Are Key to Circularity^{2,3}

Light Weighting

New polymer technologies have improved material toughness/puncture resistance, product protection, and equipment handling — with less and less material — reducing overall virgin input and packaging weight.

Readily Recyclable

Development of high barrier mono-material and all polyethylene structures that are recyclable through store-drop off programs and readily recyclable with modern technologies.

Recycled Content

Incorporation of post-industrial recycled content to displace virgin inputs into the manufacturing process. Incorporation of post-consumer recycled content to reduce virgin material consumption and waste to landfill or incineration. This can be paper, aluminum, or plastic. A variety of finished products can be made from post-consumer content, including new packaging.

Bio-based Plastics

Use of bio-based plastics, fully or partially made from renewable resources such as corn, potatoes, rice, soy, sugarcane, wheat, and vegetable oil rather than fossil fuels.

Compostable/Biodegradable Plastics

Bio-based plastics that are biodegradable in the environment. Compostable plastics break down under specific conditions through commercial or home composting systems.

Intelligent Packaging

Utilizing technology in packaging that provides information on shelf-life and freshness of the product, thereby reducing food waste and composition of the package, thereby assisting in sortation and processing in recycling systems.

Circularity Throughout the Lifecycle

Innovation in flexible packaging provides additional circularity advantages throughout the packaging lifecycle, such as lower greenhouse gas emissions, reduced energy and water usage, and less waste overall when disposed or recycled, including food waste.

Sustainability

Sustainability means examining the full life cycle of a package, and not just recyclability. **Flexible packaging is second only to nature's original packaging as it uses the least amount of packaging for the job. Thus, it is the optimum environmental choice because it uses fewer resources, generates fewer emissions, and creates *less waste in the first place*®.**



- Flexible packaging starts with using fewer resources and packages the most product in the least amount of packaging possible, decreasing energy use in manufacturing and transportation, and GHG emissions.³
- Producing a flexible food service pouch requires 75% less energy and generates just 1/10 of CO₂ emissions during production than a metal can for the equivalent amount of product.³
- 1.5 pounds of flexible packaging will package the same amount of beverage or liquid foods as 50 pounds of glass.³
- To transport packaging for an equal amount of product, it takes more than 26 truck loads of empty glass jars versus one truck load of empty flexible pouches.⁹

Viable Circularity Solutions

There is no single solution that can be applied to all communities when it comes to the best way to collect, sort, and process flexible packaging waste. Viability will be influenced by existing equipment and infrastructure, material collection methods and rates, volume and mix, and the relative location of the processor and demand for recovered material.

- Single material flexible packaging (about half of flexible packaging waste) can be mechanically recycled, currently using store drop-off programs.⁸
- Developing circularity options for multi-material packaging is a work in progress. FPA is an active partner in Materials Recovery for the Future, a collaborative project that established mechanical recycling technology for flexible packaging. It has been commercialized at the TotalRecycle material recovery facility located in Birdsboro, PA as an example for other municipal solid waste (MSW) facilities to follow. FPA is also a founding member of the Consortium for Waste to Syngas Circularity, a project managed by the University of Florida. Regenerative gasification is an advanced recycling technology capable of accepting virtually everything within MSW facilities systems and converting it to Syngas. Syngas can then be converted to methanol and back into new plastics, packaging, and products.
- The U.S. recycling system must be modernized. FPA supports policies such as extended producer responsibility schemes that create onramps for collection and recycling of all flexible packaging. The current lack of infrastructure and markets should not impede the inclusion of flexible packaging in these schemes and flexible packaging should not be banned based on lack of current infrastructure for circularity. Instead, these schemes should provide sustainable funding, including funding for R&D and investment in advanced recycling infrastructure and sustainable end markets for flexible packaging.



Customizing to Meet Product Protection Specifications

Not all flexible packaging is the same. Different products require different types of protection. Some flexible packaging is made from a single material; however, in some cases, multiple materials are required to provide the appropriate barrier and sterility. In multi-material packaging, each layer performs a different function in protecting and preserving the product.

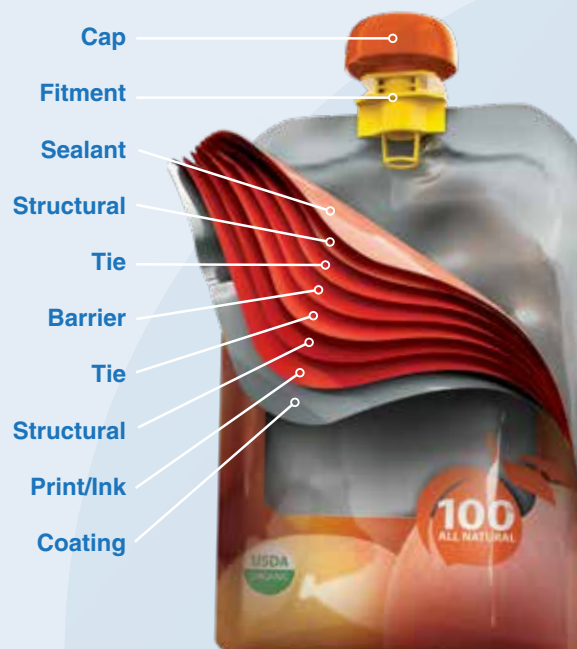
By using materials with properties geared toward specific performance, manufacturers can meet their customers' varying needs, including product protection, contamination prevention, extended freshness and shelf-life, puncture, tear and burst resistance, stretch, and seal strength.



Flexible packaging materials are customized to meet product protection specifications and each have specific functions to provide sterility, safety, and quality.

Customization Examples Include:

- Continual improvements in film barriers for refrigerated foods now keep protein fresh for longer periods of time.
- Intelligent sensor film can warn the consumer when meat and fish are past their freshness dates, helping to reduce food-related illness.
- Flexible retort pouch materials extend shelf life, reduce shipping costs, and improve food quality, which reduces food waste.
- Smart flexible packaging enables consumers to authenticate products to combat counterfeiting and provides extensive product information.
- Innovative films scavenge food odors and prevent leaks.
- QR codes and RFID technology printed on flexible packages provide product and traceability information.
- Medication and medical devices can be easily and safely dispensed through sterilized, tear-open packages engineered for dosing compliance.
- By protecting products, particularly through e-commerce, flexible packaging reduces returned merchandise along with all associated operational and environmental costs.



The barrier layer provides impediment to odor, oxygen, light, and bacteria, which can cause spoilage.

The tie layers bond the barrier layer to the structural layers, which provide strength, puncture resistance, and other operational aspects of the package.

The sealant layer provides package functionality for fitments, closures, resealability, and protects against leakage.

The print/ink and coating layers are designed for branding and product information, and contribute to the overall look and feel of the final package.

Pouch design courtesy of Dow Packaging & Specialty Plastics

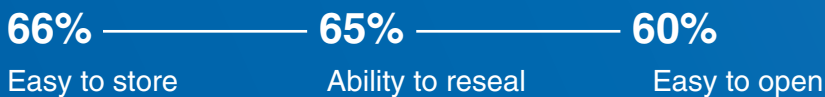
Convenience Features and Enhancements

Flexible packaging is designed to address a variety of product and lifestyle considerations and includes numerous convenience features.

- Customized fitments facilitate easy-pour spouts
- Easy open and close seals/zippers are convenient for product dispensing and portion control
- Valves and microscopic perforations enable microwave-ready (heat-n-eat) meals and bagged salads
- Handles provide easy product transport

Consumers Value the Convenience of Flexible Packaging

The top three packaging attributes as rated by consumers:⁷



70% of parents with children under 18 in their households are willing to spend more for products that are easy to store.⁷



The Rest of the Story

For more of the flexible packaging story, visit www.flexpack.org

Sources

1. Flexible Packaging Association. (2022). *State of the U.S. Flexible Packaging Industry Report, 2022*.
2. PTIS, LLC & Priority Metrics Group, LLC. (2020). *A Flexible Packaging Path to a Circular Economy: Flexible Packaging Sustainability Roadmap*. Report prepared for the Flexible Packaging Association.
3. Bukowski, T., Richmond, M. PhD. of PTIS, LLC. (2018) *A Holistic View of the Role of Flexible Packaging in a Sustainable World*. Report prepared for the Flexible Packaging Association.
4. Gunders, D. (2017). *Wasted: How America is Losing Up to 40 Percent of its Food from Farm to Fork to Landfill*. Report prepared for the National Resources Defense Council.
5. McEwen Associates. (2014). *The Value of Flexible Packaging in Extending Shelf Life and Reducing Food Waste*. Report prepared for the Flexible Packaging Association.
6. Tullo, A. H. (October 2016). *The Cost of Plastic Packaging*. Chemical & Engineering News, volume 94, issue 41.
7. G&S Business Communications. (2016). *Brand Value Study*. Report prepared for the Flexible Packaging Association.
8. To find a flexible packaging recycling program near you, visit perfectpackaging.org and plasticfilmrecycling.org.
9. Bukowski, T., Dingee, M. of PTIS, LLC. (2021). *Sustainability Life Cycle and Economic Impacts of Flexible Packaging in E-commerce*. Report prepared for the Flexible Packaging Association.

Reducing Food Waste

The Natural Resources Defense Council shows that **up to 40% of food in the U.S. is wasted.**⁴

Food waste is a key contributor to greenhouse gas emissions impacting climate change. Flexible packaging helps reduce this waste.⁵



The shelf life of **cucumbers** is extended from three days to 14 days when wrapped in polyethylene shrink wrap.



Bananas last 36 days in perforated polyethylene bags versus five days unpackaged.



The shelf life of **beef** is extended from four days to up to 30 days when vacuum packed in oxygen barrier film.



Food waste is reduced from 11.0% to 0.8% when **bread** is packaged in biaxially oriented polypropylene film.



Packaging **grapes** in perforated bags leads to a 20% reduction in in-store waste.