

Flexible Packaging U.S. Market Profile & Segmentation Report

By PTIS, LLC

Prepared for the Flexible Packaging Association
185 Admiral Cochrane Drive, Suite 105, Annapolis MD 21401

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Executive Summary

The objective of this report is to provide the Flexible Packaging Association (FPA) and its members with a profile of the U.S. flexible packaging market size (volumes and revenue) and composition by material for various flexible packaging categories including bags, wrappers, stand-up pouches, retort pouches, lidding, shrink sleeves and labels, shrink wrap, stretch films, retail carry bags, storage and trash bags, and medical packaging.

This market profile of flexible packaging formats in the U.S. by volume, revenue, and substrates was developed by PTIS, LLC. The report's primary authors are Dave Benzschawel and Danny Beard, who have more than 75 years of combined experience in flexible packaging. PTIS is a respected consulting agency in the U.S. with numerous leaders and consultants with specific areas of expertise in all facets of packaging.

The *Plastics Industry Association* (PLASTICS)¹ indicated that growth for all plastics in the U.S. was at a compound rate of 2.1% from 2012 to 2019. The dollar/tonnage volumes may be slightly different in the packaging industry because of the mix of products and the absolute size of the U.S. flexible packaging market. The report findings indicate that the flexible packaging market has been growing faster than the plastic markets' total growth.

The methodology for compiling the profile came from several different sources. These included industry experts, publications, and some industry analytics. While market studies were used for reference, most information came from people within the industry that know the market segments. Future projections are based on growth estimates for end-use markets, current industry dynamics, and some of the known effects of the COVID-19 pandemic. For instance, huge spikes in e-commerce, home deliveries, and in-home prepared foods occurred in 2020. Note that this report covers the year 2019 (pre-pandemic).

The report estimates the size of the U.S. flexible packaging market as 25.25 billion lbs. worth \$34.8 billion in USD for the year 2020. In aggregate, the value of the U.S. flexible packaging market grew at a compound (2012-2019) annual growth rate of 3.4%. Segments currently enjoying high growth rates are stand-up pouches, flow wraps, and single-serve packages (such as ready-to-eat fruits, yogurt, and Ready to Eat (RTE) tray meals). The advantages these segments demonstrate over alternative packaging formats is that they provide opportunities for flexible packaging users, including:

¹ Plastic Industry Association Summary 2020 (Executive Summary)

- Excellent retail display (multi-color graphics and total billboard area)
- Good shelf- life (hermetic seals impermeable to environmental elements, like odors)
- Processing and packaging efficiencies (less packaging volume to store and process from rollstock)
- Enhanced safety (tamper evidence)

The conversion of rigid packaging formats to flexible packaging continues in some segments (e.g., from cans to pouches, folding cartons with liners to stand-up pouches and coextruded bags, etc.). Additionally, there have been developments to reduce the thickness of materials and to make flexible structures. Food processing technologies will continue to drive flexible packaging opportunities into structures that provide the optimal shelf-life for each given product.

Programs both to *recover* used flexible packaging and to *recycle* it back to appropriate uses continue to grow to provide enhanced recyclability and compostability. The American Chemistry Council commissioned an annual survey of plastic bags and film recycling. The latest report indicates that 3.96 billion pounds of plastic bag and film material were recovered in 2018.² Most of this was from commercial sources, including stretch film, PET containers, and other polyethylene materials.

“Plastic lumber” continues to use a high percentage of recovered retail bags (more than 50% of all the recovered films and bags), while one-fifth is returned to film, and sheet uses. Additional uses of this plastic include garden products, crates, buckets, pallets, piping, building products, and other miscellaneous applications. There are differing opinions on whether use in plastic lumber and other products is truly recycling. However, the industry believes this is part of the circular economy as these are useful products with an extended life cycle and in general, are excellent uses for recovered plastics, providing a resource input from recovered flexible packaging into another product and reducing dependence on virgin materials.

In the big picture, recycled content in flexible packaging is quite minimal today when compared with overall resin consumption. Product contact, whether it be food or medical, continues to be a concern that slows the inclusion of recycled content going back into flexible packaging. Recycled resin that can be controlled, such as manufacturing regrind is being accepted as industrial recycling for some applications. A continuing driver in the past 5 years has been to reduce gauge (light-weighting) while maintaining the barrier properties at the lower gauges. In some cases, the shelf life “use by” dates have gotten shorter to correspond to the reduced barrier, but better recyclability provided by all-polyethylene-based structures is the trade-off.

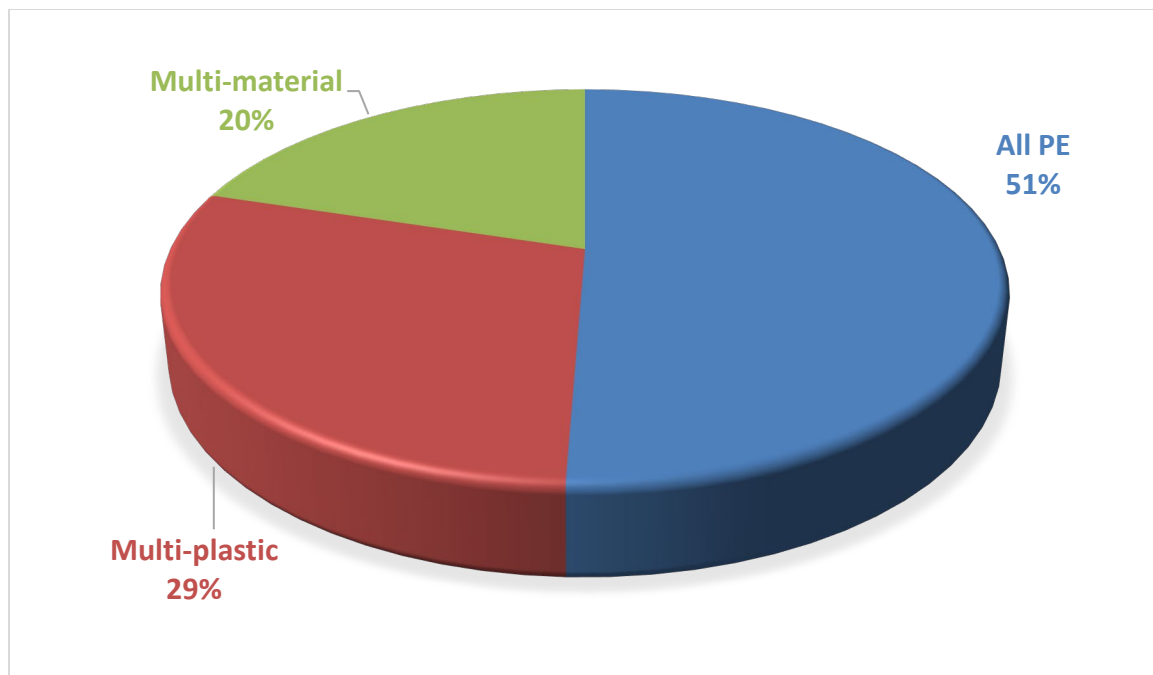
² 2021 EPA US Website on facts/figures about Materials, Waste and Recycling citing the American Chemistry Council report

For this report, the different package format categories are broken into 3 distinct material subsections, which are reflected throughout the report:

- 1) *All-polyethylene (PE) based films* (which may qualify for recycling through store drop-off programs or other mechanical recycling programs). Examples of these would include bread bags, overwraps for paper products, and cereal liners.
- 2) *Multi-plastic based films* – these consist of multiple types of plastics coextruded or laminated together for a structure. Examples in this category include most stand-up pouches and lay flat bags used in confectionery products.
- 3) *Multi-material films* – these often consist of plastic, along with other materials such as foil, paper, PET, etc. These materials are laminated together. Examples include paper/plastic chip bags, lidding for apple sauce or yogurt cups, and multi-wall bags (paper and plastic)

Figure 1 below, shows a high-level breakdown of the different categories. One important consideration is that the all-PE section formats likely qualify for store drop-off programs to enable recycling through mechanical recycling.

Figure 1. Composition of U.S. Flexible Packaging Industry by Material Family (2019)



Figures 2 and 3 breaks down the overall usage across the material types by package format in both estimated annual volumes for both resin usage (pounds) as well as sales (U.S. dollars).

Figure 2. Package Format (by Annual Pounds of Resin)

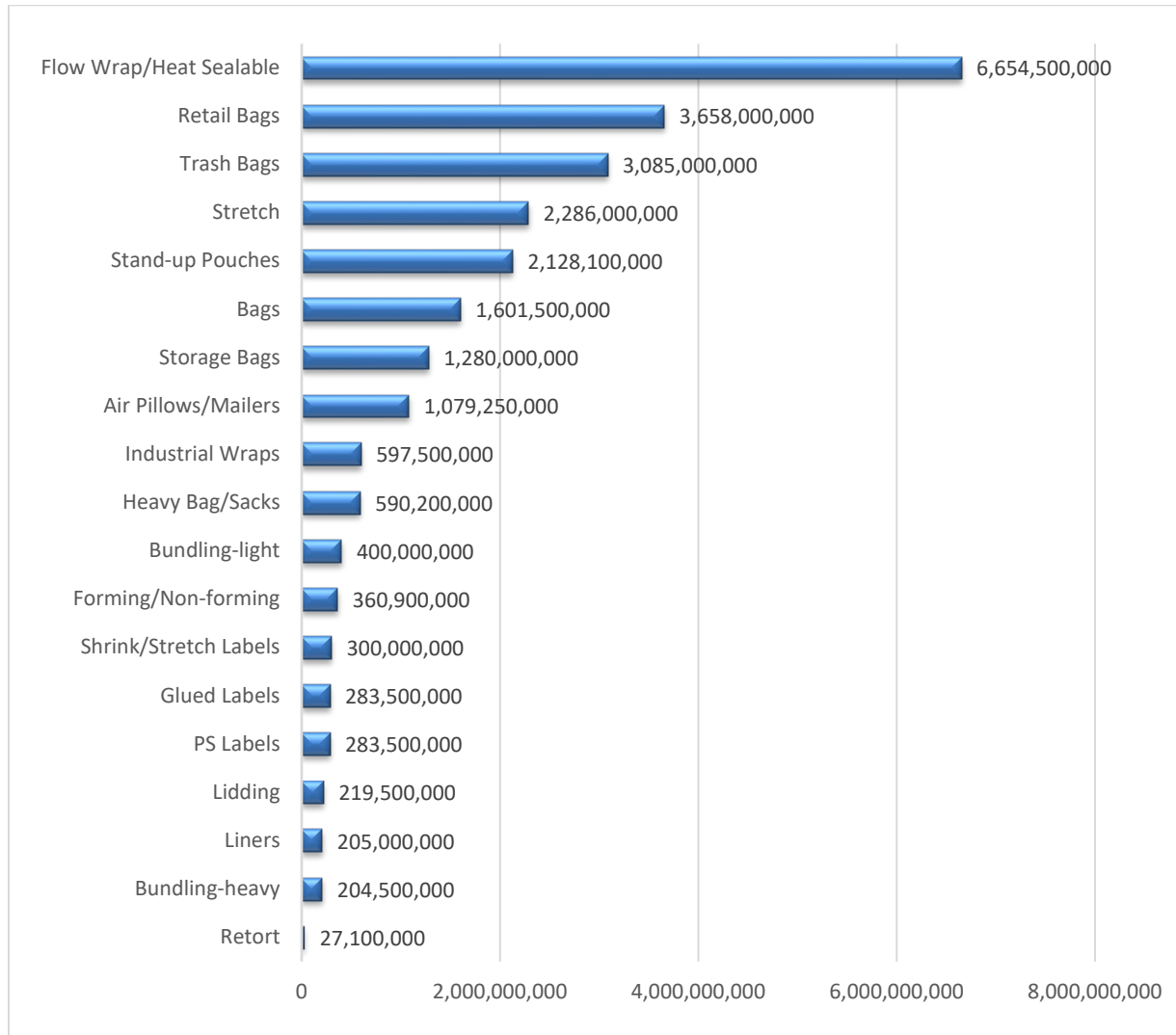
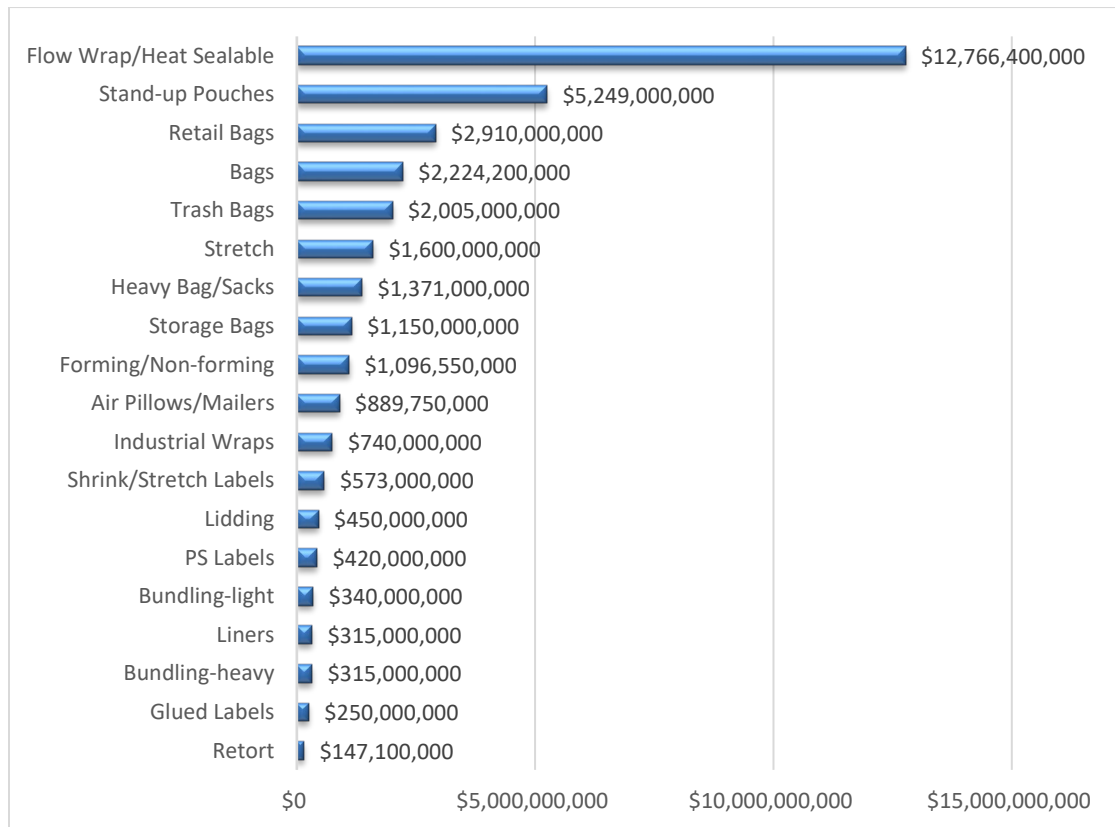


Figure 3. Package Format (by Estimated Annual Sales – USD)



Overview

The flexible packaging industry continues to develop flexible packages that are sustainable and safe for the environment. The FPA has taken a leadership position to research the lifecycle impact of flexible packaging and provide education on its uses, benefits, and end-of-life collection and repurposing. Thinner, faster, simpler are all common terms buyers use when procuring packaging materials. Manufacturers as a result are always trying to find a better way to make packaging less expensive and more effective while retaining other critical physical attributes (e.g., barrier properties, environmental impact, product safety).

Overall, the U.S. flexible packaging industry has experienced steady growth over the past decade, with a few notable exceptions. While global manufacturing capacity has continued to expand in China and India, the overall sales of U.S. produced materials remain strong. Industry consolidation has continued to create larger companies with more assets while adding limited capacity as these companies join forces to integrate their businesses.

Some key points related to the U.S. industry:

- The industry is growing at a stable rate. Most areas are growing by 2-5% annually, with other areas such as trash bags and storage bags being relatively flat.
- Stand-up pouches continue to make inroads due to the improved production rates of converting equipment and the reduced price of zippering.
- The phrase “Reduce, Reuse, and Recycle” continues to be the mantra for all packaging. This also provides measures for companies for cost-cutting and material savings.
- The product mix continues to change with market dynamics such as convenience foods in “work from home” situations. The numbers for 2020 are expected to reflect this.
- A general desire to simplify structures (for recycling) is being offset by the need to cut costs by reducing gauge which often creates more complex coextruded films. The ideal scenario would be changing to simpler, recyclable structures while also reducing gauge. (Reference Plastics News, April 2021)
- Increased growth of flexibles is also coming from new start-ups due to the lower cost of entry of flexible packaging solutions.
- Importing films has become much more challenging due to erratic port situations, higher tariffs, and long lead times.

All sections also have the estimated annual volume and dollar value, along with several examples for each product category. For additional details and definitions of each of the subsections, please see Table 1 in the appendix on page 35.

1. Bags, Single Film, and Coextruded Films

This segment includes a variety of product formats that include some premade bags, rollstock, and tube stock. They are often filled in a vertical form/fill/seal process. General use of these bags is for either holding multiple items (sliced bread, cookies, etc.) or bagged products as described below.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Bags	Single Film Bags (PE)	Bread bags, produce, dry cleaner bags, diapers, frozen vegetable bags.	204,500,000	\$225,000,000
	Coex Film Bags (PE)	Cereal, diapers, personal care, frozen food, vegetables, bulk food items.	450,000,000	\$675,000,000
	Medical Bags (PE)	Bulk bags for sterilization, biohazard bags, case liners, hand loaded bags (sterile and non-sterile).	265,000,000	\$649,200,000
	Medical Bags (Multi-plastic)	Medical devices and kits, general hospital waste, box liners, sterilization liners.	625,000,000	\$675,000,000
	Sterile and Non-Sterile Bags (Multi-material)	Packaging composed of film and Tyvek® or paper containing medical fitments/sets, medical kit wraps, medical gowns, caps, gloves.	57,000,000	\$225,500,000
	TOTAL		1,601,500,000	\$2,224,200,000

Opportunities:

Flexible bags for consumer and food products use less material than competing formats such as folding cartons or stand-up pouches. They are very efficient and lower cost for a given amount of product.

While in essence, all PE-based films and bags can be collected and recycled, the main collection point for them currently is through store drop-off programs, such as the Wrap Recycling Action Program (W.R.A.P. – www.plasticfilmrecycling.org) and Bag2Bag program (https://novolex.com/assets/content/H_BI_0125_0217_Bag2BagBifold.pdf), and through certification programs like the How2Recycle label for store drop-off.



Multi-layer materials make recycling more challenging for flexible packaging because they require additional consumer education to identify and properly deposit packaging of this type. This is a reason why more brand owners are using the How2Recycle label communication scheme to alert consumers that all-PE packaging may be recycled at store drop-off points.

2. Heavy Duty Shipping Sacks

This area has two primary packaging formats: PE-based films for large bags/sacks and multi-material bags/sacks for a variety of food, pet, and industrial products.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Bags/Sacks	Heavy Duty Shipping Sacks (PE)	FIBC liner, mulch bags, potting soil bags.	143,200,000	\$141,000,000
	Multiwall Bags (Multi-material)	Pet food bag, cement, agricultural chemicals, resins, dry ingredients.	447,000,000	\$1,230,000,000
	TOTAL		590,200,000	\$1,371,000,000

Opportunities:

The main opportunity areas for heavy duty shipping sacks are through technological advances to improve physical properties such as puncture, tear resistance, and grease/oil resistance. Driving cost out of these large bags is always top of mind for purchasing personnel. Down gauging and simplification of the structures provide methods to further reduce cost.

Further enhancements include making the format recyclable. There are several challenges in this regard because of the structures that are used and the contents that are packaged. Moist products could contaminate a potentially recyclable bag/sack, however dry goods such as powders or pet foods may offer better opportunities for recycling. Opportunities to recycle multi-material bags are limited with the current collection and recycling infrastructure.

While paper is seen by the consumer as a renewable resource, the amount of energy needed to make paper using equipment to harvest and transport wood fiber, then make the paper (using high amounts of water), dry paper (using high amounts of heat) then coat or laminate the paper, often ends up using more energy (and hence carbon impact) compared with plastic films. And, in some cases, these types of paper packages also have limited opportunities for recycling given the current infrastructure.

Finally, the use of biobased resins would be advantageous over time assuming cost parity. Down the road, advanced recycling could provide a new path for flexible packaging recovery if the advanced recycling technologies become cost-effective.

3. Flow Wrap and Heat Sealable Film

This segment includes films that form a tube or pocket with an end seal and longitudinal seal. It is then filled with the product and a final end seal is made to enclose the product. Depending on the product used in this format there may be modified atmospheres containing nitrogen and/or carbon dioxide to provide enhanced performance and increased shelf life.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Heat Seal Films	Thin Gauge Film (PE)	LLDPE – Produce, cheese, meat, pre-cut fruit.	200,000,000	\$180,000,000
Form/Fill/Seal (FFS)	Horizontal and Vertical FFS – Single-serve up to Family Size (PE)	Snacks, cereals, bread, salad mixes, confectionary, sugar, dry mixes, frozen foods, etc.	204,500,000	\$260,000,000
	Horizontal and Vertical FFS – Single-serve up to Family Size (Multi-plastic)	Cookies/crackers/cereals, snacks, bread, salad mixes, confectionary, sugar, dry mixes, frozen foods, coffee, pet food, treats, etc.	4,307,000,000	\$8,400,000,000
	Horizontal and Vertical FFS – Single-serve up to Family Size (Multi-material)	Snacks/cookies/crackers, cereals, bread, confectionary, dry mixes, coffee, pet food/treats, etc.	1,865,000,000	\$3,450,000,000
	Laminated Films and Flow Wraps (Multi-material)	Pills, tablets, medications and other pharma products requiring barrier properties.	78,000,000	\$476,400,000
	TOTAL		6,654,500,000	\$12,766,400,000

Opportunities:

The main areas of opportunity here are recyclability, elimination of unlike materials, and simple coextruded structures.

Consumer convenience for tray packed cookies and other products packed in rows are often in flow wrap with the introduction of easy-open and reseal features. This makes dispensing the product very simple while also creating a reseal that prevents contamination and spoilage. Consumers love the convenience of easy-open and reclosable packages.

4. Stand-up Pouches with and without Fitments

This rapidly growing segment consists of many types of pouches that have various gussets or panels that allow the packaging to be a free-standing package or to be easily placed on pegs.

Fitments and zippers add another level of convenience creating a dispensing package that consumers love.

Materials for stand-up pouches are very similar to those used for lay-flat pouches.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Pouches	Stand-up Pouches with and w/o Fitments (PE)	Snacks/crackers, cereals, confectionary, condiments, dry mix pouches, frozen foods, coffee, sauces, frosting, etc.	116,600,000	\$177,000,000
	Stand-up Pouches – Food (Multi-plastic)	Snacks/cookies/crackers, cereals, confectionary, condiments, drink pouches, frozen foods, coffee, etc.	736,000,000	\$2,025,000,000
	Stand-up Pouches – Non-food (Multi-plastic)	Dry and liquid soaps, personal care, laundry/household products, cleaning chemicals, automotive fluids, etc.	471,000,000	\$1,060,000,000

Stand-up Pouches w/ Fitments (Multi-plastic)	Baby food, applesauce, sour cream/yogurt, condiments, drinks, powders, confectionary, personal care, household products, etc.	40,000,000	\$74,000,000
Stand-up Pouches w/wo Fitments – Food (Multi-material)	Baby food, applesauce, sour cream/yogurt, condiments, drinks, powders, confectionary, personal care, household products, etc.	244,000,000	\$685,000,000
Stand-up Pouches – Non-food (Multi-material)	Dry and liquid soaps, personal care, laundry/household products, cleaning chemicals, automotive fluids, refill pouches, etc.	510,000,000	\$1,150,000,000
Medical Pouches (Multi-material)	Syringes, fitments, tubing sets, blood management, sutures, gauze medical instruments.	10,500,000	\$78,000,000
TOTAL		2,128,100,000	\$5,249,000,000

Opportunities:

Pouch structures used to tend toward thick and stiff laminations. However, thinner materials have successfully been used such as CPP and OPET. This has allowed for thinner gauges and lower costs.

Many of the innovations that began in Europe such as concentrated liquids in pouches have now been slowly catching on in the U.S. As concentrates see more traction in the U.S. markets, this segment should continue to grow. Concentrates require less packaging and less storage area. “HE” (high efficiency) liquid detergents are a good example of a concentrated product. With an increased focus on sustainability and circularity, there will likely be more growth in the refillable pouch sector.

5. Retort Pouches

The retort pouch segment is one of the smaller areas but an important one related to the conditions where the product is used. These are typically high strength, high demand applications with long shelf life (2 years is typical) and the ability to heat and eat right from the package.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Retort Pouches	Retort Stand-up Pouch (Multi-plastic)	Multi-layer laminated films, formed into flat pouches, often on horizontal fill/seal equipment. Primarily stand-up and some lay-flat pouches filled with products for which thermal sterilization (retorting) is necessary to stop pathogen growth in vulnerable products.	9,300,000	\$49,000,000
	Retort Stand-up Pouch (Multi-material)	Multi-layer plastic film, foil, and/or paper laminated structures, formed into flat pouches typically filled on horizontal fill/seal equipment. Primarily stand-up and some lay-flat pouches filled with products for which thermal sterilization (retorting) is necessary to stop pathogen growth in vulnerable products.	17,800,000	\$98,100,000
TOTAL			27,100,000	\$147,100,000

Opportunities:

While the Meals Ready to Eat (MRE) military rations program has continued to be an important part of this packaging format, the refinement of the pouch components has created a new niche for many products. Advancement of inks and adhesives, plastic profile zippers, and transparent high barrier plastic films have created opportunities for hiking, camping, and other outdoor activities, along with the traditional use of military MREs. Additionally, high-end “wet” pet food in small servings for small animals has increased in popularity.

Simplification of the total package is probably one of the biggest potential improvements and remains a viable opportunity for this market. The elimination of foil from these packages has been a development over the past decade. This is due to the flex cracking of foil which reduced the shelf life and was a cause of leakage. The usage of high barrier transparent films, including OPET and EVOH, has allowed the replacement of foil in retort laminations. However, foil continues to provide a superior barrier when needed, despite some concerns about flex cracking. Also, the retort pouch market supply situation is changing from imports from Asia to domestic U.S. production.

Although the shelf life of foods packaged in transparent materials may be slightly less compared to foil laminations, the all-plastic alternative gives consumers the option to prepare table-ready food directly from a microwave. Flex crack reduction through the elimination of foil has been a major improvement.

Improvement in pouch filling speeds as well as the addition of fitments have made retort pouches a viable option for more than just the military. While institutional sizes do remain viable for some applications, both package and processing costs are a driver that prevents retort from overtaking other packaging formats. Additionally, aseptic filling of institutional size food packaging is a much more viable “big fill” package option.

The elimination of foil and the long-term objective to have advanced recycling options would be the “ideal world” scenario for the format. More recently, technology advancements have delivered recyclable mono-material pouches. Look for increased growth in this area to aid in providing recyclable retort structures as well.

6. Shrink and Stretch Labels

Shrink and stretch labels are used almost exclusively on round and shaped containers. The compressive force built into the label creates the “cling” needed to hold the label in place. As in other materials with shrink ability, heat releases the memory force in the film allowing it to shrink into position.

Stretch labels also have built-in memory. However, the application force is applied and released at the time of application using mechanical force rather than heat while shrink labels use heat to release the built-in memory.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Labels	Stretch/ Shrink Sleeve Labels (PE)	Stretch and shrink sleeves and labels for bottles, cups, tubes, etc.	80,000,000	\$144,000,000
	Stretch/ Shrink Sleeve Labels (Multi-plastic)	Stretch and shrink sleeves and labels for bottles, cups, tubes, etc. – PP, PETG, OPS, PVC are typical materials.	220,000,000	\$429,000,000
	TOTAL		300,000,000	\$573,000,000

Opportunities:

The graphic impact of sleeve labels can give otherwise plain rigid containers a 360-degree visual impact not accomplished by typical front and back labels. The billboard effect has given shrink and sleeve labels a major boost in the marketplace. Developments in this segment continue to improve online speeds and application techniques.

Companies have recently announced recyclable label structures, which have been part of sustainability development plans. Additional improvements include:

- Perforations for easy removal
- Structures that have linear tear properties
- Reductions in the amount of adhesive for application

7. Pressure-sensitive (PS) and In-Mold Labels (IML)

This segment includes all plastic and laminated labels made of specific components that attach to plastic containers, bags, trays, bottles, and jars. They may be printed from 1 to 10 colors depending on need and application.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Labels	Pressure-sensitive, Transfer, and In-Mold Labels (Multi-plastic)	Bottle, can, cup, lidding, cartons, stickers, etc.	187,500,000	\$300,000,000
	Pressure-sensitive and Transfer Labels (Multi-material)	Bottle, can, cup, lidding, cartons, stickers, etc.	96,000,000	\$120,000,000
	TOTAL		283,500,000	\$420,000,000

Opportunities:

Material simplification through the use of mono-material PE materials. Also, the development of adhesives that allow the removal of pressure-sensitive labels without leaving residue is an attribute that would help the package be more recyclable.

8. Glued Labels

Glued labels typically attach to rigid plastic containers, glass and plastic bottles, jars, and in rare instances, to boxes or folding cartons. In almost all instances, the labels are placed on a round symmetrical shaped bottle, can, or container. This type of label almost always involves a consistently flat surface to apply the material while allowing enough surface contact to create surface contact for the adhesive. Almost all glued labels require a rolling application method to apply the substrate.

Typical materials for these labels are paper, PP, PE, OPP, and Mylar. They may be printed from 1 to 10 colors depending on need and application. As with shrink, stretch, and PS labels, these are often the graphic billboard to catch the attention of the consumer.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Labels	Glued Labels (Multi-plastic)	Bottled and canned beverage labels, wrap around (canned foods), carton/case labels.	214,000,000	\$150,000,000
	Glued Labels (Multi-material)	Bottled and canned beverage labels, wrap around (canned foods), carton/case labels.	133,000,000	\$100,000,000
	TOTAL		283,500,000	\$250,000,000

Opportunities:

The graphic impact of glued labels is similar to PS labels and can provide great visual impact. The advantage of this category is generally cost and the ability to run hundreds of different copies on the same cutting dies and overall application equipment. An opportunity to aid in package recovery is the use of water-soluble adhesives that allow for easy label removal from a rigid package.

Being high volume and heavily commoditized, the cost is always a factor. Efficient run sizes and fast changeovers are imperative to keep pricing competitive. Material selection is important, and simplification of materials can help drive down costs.

9. Lidding

This segment includes a specific component applied to the top of various rigid containers. This includes cups, trays, bottles, and jars used in a manufacturing environment. A lower melt polymeric layer is needed to seal to a plastic, metal, or glass container.

The lidding segment is one of the segments that has grown significantly in the past decade. Multiple formats are common in this category:

- Monolayer sealable OPET film
- Foil lidding with heat seal coatings and/or laminated plastic layers
- Induction-sealed coated and laminated foil on bottles and jars
- Sterile medical device trays use various heat-seal coated top-web materials including Tyvek®, paper, and other porous materials allowing Ethylene Oxide (ETO) sterilization

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Lidding	Cup and Tray Lidding (Multi-plastic)	Apple sauce and fruit cups, yogurt cups, chip dip, cottage cheese, microwavable trays, and cups.	97,600,000	\$200,000,000
	Cup Lidding (Multi-material)	Apple sauce cups, yogurt cups, chip dip, cottage cheese.	121,900,000	\$250,000,000
	TOTAL		219,500,000	\$450,000,000

Opportunities:

Trays and cups in the single-serve category have grown substantially. The lid itself is an integral part of fiberboard trays, CPET, and other formable materials. Trays that are refrigerated or frozen can go from freezer to microwave and then be utilized as the serving container. Cups of yogurt, fruits, and snacks act as the serving container as well and are often consumed at breakfast, lunch, and mid-day snacks.

The lid acts as a cover in the microwave and needs to have easy-peel characteristics to be a useful part of the package while acting as a vent during heating.

In the ideal world, these structures will be simplified as much as possible to make them more recyclable. Fiberboard tray lidding is generally PET and is peelable through a release coating on the tray. Barrier characteristics required for sauces and puddings often contain fairly complex structures that do not currently lend themselves to easy recycling. Most of those films are multi-material structures consisting of multiple layers.

10. Shrink Bundling – Light Gauge

This segment comprises various films used to unitize products into saleable bulk packs sold in many retail environments and are especially common in club stores. The films themselves are heat set during film manufacturing and are sent through heat tunnels during manufacturing to draw the units together. The physical performance of the bundle is controlled by the film gauge, shrink percentage, and overall film strength.

Light gauge shrink bundling films range from a fractional gauge up to approximately 1.5 mils in thickness. The films are generally printed with basic graphics to allow a bar code to be applied or to block out the interior UPCs. The products themselves tend to be lighter in weight (less than 5 lbs.) and are used to prevent the consumer from breaking multi-packs apart for unit sales.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Bundling	Printed and Unprinted Overwrap - Light Gauge (PE)	Paper towel, napkins, toilet tissue. Bundle wrap/shrink.	400,000,000	\$340,000,000
	TOTAL		400,000,000	\$340,000,000

Opportunities:

Continued downgauging and the use of PE-based structures will continue to guide opportunities for lightweight bundling films along with certification from the How2Recycle labeling program for store drop-off collection.

11. Shrink Bundling – Heavy Gauge

This segment comprises various films used as product unitizers in bulk packs sold business to business or direct to consumer. These bundles tend to be heavier, bulkier, and less uniform in shape when compared to the light gauge bundle films. Again, the films are heat set during film manufacturing and the force of the film on the interior products pulls them together through the film memory released in a heat tunnel. The physical performance of the bundle is controlled by the film gauge, shrink percentage, and overall film strength.

Heavy gauge shrink bundling films are typically at least 2-3 mil in thickness but can go up to 4 to 6 mils depending on the weight of the bundled unit. For instance, cases of water are typically bundled in 3-4 mil LLDPE and/or MDPE shrink film. Shipping cases are sometimes overwrapped in HDPE film blends to protect from moisture and prevent product loss in the event of case failure.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Bundling	Shrink Bundling – Heavy Gauge (PE)	Shrink bundle around beverage multipacks (printed or clear), can in trays.	204,500,000	\$315,000,000
TOTAL			204,500,000	\$315,000,000

Opportunities:

Similar to the section on “light gauge shrink bundling,” this is a relatively developed market. Success for players in this segment requires attention to technological development for resin grades that would allow down-gauging and perhaps greater efficiency in pallet wrapping for customers. There is also an opportunity to use more recycled content in these structures, which often have lower graphic requirements.

The bundle itself acts as the display in most instances so uniform shrink and excellent graphic presentation are imperative after the film has drawn around the product.

From a manufacturing standpoint, lower cost resins and improved manufacturing effectiveness is the driver to keep costs low, while achieving certification for store drop-off labeling through How2Recycle, which may be of value to brand owners. These formats are currently facing some new entrants as a result of increased focus on reducing plastic waste. These PE based materials can be easily recycled via store drop-off locations.

12. Stretch Film

This segment comprises various films used as pallet-load unitization and are sold business to business. Nearly every product sold in the U.S. is unitized at some point using a pallet and stretch film.

Stretch films require sufficient elasticity and memory to stretch when pulled along the sides of rigid articles stacked on a pallet. There is a surprising amount of technology in stretch film due to the high elastic force required to hold large pallets of product in place. When one considers the immense variety of unitized products shipped daily, it should be no surprise that different films are required for different applications.

Additionally, this market is one of the most cost competitive of all the categories. It has huge volume but many competitors with a vast distribution network.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Stretch	Stretch Film (PE)	Stretch film around pallets. Stretch film around a tray.	2,286,000,000	\$1,600,000,000
	TOTAL		2,286,000,000	\$1,600,000,000

Opportunities:

Stretch film is an established market. The main differentiation in the segment is accomplished by increasing production efficiencies and using best-in-class resin technology to reduce costs. Successful companies in this segment have developed technological advances in resin that allow down-gauging and perhaps greater efficiency wrapping the pallets themselves with fewer or faster wraps. Speed is key in getting a pallet from the wrapper to the warehouse or truck.

Interestingly, from a recycling standpoint, stretch films may be one of the best success stories related to being recovered and recycled. Virtually all stretch film is LDPE and retailers that take in thousands of pallets of materials have found ways to either bale and sell the pallet wrap or to “munchie” the film into saleable product going back into other LDPE products. Since so much pallet wrap ends up in large distribution centers, it becomes a captive and somewhat controlled source. Extremely clean, reprocessed LLDPE materials have the potential to be added back into stretch film.

To recover stretch film, there are two main contaminants, dirt/dust and pallet labels. Many companies require labels to be attached to the pallet and not to the wrap itself to keep the pallet wrap from being contaminated with adhesive or paper fibers. This leaves the dust and dirt contamination something that can be dealt with by various cleaning methods prior to pelletizing.

13. Retail Carry Bags

In general, these are bags used for getting goods from a retail store to homes after sale. The bags help the consumers gather and contain dissimilar merchandise into a single unit that can be easily carried from store to car and car to home. Not that long ago this market was 100% paper bags. While paper bags continue to have certain advantages including the perception of “being green,” they also have poor wet strength, generally poor tear strength after an initial tear, and still require significant resources to go from forest to mill to paper to converting. Plastic carry bags, on the other hand, have additional convenience features and can be reused as well as recycled through store drop-off programs, though perhaps because of their reusability, the recovery rate is well behind paper products, which can be recycled in curbside programs.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Retail Bags	Retail Carry - Light Gauge (PE)	Plastic HDPE/LDPE bags - grocery store/carry out.	2,310,000,000	\$1,850,000,000
	Retail Carry - Paper Bags	Paper bags - grocery store/carry out.	1,348,000,000	\$1,060,000,000
	TOTAL		3,658,000,000	\$2,910,000,000

Opportunities:

Opportunities for PE-based retail carry bags include expansion of store drop-off programs, so consumers can return the bags to retailers for recycling. Additionally, the continued incorporation of post-consumer recycled (PCR) content into bags will further reduce their carbon footprint, while helping to foster a circular economy.

14. Storage Bags

This segment includes a range of item containers sold business to consumer for storage of household goods. It can range in size from a tiny zipper bag for nuts and bolts, up to huge, vented, multi-layer, barrier bags used for clothing and bedding.

These bags are used to contain and protect various items in a household. They protect contents from dirt and moisture and are very utilitarian in nature. They help to protect, transport, and store household goods used by the consumer. Millions of these bags are used daily to transport household items from one spot to another, whether it is from home to work or countertop to refrigerator and freezer.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Storage	Storage Bags (PE)	Resealable storage and freezer bags, "baggies," etc.	1,280,000,000	\$1,150,000,000
TOTAL			1,280,000,000	\$1,150,000,000

Opportunities:

The storage bag technology offers some opportunities for competitive advantages among products:

- Down gauging using stronger LDPE resins
- Improved features such as zipper and slider closures, color identifiers
- Improved reusability
- Use of biobased resins
- Consumer communication about recyclability for PE based storage bags

The improvements made in these bags has been remarkable in that they have resulted in more convenience (resealability, temperature resistant, fitment strength) and less expensive over time. From the days of the fold-over sandwich bag to a full zipper or even slider zipper, the convenience and security factor in this category has improved immensely.

15. Trash Bags

This segment includes a range of bags sold business to business as well as business to consumer for collection and disposal of discarded materials. The concept is simple; provide the strongest, most efficient bag possible at the lowest cost. Execution is another story with significant creativity needed to keep the price point low while creating a product that doesn't fail while holding 30 pounds of product and has puncture points piercing through the bag on the way to the dumpster.

Both institutional and household products are included in the category.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Trash Bags	Trash Bags (PE)	Trash bags or other bags used for trash disposal.	3,085,000,000	\$2,005,000,000
	TOTAL		3,085,000,000	\$2,005,000,000

Opportunities:

Trash bags serve to contain various wastes and other discarded items destined for disposal. Some bags mask or absorb odors from the waste as much as possible without the masking agent being offensive itself. Bag colors and printed messages may serve to identify waste where special disposal handling is required (i.e., certain medical wastes require a "biohazard" designation).

Similar to the storage bag segment, the familiar technological advances are in play here:

- Downgauging
- Consumer enhancements (easy closure, odor control, strength, durability)
- Use of PCR
- Optimized manufacturing processes and PCR utilization to reduce the carbon footprint

Each of these areas provides some degree of challenge and improvement potential. In the end, the cost will almost always win in the eyes of the consumer because almost all bags will end up buried in a landfill.

16. Air Pillows, Cushioning, and Mailers

This segment includes two primary formats (cushioned vs. non-cushioned) made with PE films. While sold business to business this business-to-consumer product helps to move massive amounts of freight primarily from online shopping.

No matter the shipping method through USPS, UPS, FedEx, etc., the products need to be protected from weather, handling, and pilferage all while protecting the product being shipped.

There are several primary packaging formats:

- Air pillows
- Bubble wrap mailers
- Standard mailers
- Void fill packaging

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Protective Packaging	Air Pillow/ Cushioning (PE)	Air cushion pillows, bubble wrap, LDPE component bags, LLDPE to HDPE Coex.	201,250,000	\$161,000,000
	PE-based Mailers (PE)	LLDPE based mailers, bubble mailers, HDPE poly mailers.	878,000,000	\$728,750,000
	TOTAL		1,079,250,000	\$889,750,000

Opportunities:

The pandemic has significantly increased this category in 2020. Although the numbers are not available at the time of this report, it is known that shipment volume increased substantially. Many of the products in this category – the PE-based structures, are not only reusable, but also recyclable through store drop-off programs.

In this category, there are several long-term goals to consider. Determine the package that creates the least amount of bulk waste for disposal and can be recycled with the lowest carbon footprint. Therefore, the goals should be:

- Lowest gauge while providing adequate strength
- High recyclability
- Most efficient during use (least amount of film per shipment)
- PCR content
- Greener packaging (e.g., bio-based resins, compostability)
- Where labels are required (ex. shipping labels), use of PE-based labels vs. paper to reduce contamination and enhance recyclability
- Provide same package return options to improve reuse and circularity

17. Bottom Forming Webs with Non-Forming Top Webs

This area continues to grow for both food and medical businesses. It is very popular for packaging that needs to be hand loaded due to non-uniform shapes, bulky products, or for multi-component loading. The package starts with relatively heavy gauge film that is heated and then formed into a cavity with vacuum and sometimes plug assist. After being formed, the product is loaded either by hand or automation depending on the complexity of the product. Once all components have been loaded, a top web is heat seal applied, the packages are then slit apart with a final cut separating the packages from each other. The top web can be pre-printed or printed in-line if only simple graphics are needed.

Finished packages may be retail ready, but in the instance of medical packaging, sterilization is frequently required to provide a sterile product for a medical procedure, whether in an operating room, doctor's office, or at home.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Forming Films	Medical – Bottom Forming Webs – Coex and Polyolefin (PE)	Tubing sets, antiseptic swabs, sterile solutions, surgical supplies.	61,000,000	\$125,050,000
	Medical Rollstock and Forming Films (Multi-plastic)	Medical devices, fitments, solutions, kit components.	204,000,000	\$571,000,000
	Food – Bottom Forming Webs (Multi-plastic)	Meat and cheese bricks/foodservice/retail, fruits/nuts, snacks, condiments.	38,900,000	\$175,000,000

Non-Food Bottom Forming Webs (Multi-material)	Medical instruments, syringes, gowns, surgical tools sutures, full medical procedure kits.	57,000,000	\$225,500,000
TOTAL		360,900,000	\$1,096,550,000

Opportunities:

This area is seeing good growth because it is found to be a great space-saving method and can offer more recyclable films while also driving out significant costs throughout packaging, distribution, and final disposal. Continued down gauging has driven out cost and improved production speeds. There will likely be a continued expansion of PE based structures, which will help to simplify the structure while replacing more expensive packaging formats.

Adequate barrier technology and improved seal integrity to reduce leakage will continue to be reviewed and improved to match product shelf-life requirements.

18. Industrial Wraps

This segment comprises various films used as large item unitizers and product protectors. These films are typically used to protect items during shipping where there is a need for scratch and abrasion resistance. These films are generally LDPE-based and are relatively simple in composition. One of the technical innovations in this category is in the application of a resin or coating that allows the film to stick to the surface of the product but not leave any residue. This is what makes these films advantageous in this application.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Wraps	Industrial Wraps (PE)	Cling wraps, protective wraps – microperf, UV-blocking films.	203,500,000	\$290,000,000
	Industrial Wraps (Multi-plastic)	Cling wraps, protective wraps - microperf, UV-blocking films.	227,000,000	\$250,000,000
	Industrial Wraps (Multi-material)	Industrial wraps, protective wraps – paper and foil laminations, Tyvek®, etc.	167,000,000	\$200,000,000
	TOTAL		597,500,000	\$740,000,000

Opportunities:

Tough films that are easily recyclable and not contaminated with adhesives or other coatings will be desired going forward. This market will continue to grow with the size of the product markets. Larger screen TVs, computer monitors, and appliances all use this technology to protect expensive items. But even small high-end items such as phones, electrical components, chips, and digital watches need the protection that these films can provide at an affordable cost.

Many of these films can be recycled through store drop-off programs.

19. Box Liners and Auto Insert Bags

This segment is mainly comprised of large bags used for shipping bulk products and are sold business to business.

These products are typically made of blown film and the bags/liners are gusseted coming out of the tower and then have heat seals and perforations applied all in line with the collapsed tube. A finished roll comes off the end of the line made to the desired specification.

Many of the finished bags are used by the end-user with a bag-in-box type application. Many of these use some sort of bulk filling. The bulk products can range from cereal, dog food, and product ingredients to drywall mud and other industrial compounds.

Category	Sub Segment	Examples	Est. Annual Volume (lbs.)	Est. Annual Value – \$USD
Liners	Box Liners (PE)	PE box liners – gaylord/drum liner. Large box liner, auto-insert.	205,000,000	\$315,000,000
	TOTAL		205,000,000	\$315,000,000

Opportunities

Opportunities for this product area will include downgauging of films where possible, improving strength, improving easy open and resealable features, and PCR utilization. Over time these structures may also use biobased resins, but due to their higher price and lack of consumer visibility, this segment is not likely to transition into new formats in the short to mid-term.

Overall Market Size and Summary

Category	Sub Segment	Definition	Examples	Est. Annual Volume (lbs.)	Est. Annual Value \$USD	CAGR* (estimated)
Polyethylene Based						
Bags	Single Film Bags (PE)	"Single film bags" are made from PE and include bread bags, diaper bags, produce bags, textile bags, frozen vegetable bags, dry cleaning bags, and other non-food bags used to collate and merchandise multiple items.	Newspaper bags, bread bags, produce bags, dry cleaner bags, frozen vegetable bags.	204,500,000	\$225,000,000	2-3%
	Coex Film Bags	Coextruded film consisting of coextruded HDPE, LLDPE, or LDPE.	Cereal film liner, multi-layer but all PE-based pouches.	450,000,000	\$675,000,000	3-4%
	Bags Retail Carry – Light Gauge	Range of item containers sold business to business and given—or sold—to retail customers for transporting goods at the time of sale – LDPE/HDPE based.	Plastic HDPE/LDPE bags – grocery store/ carry out.	2,310,000,000	\$1,850,000,000	1%
	Storage Bags	Business to consumer for improvised storage of household goods.	Ziploc® type bags, "baggies," etc.	1,280,000,000	\$1,150,000,000	2-3%
	Trash Bags	Serve to contain various wastes and discards destined for disposal. Some are designed to mask or absorb odors from the wastes to some degree.	Trash bags or other bags used for trash disposal.	3,085,000,000	\$2,005,000,000	2%

Thin Films	Heavy Duty Shipping Sacks	Single-layer and coextruded films consisting of HDPE, LLDPE, or LDPE.	FIBC liner, bag mulch, potting soil bags.	143,200,000	\$141,000,000	4%
	Thin Gauge Films (typically of LLDPE, easily heat sealable)	Sold business to consumer as well as business to business for temporary containment and protection of food products. Both Institutional and household products are included in the category.	Cucumbers, cheese, meat with or without a tray that has a wrap around it. Stretch film around a tray. Pre-cut fruit (watermelon).	200,000,000	\$180,000,000	4%
FFS	Horizontal and Vertical Form/Fill/Seal (FFS) Packages	The segment includes conventional 3- and 4- side "pillow-style" sealed pouches made from single-ply or laminated PE-only films, formed with neither side nor bottom gussets. As estimated here, the pouches are formed/filled/sealed from rollstock in integrated operations. "Pillow pouches" in this category represent bags made from one web, formed into a tube-shape; sealed edge to edge (i.e., machine direction) to preserve the tube form; and then sealed in the cross-web direction for top and bottom seals.	Snacks/cookies/crackers, cereals, bread, salad mixes, confectionary, flour/sugar/dry mixes, frozen foods, coffee, pet food/treats, etc.	204,500,000	\$260,000,000	3-4%

Pouches	Stand-up Pouches	“Stand-up pouches” incorporate gussets in either the bottom, bottom and top, or sides to provide a stand-up feature. These include both premade and form/fill/seal pouches made of all-PE single ply and laminated films.	Snacks/cookies/crackers, cereals, confectionary, condiments, dry mix pouches, frozen foods, coffee, etc.	96,600,000	\$140,000,000	3-4%
	Stand-up Pouch with Fitment	No significant volumes of PE are used in this category.	Sauces, frosting, Method refill pouches.	20,000,000	\$37,000,000	4%
Labels	Stretch/Shrink Sleeve Labels	These are labels requiring a compressive force or heat to affix them to their containers. The force is accomplished in one approach by stretching the circumference of the sleeve as it is placed over a container. With the force removed, the sleeve snaps back to hold snugly around the container. Alternately, heat is used to relieve residual stresses heat-set in the film after the sleeve is placed over the container.	Stretch and shrink sleeves and labels for bottles, cups, tubes, etc. made from PE.	80,000,000	\$144,000,000	3-4%

Bundling	Printed and Unprinted – Light Gauge	Wrap-around labels and product wrappers sold business to business. The common feature of this segment involves cutting a length of material from a roll and then automatically wrapping the cut piece around another object.	Paper towel, napkins toilet tissue. Bundle wrap/shrink.	400,000,000	\$340,000,000	3-4%
	Shrink Bundling – Heavy Gauge	Wrap-around labels and product wrappers sold business to business. The common feature of this segment involves cutting a length of material from a roll and then automatically wrapping the cut piece around another object.	Shrink bundle around beverage multipacks (printed or clear), can in trays.	204,500,000	\$315,000,000	4-5%
Stretch	Stretch Film	Used as pallet-load unitizers, sold business to business.	Stretch film around pallets. Stretch film around a tray.	2,286,000,000	\$1,600,000,000	2%

Protective Packaging	Air Pillow/ Cushioning	This is roll film often sold as flat tubing that is converted into air pillows at distribution centers. The pillows are filled with air to take up excess space in a box and provides cushioning for the product. This is supplied B2B as roll film that is formed into bubble wrap or as preformed bubble wrap. This is used as protective packaging for shipping small to large items.	Air cushion pillows, bubble wrap, LDPE component bags. Air pillows are typically MDPE or HDPE Coex. Includes film rollstock formed into bubble wrap.	201,250,000	\$161,000,000	8%	
	PE-based Mailers	Plastic-based mailers are usually made from PE-based material. Can be either poly sheet or interior lined with "bubble wrap" for product protection.	LLDPE based mailers, bubble mailers, HDPE poly mailers.	878,000,000	\$728,750,000	5-6%	
	Wraps	Industrial Wraps	A peelable film that has release characteristics from the surface to which it is applied. Leaves no residue.	Industrial wraps, cling wraps, protective wraps – micro-perf, cling, UV-blocking films.	203,500,000	\$290,000,000	2-3%
	Liners	Box Liners	Liner to keep dust out – premade liners.	PE box liners – Gaylord/drum liner. Large box liner, bulk packs.	205,000,000	\$315,000,000	2-3%

Medical Packaging	Bottom Forming Webs	Rollstock that runs on FFS machines such as Multivac, Ossid, or other similar equipment.	Coex LLDPE and Polyolefin Copolymers or Surlyn Coex. Tubing sets, antiseptic swabs, sterile solutions, surgical supplies.	61,000,000	\$125,050,000	5-6%
	Bags	Rollstock bags, liner bags, wicketed bags. Often hand loaded or bulk bags. LDPE and LLDPE.	Bulk liner bags for sterilization, case liners, hand loaded bags for non-sterile packaging.	265,000,000	\$649,200,000	3-5%
	Total for PE Category			12,778,050,000	\$11,331,000,000	4%

Multi-plastics (PE, PP, PET, etc.)		Definition	Examples	Est. Annual Volume (lbs.)	Est. Annual Value \$USD	CAGR* (estimated)
Co-ex and Laminated Films	Horizontal and Vertical FFS Packages	The segment includes conventional 3- and 4- side "pillow-style" sealed pouches made from multiple plastic laminated films, formed with neither side nor bottom gussets. As estimated here, the pouches are formed/filled/sealed from rollstock in integrated operations. "Pillow pouches" in this category represent bags made from one web, formed into a tube-shape; sealed edge to edge (i.e., machine direction) to preserve the tube form; and then sealed in the cross-web direction for top and bottom seals. These packages are most often fabricated in a form-fill-seal process. "Stand-up bags," both pre-made and vertical form/fill/seal, represent a hybrid format.	Snacks/cookies/crackers, cereals, bread, salad mixes, confectionary, flour/sugar/dry mixes, frozen foods, coffee, pet food/treats, etc.	4,307,000,000	\$8,400,000,000	2-3%

Pouches	Stand-up Pouches – Food	“Stand-up pouches” incorporate gussets in either the bottom, bottom and top, or sides to provide a stand-up feature. These include both premade and form/fill/seal pouches made of multiple plastic laminated films.	Snacks/cookies/crackers, cereals, confectionary, condiments, baby food/applesauce, drink pouches, frozen foods, coffee, etc.	736,000,000	\$2,025,000,000	4-5%
	Stand-up Pouches – Nonfood	“Stand-up pouches” incorporate gussets in either the bottom, bottom and top, or sides to provide a stand-up feature. These include both premade and form/fill/seal pouches made of multiple plastic films.	Dry and liquid soaps, personal care, laundry/household products, cleaning chemicals, automotive fluids, etc.	471,000,000	\$1,060,000,000	5%
	Retort stand-up Pouch	Multi-layer laminated films, formed into flat pouches typically filled on horizontal fill/seal equipment. Primarily stand-up and some lay-flat pouches filled with products for which thermal sterilization (retorting) is necessary to stop pathogen growth in vulnerable products.	MREs and MRE equivalents, tuna, chicken, stews, sauces, desserts, other low acid foods.	9,300,000	\$49,000,000	2%

Food Forming Films Labels	Stand-up Pouch with Fitment	Multi-layer laminated films, formed into flat pouches, typically filled on horizontal fill/seal equipment. Filled with products for which a fitment provides functionality.	Baby food, applesauce, sour cream/yogurt, condiments, drinks, powders, confectionary, personal care, household products, etc.	40,000,000	\$74,000,000	4%
	Bottom Forming Webs	Generally, coextruded films (PE, PP, nylon, EVOH, etc.) that provide formability, toughness, and barrier properties, sealed to a non-forming top web.	Meat and cheese bricks/foodservice/retail, fruits/nuts, snacks, condiments.	38,900,000	\$175,000,000	3%
	Stretch/Shrink Sleeve Labels	These are labels requiring a compressive force or heat to affix them to their containers. The force is accomplished in one approach by stretching the circumference of the sleeve as it is placed over a container. With the force removed, the sleeve snaps back to hold snugly around the container. Alternately, heat is used to relieve residual stresses heat-set in the film after the sleeve is placed over the container.	Stretch and shrink sleeves and labels for bottles, cups, tubes, etc. – PP, PETG, OPS, PVC are typical materials.	220,000,000	\$429,000,000	3-4%

Lidding	Pressure-sensitive, Transfer, and In-mold Labels	PP, PET/PETG, OPS, PP.	Bottle, can, cup, lidding, cartons, stickers, etc.	187,500,000	\$300,000,000	3%
	Glued Labels	Glued labels, wrap-around label.	Bottled and canned beverage labels, wrap around (canned foods), carton/case labels.	214,000,000	\$150,000,000	2-3%
	Cup Lidding	All plastic structures (coex and/or laminations, plus coatings) layer capable of sealing to a plastic, metal, or glass container.	Apple sauce and fruit cups, yogurt cups, chip dip, cottage cheese.	97,600,000	\$200,000,000	3-4%
Wraps	Industrial wraps	Peelable release films, house and construction material wraps, industrial wraps.	Industrial wraps, cling films, protective wrap – PVC, PE, CPP.	227,000,000	\$250,000,000	4-5%
Medical Packaging	Rollstock and forming films	PE, Nylon, and PP resins, either coex or laminates that need to be highly puncture resistant and strong.	Forming films, Pouch films.	204,000,000	\$571,000,000	4-5%
	Medical bags	High performance PE resins that need high puncture and tensile properties.	Biohazard, general hospital waste, box liners, sterilization liners.	625,000,000	\$675,000,000	2%
Total for Multi-Plastics Category				7,377,300,000	\$14,358,000,000	3%

Multi-materials (plastic, paper, alum, etc.)		Definition	Examples	Est. Annual Volume (lbs.)	Est. Annual Value \$USD	CAGR* (estimated)
Bags/Sacks	Multiwall Bags	Paper/poly/paper, paper/poly/foil/poly, Film/poly/paper/poly, film/poly/foil/poly, etc.	Pet food bag, cement, ag chemicals, resins, dry ingredients.	447,000,000	\$1,230,000,000	2-3%
	Retail Carry Paper Bags	Range of item containers sold business to business and given—or sold—to retail customers for transporting goods at the time of sale – paper-based.	Paper bags – grocery store/carry out.	1,348,000,000	\$1,060,000,000	1%

Form/Fill/ Seal (FFS)	Horizontal and Vertical FFS Packages	The segment includes conventional 3- and 4- side "pillow-style" sealed pouches made from a combination of plastic, foil, and paper laminated films, formed with neither side nor bottom gussets. As estimated here, the pouches are formed/filled/sealed from rollstock in integrated operations. "Pillow pouches" in this category represent bags made from one web, formed into a tube-shape; sealed edge to edge (i.e., machine direction) to preserve the tube form; and then sealed in the cross-web direction for top and bottom seals. These packages are most often fabricated in a form/fill/seal process.	Snacks/cookies/ crackers, cereals, bread, confectionary, flour/sugar/dry mixes, frozen foods, coffee, pet food/treats, gum, mac and cheese mix, etc.	1,865,000,000	\$3,450,000,000	3%
	Pouches	Stand-up Pouches – Food	"Stand-up pouches" incorporate gussets in either the bottom, bottom and top, or sides to provide a stand-up feature. These include both premade and form/fill/seal pouches made of a combination of plastic, foil, and paper laminated structures.	Snacks/cookies/ crackers, cereals, confectionary, condiments, baby food/applesauce, drink pouches, frozen foods, coffee, etc.	244,000,000	\$685,000,000

Labels	Stand-up Pouches – Nonfood	“Stand-up pouches” incorporate gussets in either the bottom, bottom and top, or sides to provide a stand-up feature. These include both premade and form/fill/seal pouches made of a combination of plastic, foil, and paper laminated structures.	Dry and liquid soaps, personal care, laundry/household products, cleaning chemicals, automotive fluids, etc.	510,000,000	\$1,150,000,000	4%
	Retort stand-up Pouch	Multi-layer plastic film, foil, and/or paper laminated structures, formed into flat pouches typically filled on horizontal fill/seal equipment. Primarily stand-up and some lay-flat pouches filled with products for which thermal sterilization (retorting) is necessary to stop pathogen growth in vulnerable products.	MREs and MRE equivalents, tuna, chicken, stews, sauces, desserts, other low acid foods.	17,800,000	\$98,100,000	3-4%
	Pressure-sensitive and Transfer Labels	Generally, web-fed labels not requiring secondary gluing operation. Packaging-related uses only.	Bottle, can, cup, lidding, cartons, stickers, etc.	96,000,000	\$120,000,000	3%
	Glued Labels	Glued labels, wrap around labels. Packaging-related uses only.	Bottled and canned beverage labels, wrap around (canned foods), carton/case labels.	133,000,000	\$100,000,000	2%

Lidding	Cup Lidding	Multi-layer structures made from plastic, paper, and foil, some with heat sealable coatings – capable of sealing to a plastic, metal, or glass container.	Apple sauce cups, yogurt cups, chip dip, cottage cheese.	121,900,000	\$250,000,000	4%
	Wraps	House and commercial construction material wraps, industrial wraps.	Industrial wraps, protective wraps - paper and foil laminations, Tyvek®.	167,000,000	\$200,000,000	4-5%
	Medical Packaging	Typically, this is a flat "bag" with a Tyvek® side and a film side. Almost all are peelable so that they can be opened for sterile presentation in a medical setting.	Syringes, fitments, tubing sets, blood management, sutures, gauze medical instruments.	10,500,000	\$78,000,000	3-5%
	Bottom Forming Webs	These films are heated and formed to create a pocket that is loaded with anything from syringes, medical fitments, or sterile solutions up to full medical kits used in surgery.	Medical instruments, syringes, gowns, surgical tools, sutures, full medical procedure kits.	57,000,000	\$225,500,000	8%

	Laminated Films	Laminated products for high barrier applications. These include PP, foil, PET, LLDPE, and various combinations of these.	Pills, tablets, medications and other pharma products requiring barrier properties.	78,000,000	\$476,400,000	2%
			Total for Multi-Materials Category	5,095,200,000	\$9,123,000,000	4%
			Total for All Categories	25,250,550,000	\$34,812,000,000	3.4%

***CAGR estimates** – The CAGR projections were based on discussions with industry personnel and triangulating across other sources to develop the estimates. The projections are also reflective of the anticipated changes coming into 2020. Most industry contacts have seen relatively dramatic changes in order patterns that will continue for the time being as companies determine how many people will remain off-site vs. in office.

Estimated Annual Value – based on late 2019 resin price estimates

Expectations and Looking Forward

The 2020 Coronavirus pandemic changed the packaging landscape in several areas. This will be heavily reflected in the 2020 numbers when they are reported. For instance:

- Institutional areas were hit hard because restaurants closed
- Hotel stays were scaled back significantly
- Flights dropped by 75%
- Millions of people stopped going into an office each day

On the flip side, online orders experienced significant growth and home offices blossomed, creating a demand for in-home convenience that required as little face-to-face contact as possible. As a result, institutional packaging for foodservice or hotel amenities dropped immensely. Meanwhile, convenience foods and home cooking supplies shot straight up; toilet paper and cleaning supply shortages occurred for home use; e-commerce and take-out and delivery skyrocketed; delivery services couldn't deliver fast enough; and warehouses had to change quickly from getting supplies from domestic or overseas to "wherever they could get it."

Where does this leave the U.S. for 2021 and beyond? We believe somewhere in the middle. Many employers found that workers were more productive at home and that employees want the flexibility to work from home at least part-time. This changes the future landscape where one would expect that e-commerce and home delivery of supplies will continue because this was already a growing segment. We would also hope that consumers and businesses will better recognize the value and importance of packaging going forward.

Where does this leave the flexible packaging industry?

Even before the pandemic, the annual increases in home shopping and delivery created a new economy in package shipping with void film packing, bubble wrap mailers, shipping pouches, and mailer film, in a steady growth mode. The pandemic kicked this transition into higher gear.

Many online stores have been looking to simplify packaging. Retail packaging is not needed for display purposes for online shipments – protection is the key. Therefore, retailers are looking for less obtrusive packaging that is easier to open with less waste at end of life – or better yet, reusable and recyclable structures. This trend will likely continue.

APPENDIX

List of Acronyms

AL or Al	Aluminum
BON	Biaxially Oriented Nylon
ETO	Ethylene Oxide (Sterilization)
EVOH	Ethylene Vinyl Alcohol
FPA	Flexible Packaging Association
GHG	Greenhouse Gas Emissions
HDPE	High Density Polyethylene
LCA	Life Cycle Assessment
LLDPE	Linear Low Density Polyethylene
LDPE	Low Density Polyethylene
MDPE	Medium Density PE (blend of lower and higher density materials)
MRE	Meals Ready to Eat
MRFF	Materials Recovery for the Future
MSW	Municipal Solid Waste
OPET	Oriented Polyester
OPP	Oriented Polypropylene
OPS	Oriented Polystyrene
PCR	Post-Consumer Recycled
PE	Polyethylene (including copolymers and various densities)
PTE-G	Glycol-modified polyester (shrink film)
PVC	Polyvinyl Chloride
WOPP	White Oriented Polypropylene
WRAP (UK)	Waste Resources Action Program

Process for data collection:

The following general process was used to determine resin usage by pounds and dollar value for each of the categories.

1. Reviewed government data on categories where available. (typically this information is not very reliable especially for packaging from government sources.)
2. Looked at companies/other public sources that have detailed presentation data.
3. Utilized FPA rolled up data/reports. (*State of the U.S. Flexible Packaging Industry* and Euromonitor International data)
4. Leveraged articles and other internet sources.
5. If data was not available from PTIS or FPA sources, other reports and other data sources were leveraged.
6. Used PTIS contacts in the industry. (Note: This process was largely leveraged for the report as the PTIS team contacted knowledge experts within the industry to obtain insights and data on approximate market sizes.)
 - a. PTIS team then estimated an economic price/pound based on the value-added component of each category to determine overall annual sales or resin usage.
7. Category growth and ties to economic growth or decline.
8. Supplemented with survey data from FPA members. (where available)
9. Triangulated data sources and document assumptions.

Other sources and examples used for the report/data findings include:

Sub Segment	Source	Assumptions
Stretch Film	https://brandessenceresearch.com/packaging/stretch-films-market	Global market = \$7975.9. Used 20% for U.S. market (estimate based on generic graph shown). $\$7975.9 \times .2 = \1.595B . Use \$.70/lb.
Retail Carry Bags – Light Gauge PE	https://www.arizton.com/mark-et-reports/retail-bags-market-united-states https://www.reusethisbag.com/articles/25-reasons-to-go-reusable	\$3.6 entire market * .75 (market value for plastic)= \$2.7B @ \$.80/lb.
Storage Bags	https://www.mordorintelligence.com/industry-reports/trash-bags-market	Price = \$.90/lb.
Trash Bags	Dollar volume - https://www.businesswire.com/news/home/20210316005495/en/Global-Trash-Bags-Industry-2020-to-2027---Market-Trajectory-Analytics---ResearchAndMarkets.com	Winsight Grocery Business – Garbage bag + \$.65/lb.
PE-based Mailers	Market size obtained from FPA member company	Market size obtained from FPA member company



The Flexible Packaging Association (FPA) is the voice of the U.S. manufacturers of flexible packaging and their suppliers. The association's mission is connecting, advancing, and leading the flexible packaging industry. Flexible packaging represents over \$34 billion in annual sales in the U.S. and is the second largest and one of the fastest growing segments of the packaging industry. Flexible packaging is produced from paper, plastic, film, aluminum foil, or any combination of those materials, and includes bags, pouches, labels, liners, wraps, rollstock, and other flexible products.

www.flexpack.org



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