

CHAPTER 2

FOOD PACKAGING

INTRODUCTION

Products discussed in the food packaging chapter include consumer food containers, institutional food containers and food service items. A wide variety of food products are packaged in injection molded consumer food containers. Packaged products in these containers include: ice cream, margarine, yogurt, cottage cheese and various other consumer food products. Additionally, berry produce baskets and bone covers used by meat packaging companies may be included in this chapter.

Institutional food service containers and food service items are utilized by restaurants, hotels, cafeterias, hospitals, schools, airlines, correctional facilities and other institutions which serve food. Injection molded food service products discussed in this chapter include: beverage stirrers, cake/pastry display covers and trays, cocktail arrows and swords, compartmented trays, condiment dispensers, display and serving pans, dishwasher racks, food baskets, food service trays, food storage containers, funnels, high-heat/ovenable pans, ice cream and meat spades, insulated pan carriers, large institutional food packaging containers, measuring cups, measured liquor pourers/jiggers, napkin, straw and toothpick dispensers, picks, pitchers, plate covers, scoops, single-serve food containers, steak markers, table bussing boxes, utensils, vending machine trays and display covers, and warming trays.

For information on pails used to package and ship institutional foods, please see Chapter 6-Pails. Lids and closures for pails and food packaging containers are discussed in Chapter 3-Lids, Caps, Closures, Overcaps & Dispensers. Information on cases, crates, totes, pallets and trays used in food processing facilities can be found in Chapter 5-Material Handling Products. Reusable cups, plates and bowls; consumer kitchen items, and houseware items are discussed in Chapter 16-Housewares. Disposable forks, plates, bowls, cups, souvenir cups, and stadium cups are included in Chapter 12-Disposable Cutlery, Bowls, Cups & Plates. Finally, injection molded parts for machinery used in institutional kitchens and food processing plants are included in Chapter 21-Miscellaneous Industrial/Commercial Components.

This chapter will analyze the North American injection molded food packaging market. This chapter will provide a market analysis and factors affecting the market, discussions of injection molding and resin technology, provide a value-in-use analysis, as well as forecasts of resin use and consumption for 2020 and 2023.

MARKET ANALYSIS

Market Size

The profiled North American producers of injection molded food packaging processed approximately [REDACTED] for this market in 2020. Those participants are projected to increase at an average annual growth rate (AAGR) of [REDACTED]% over the next three years, increasing resin consumption to [REDACTED] lbs. by the year 2023.

North America is estimated to be the largest market globally for rigid food packaging, owing to increasing consumer demand for packaged food offering nutritional value and convenience.

Market and Product Specifications

Impact strength, rigidity, top load strength, and environmental stress crack resistance (ESCR) are required for food packaging and containers. Injection molded food packaging containers are typically resealable, which is very important for foods such as condiments, relishes, syrups and dessert toppings, which are used over extended periods of time.

Food contact grade resins are used for a majority of products in this market and are regulated on the basis of migration, permeation and ultraviolet (UV) light protection. Migration is the movement of materials from the plastic container into the food, such as additives, polymer fractions, and processing aids. Permeation is the process by which gases, aromas, and moisture physically pass through plastic packaging. Aroma and moisture are lost from food products to the surrounding atmosphere with internal to external permeation, while external to internal permeation often causes product spoilage. For example, food textures can change by external to internal moisture permeation, thus promoting microorganism growth. UV light penetration can result in color and nutrient loss in food products.

Shelf appeal and brand recognition are of primary importance to food processing companies who utilize these containers. Injection molded consumer food containers range in size from 4.0 ounces to 4.0 gallons and 6.0 quarts to 176.0 quarts. Container weights vary depending on the size and type of the container. Downsizing and thin-walling of containers are common practices in the market resulting in cost reduction and source reduction to landfills.

Food service trays do vary in size as well; however, some common size trays are 11.0” x 14.0”, 12.0” x 16.0”, and 14.0” x 18.0”. A typical size school compartment tray is 10.0” x 14.5”.

Materials Competition

Injection molded consumer food containers compete directly with extrusion coated paperboard containers, metal, glass, thermoformed plastic containers, flexible packaging, and fiber produce/berry baskets. Participants claim that, where consumers can, they are turning away from plastic packaging. Some products still packaged in extrusion coated paperboard containers are ice cream and some microwavable meals. Growth of the paper and paper-based segment is driven by a bid to substitute non-biodegradable packing solutions. New technology in design, printability, and sustainability give paper packaging a competitive advantage over plastic and metal packaging solutions.

Berries and produce are often found in thermoformed containers and fiber baskets. However, the competing materials are not as sturdy as injection molded plastic containers.

Rising usage of flexible packaging such as retort pouches and films used in secondary food packaging is anticipated to have a competitive influence on the injection molded food container market. For example, sour cream and yogurt formerly packaged in an injection molded tub are now being offered in a pouch

coupled with a dispensing cap. Superior properties offered by flexible packaging, such as increased sealing capacity and high moisture barrier, are anticipated to drive the product demand.

Metal packaging is still a common use for applications such as canned food, fish, meat, and canned fruits. The stable demand for metal cans is due to its ability to extend shelf-life of food products, provide tamper-proof packing, and facilitate nutrition preservation. Growth in the metal packaging segment is expected to be driven by investments, technological advancements, and design innovations.

The glass food packaging segment is expected to grow due to its non-corrosive nature. Additionally, recyclability, non-permeability, and chemical inertness make it a suitable and safe material for direct food contact.

Participants

Mastio & Company has identified nine major participants in the injection molded food packaging market for 2020. [REDACTED]

[REDACTED] of the resin consumed by the profiled participants in the injection molded food packaging market. The remaining participants consumed [REDACTED], or 21.0% of resin for this market during 2020.

Please see Exhibit 2-1 displaying names and locations of major injection molded food packaging manufacturers. The parent company names are listed first, with the division names (where applicable) listed in parentheses. The number of locations was provided by the respondent and may or may not represent their total facilities.

Exhibit 2-1

**NAMES AND LOCATIONS OF MAJOR NORTH AMERICAN
INJECTION MOLDED FOOD PACKAGING PRODUCERS**

Company	Location	# of Plants
[REDACTED]	Omaha, Nebraska	1
[REDACTED]	Evansville, Indiana	1
[REDACTED]	Huntington Beach, California	1
[REDACTED]	DeSoto, Kansas	1
[REDACTED]	St. Damien Buckland, Quebec, Canada	1
[REDACTED]	Erie, Pennsylvania	1
[REDACTED]	Toronto, Ontario, Canada	1
[REDACTED]	Elgin, Illinois	1
[REDACTED]	Sheboygan, Wisconsin	1

Source: Mastio & Company Injection Molding Market Study

Please see Exhibit 2-2 listing names and locations of other known North American injection molded food packaging manufacturers.

Exhibit 2-2

**NAMES AND LOCATIONS OF OTHER KNOWN NORTH AMERICAN
INJECTION MOLDED FOOD PACKAGING MANUFACTURERS**

Company	Location
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Source: Mastio & Company Injection Molding Market Study

Please see Exhibit 2-3 listing the producers of injection molded food packaging with their market shares, volumes for 2020 and 2023, and the AAGR for each company.

Exhibit 2-3

**ESTIMATED RESIN CONSUMPTION, MARKET SHARE, AND AAGR
FOR INJECTION MOLDED FOOD PACKAGING BY NORTH AMERICAN PRODUCER
2020 AND 2023**

	2020		2023		2020-2023 AAGR (%)
	Consumption (MM lbs.)	Market Share (%)	Consumption (MM lbs.)	Market Share (%)	
[REDACTED]	210.0	53.9	243.1	55.0	5.0
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	5.4	1.4	5.4	1.2	0.0
[REDACTED]	4.2	1.1	4.7	1.1	4.0
[REDACTED]	2.5	0.6	2.5	0.6	0.0
GRAND TOTAL	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Mastio & Company Injection Molding Market Study

Growth Projection By Processor

The exhibit compares the processor’s company growth estimate with their overall market growth estimate. This table and the explanation for differences can be found in the electronic edition (file name: Growth Comparisons).

2020		2023		Explanation - Company & Market Growth/Decline	Explanation - Growth by Number of Units
Consumption (MM lbs.)	Market Share %	Consumption (MM lbs.)	Market Share %		

Capacity Utilization By Processor

Please see the electronic edition (file name: New Equipment, Capacity Utilization, Favorite Resin Supplier, & Additional Capacity Coming Online). An example of the table included in the electronic edition is provided below.

Processor Name/HQ Location	Operating Capacity 2020	Projected Operating Capacity 2023	Reason(s) for the Capacity Difference	How Will Additional Capacity Coming Online in Next Few Years Grow Your Business
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FACTORS AFFECTING THE MARKET

Please see the electronic edition (file name: Factors Affecting the Market), for all *Factors Affecting the Injection Molded Food Packaging Market by processor name and HQ location*. Topics discussed in the electronic edition include: key factors affecting growth or decline for the market and their company; challenges or threats the market faces (economy, imports, mergers and acquisitions, etc.); growth opportunities; environmental issues (recycling, biodegradable polymers, and government/customer shareholder pressures); changes over the last two years (big historical events or market trends); and solutions for sustainability. An example of the table included in the electronic edition is provided below.

Processor Name/HQ Location	Key Factors Affecting Market Growth/Decline	Key Factors Affecting Company Growth/Decline	Challenges or Threats Faced in the Markets Served?	Growth Opportunities in the Markets Served?	Environmental Issues Encountered?	Changes Over the Last 2 yrs. for markets served?	Solutions for Sustainability
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The food packaging market in the United States (U.S.) is predicted to grow based on an increasing urban population. A rising disposable income will also lead to additional growth in consumption of packaged food and rising popularity of single-serve packs. Additionally, factors such as convenience, improved shelf-life, improvements in the prevention of content contamination, and use of high-performance materials are expected to help food packaging growth.

Growth is up industry-wide since consumers are staying home due to the COVID-19 pandemic. Therefore, rising sales of retail products and the trend of online shopping is expected to have a positive influence over the market. The market is also supported by an increasing infrastructure for the recycling of plastics, metals, and glass. However, concerns regarding waste due to improper packaging may hamper growth.

On the opposite end of the spectrum, the food service market is also predicted be hindered since some businesses in the industry were closed due to the COVID-19 pandemic. Growth is expected to increase slowly as more restaurants, movie theaters, hotels and amusement parks re-open for business.

A challenge for some companies has been the ability to receive product in a timely manner. Food retailers are focused on ensuring local sourcing to overcome the risk of cross-regional transportation bans. Food manufacturers with facilities in other countries have begun working with local suppliers to keep product moving. Due to food packaging needed in the marketplace in a timely manner some companies that offer

the complete package for their customers including containers, lids, closures, bottles, and more are seeing a higher uptick in demand.

The food packaging categories will continue to grow and stay very robust and that is why the impacts of COVID-19 are clearly transitory. Participants feel very comfortable that the food packaging market will pursue and grow post-COVID-19. There are some packaging needs that cannot be moved away from plastic packaging to other forms of packaging.

Brand recognition, new consumer packaging, the increased demand for more post-consumer recycled (PCR) material use, manufacturing efficiency, and pricing of material are all factors that can affect the food packaging market. If these factors go well companies will grow.

The Economy

Participants in the food packaging market claim that when the economy is slow, consumers have less buying power. They cut back on outdoor activities and purchases when sales are usually high, and they tend to prepare more meals at home, thus increasing sales of food products packaged in consumer-sized containers. This has also remained true during the COVID-19 pandemic.

On the institutional side, when the economy is strong, consumers tend to increase dining in restaurants, thereby increasing demand for food containers and lids utilized by commercial food establishments. However, when these businesses were shut down for a few months during the pandemic in 2020, the institutional industry and businesses slowed tremendously. Their growth is returning to pre-pandemic levels.

Other economic factors affecting this market are the currency exchange rate between the U.S. and Canadian dollar. As the value of Canadian currency increases, relative to the U.S., importing injection molded Canadian food containers in the Northern U.S. is less feasible.

The price of resin does increase the cost of containers and items in the food packaging market, as well as other injection molded markets. Recent increasing resin prices in 2020 cut into profit margins, and as a result, many injection molding companies had to raise their prices and pass on the increase to their customers. Injection molding companies try to avoid passing on the price increases and absorb as much of the cost as possible.

Government Regulations

In the U.S., both direct and indirect food contact grade resins are regulated by the **U.S. Department of Agriculture (USDA)** and the **Food & Drug Administration (FDA)**. In Canada, food contact grade resins are approved by the **Department of Health and Welfare**. Their regulations also provide specifications regarding composition additives and properties. A material which meets these standards can then be stated as **FDA compliant** (see fda.gov). Some companies manufacture closures containing recycled content, which is purified to meet **FDA** levels and remain at a good level for functionality.

Hazard Analysis Critical Control Points (HACCP) is a systematic approach to food safety. This approach utilizes seven principles and practices for analyzing a food process and determines the hazards within that process (see nal.usda.gov/fnic/foodborne/haccp/index.shtml).

National Sanitation Foundation (NSF) is an independent testing laboratory that lists products which meet their criteria for clean ability and sanitation in the areas of food contact and splash zone. Standard 2: Food Equipment and Standard 21: Thermoplastic Refuse Containers (see nsf.org).

The **Occupational Safety and Health Administration (OSHA)** works with employers and employees to create better, safer and healthier working environments in the U.S. **OSHA** Sanitation Regulations (Standards - 29 CFR) state that any receptacle used for putrescible solid or liquid waste or refuse shall be so constructed that it does not leak and may be thoroughly cleaned and maintained in a sanitary condition. Such a receptacle shall be equipped with a solid, tight-fitting cover, unless it can be maintained in a sanitary condition without a cover (see osha.gov)

Furthermore, the **USDA** is a food and safety inspection service that regulates manufacturing, packaging, and handling practices in the agricultural food industry. **USDA** requirements for material approval are satisfied by a certification of **FDA** Compliance (see usda.gov).

Environmental Issues

There are several environmental issues affecting the food packaging market. Our society has become more environmentally conscious over the last few years. Several manufacturers are addressing the issue of source reduction by reducing the weight of their food containers while still making them sturdy enough to be reusable.

Most injection molded food containers today are also recyclable. For example, food containers made of high density polyethylene (HDPE) resin are very easy to recycle. Properties of recycled HDPE resin are not greatly affected by the small amounts of contamination from labels. This gives companies utilizing PCR some freedom in reprocessing. Cleaning and sorting techniques have also been utilized by recycling companies to maintain the high quality of this material. HDPE resin's limitation is its porous nature; acting like a sponge it absorbs aromatic chemicals.

The in-mold label (IML) container is easier to recycle. Food packaging that is made from the same material, such as polypropylene (PP) resin, means there is no need to remove a label before it goes into the recycling bin. Also, IML packages are incredibly durable and can be reused for food storage to make the most of a container's life cycle.

Through lightweighting and utilizing PCR material, partnerships are created to use and promote closed-looped systems. Producing products made from a single material, such as PP resin, is more conducive to recyclability as well. Establishing a closed-loop system allowing manufacturers to get more PCR material back into the stream is a common goal in this market.

Sustainability Issues

Sustainability has resulted in discussions around recyclability, PCR, and lightweighting. During 2020, virtually every company claimed recyclability for injection molded products. Some participants said that sustainability is a challenge for them. They feel if they don't become sustainable in the environment then it might hurt their image. Manufacturers want a solution, but their customers do not want to pay for it.

Please see Exhibit 2-4 listing North American food packaging producers along with their sustainability solutions.

Exhibit 2-4

NORTH AMERICAN FOOD PACKAGING PRODUCERS AND THEIR SUSTAINABILITY SOLUTIONS

Company	Sustainability Solution
[REDACTED]	Lids and IMLs are all made from the same material, which means no need to remove a label before it goes into the recycling bin. IML packages are incredibly durable and can be reused for food storage to make the most of a container's life cycle. Made significant efforts and partnerships designed to educate and inspire PCR efforts. Able to dramatically reduce the amount of resin used, and therefore the weight of their products. Make a product called The Again Cup [®] , which is a reusable plastic coffee cup that can replace typical disposable cups.
[REDACTED]	Involved in recycling chains. Reduced carbon footprint. Sent 100.0% of material out to be reprocessed. Used 100.0% of their scrap. Part of The Alliance to End Plastic Waste . Berry PET Power is a partner of the United Packaging Forest Initiative , which has been established to help compensate for the over 10.0 billion trees that are lost in the world each year and offset the CO ² emissions of the entire production chain. In an effort to encourage recycling and build upon their commitment to sustainability, they created an education hub on their sustainability website.
[REDACTED]	Work hard on recycling issues. Use up to 50.0% PCR recycle content in totes and will keep doing more.
[REDACTED]	Switched to LED lighting, have auto timers on all lighting, track all scrap and waste, committed to recycling, track water usage, and use PCR content. Moving to electric presses to reduce water and electricity use. The presses have an auto feature that turns off between cycles.

Company	Sustainability Solution
[REDACTED]	Taken over 60.0% of the resin out of their containers over the years equating to a 60.0% reduction in their carbon footprint. Less secondary packaging saves trees. Less CO ² and fuel emissions by maximizing pallet cube, which takes trucks off the road. All of their cups and lids are 100.0% recyclable. All corrugate is 100.0% PCR. In-process waste is reused within our facilities. Resins have always been BPA and Phthalate Free.
[REDACTED]	Became more “green” by changing lights in their plant, and shows traction of many energy efficient activities.

Source: Mastio & Company Injection Molding Market Study

Mergers and Acquisitions

A few acquisitions have occurred in the injection molded food packaging market over the past few years. In 2014, **Quantum Plastics, L.L.C.** acquired **Master Molded Products** and **River Bend Industries**. **Hospitex USA** and **Apollo Plastics** were acquired by **Quantum Plastics** in 2015, and **Transfer Solutions** and **3D Plastics** were acquired by **Quantum Plastics** in 2016. Furthermore, **Quantum Plastics** expanded into Mexico with the acquisition of **Plasticos Promex**.

INJECTION MOLDING TECHNOLOGY

Standard thermoplastic injection molding was utilized by all (100.0%) of the profiled participants in the injection molded food packaging market during 2020. High efficiency is an important reason why the standard injection molding process is preferred. The process has a high production output rate, which makes it cost-effective as well. Containers and equipment used in food packaging have diverse and complex designs. Plastic injection molding has the potential to handle highly complex parts and ensures uniformity in them for better quality.

Please see Exhibit 2-5 displaying estimated resin consumption and market share for the types of injection molding processes and constructions utilized in the food packaging market for 2020.

Exhibit 2-5

**BREAKDOWN OF RESIN CONSUMPTION FOR FOOD PACKAGING
BY INJECTION MOLDING PROCESS TYPE AND CONSTRUCTION**

	2020	
	Consumption (MM lbs.)	Market Share (%)
Thermoplastic Injection Molding Processes		
Standard Injection Molding		
Total Thermoplastic Molding		
Grand Total		

Source: Mastio & Company Injection Molding Market Study

Equipment Utilization and New Equipment Purchases

Please see the electronic edition (file name: New Equipment, Capacity Utilization, Favorite Resin Supplier, & Additional Capacity Coming Online). An example of the table included in the electronic edition is provided below.

Processor Name/ HQ Location	Description of Process Type	Plans to Purchase New Injection Molding Equipment	Brand and Equipment Type of Planned Purchases
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RESIN TECHNOLOGY

Several different types of resin are utilized by injection molded food packaging producers. The most commonly used resin types include PP-impact copolymer, medium molecular weight-HDPE (MMW-HDPE), PP-random copolymer, linear low density PE-butene (LLDPE-butene), and PP-homopolymer. HDPE resins provide good impact resistance, moisture barrier, ESCR, heat and cold resistance, and chemical resistance. PP resins provide ESCR, rigidity, moisture barrier, as well as heat and chemical resistance. However, containers constructed with PP resins are less suitable for freezer applications as they tend to have a loss of integrity at low temperatures. LLDPE resin offers low temperature flexibility, good ESCR, and good processability under a wide range of molding conditions.

Polycarbonate (PC), high molecular weight-HDPE (HMW-HDPE), LLDPE-octene, LLDPE-hexene, low density PE-homopolymer (LDPE-homopolymer), nylon, acrylonitrile-butadiene-styrene (ABS), PCR-PP, and styrene-acrylonitrile copolymer (SAN) resins are also used in this market in smaller amounts.

Furthermore, PC resins provide high impact strength, good heat resistance, low water absorption and no toxicity. ABS resin is a thermoplastic material known for its high impact resistance and toughness. SAN exhibits excellent toughness, rigidity, and dimensional stability. SAN is often used as a replacement for polystyrene (PS) because it offers greater thermal resistance.

Favorite Resin Supplier

Please see the electronic edition (file name: New Equipment, Capacity Utilization, Favorite Resin Supplier, & Additional Capacity Coming Online), which contains the respondents’ favorite resin supplier and their reasons why. An example of the table included in the electronic edition is provided below.

Processor Name/ HQ Location	Favorite Resin Supplier	Resin Types	Explanation for Being Favorite Resin Supplier
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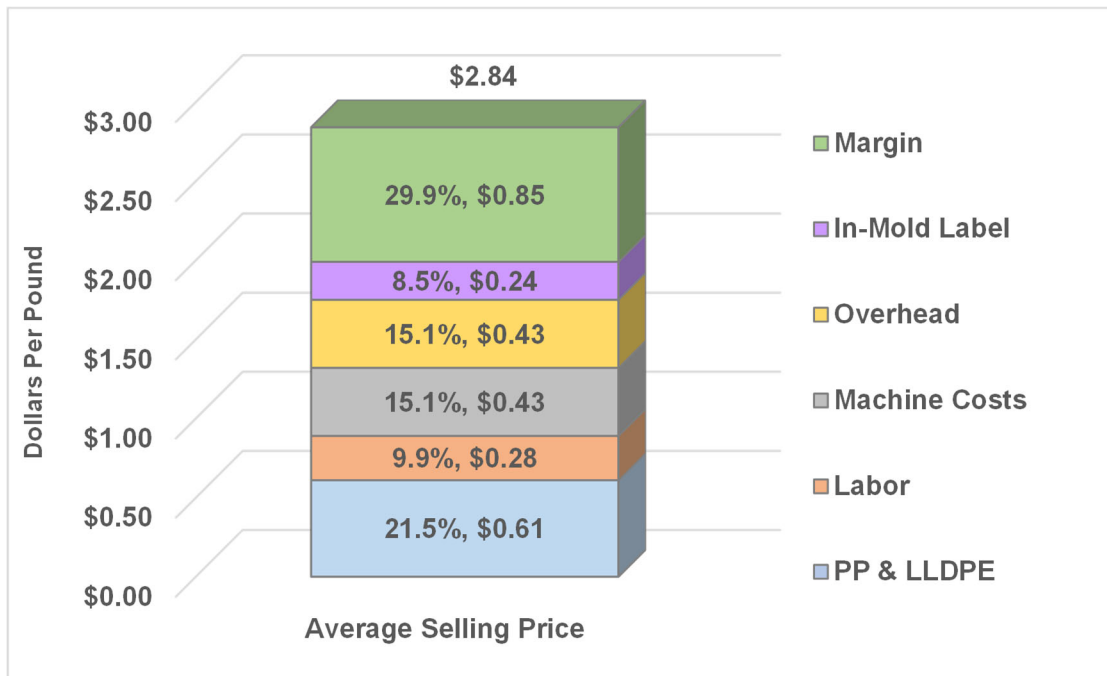
VALUE-IN-USE

For the first value-in-use analysis, [REDACTED]

Please see Exhibit 2-6 illustrating the value-in-use analysis for a [REDACTED]

Exhibit 2-6

VALUE-IN-USE ANALYSIS FOR [REDACTED]



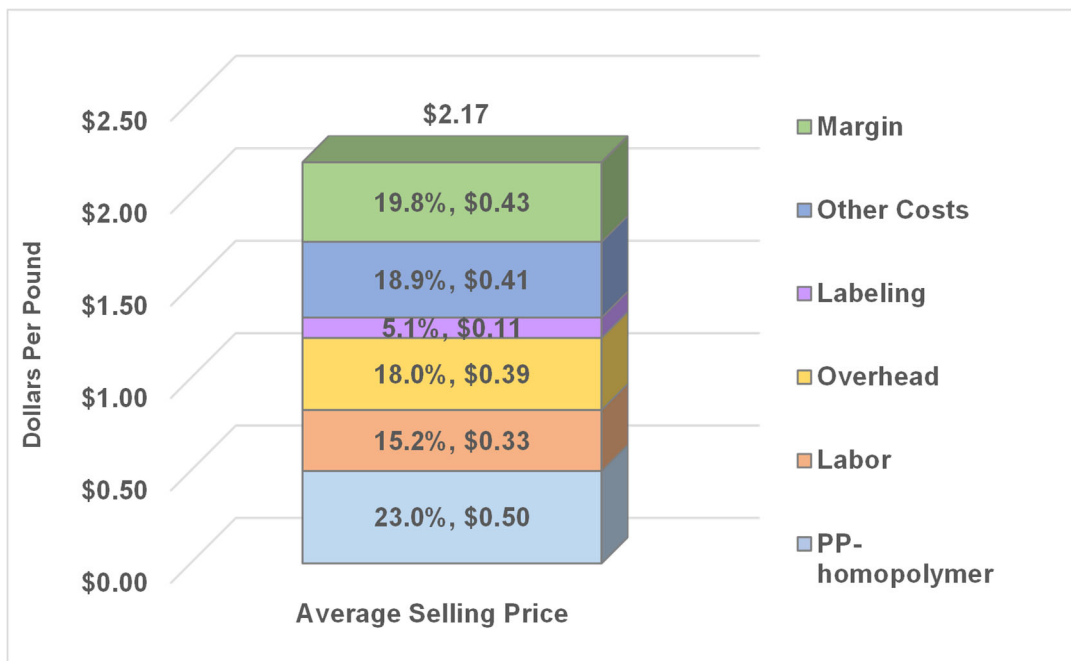
Source: Mastio & Company Injection Molding Market Study

For the second value-in-use analysis, [REDACTED]

Please see Exhibit 2-7 illustrating the value-in-use analysis for [REDACTED]

Exhibit 2-7

VALUE-IN-USE ANALYSIS FOR [REDACTED]



Source: Mastio & Company Injection Molding Market Study

FORECAST OF RESIN USE AND CONSUMPTION

Total resin consumption in 2020 for injection molded food packaging was [REDACTED]

Please see Exhibit 2-8 displaying the forecast of resin use and consumption for injection molded food packaging, by resin type, for 2020 and 2023.

Exhibit 2-8

**FORECAST OF RESIN USE AND CONSUMPTION, MARKET SHARE, AND AAGR
FOR INJECTION MOLDED FOOD PACKAGING BY RESIN TYPE
2020 AND 2023**

Resin	2020		2023		2020-2023 AAGR (%)
	Consumption (MM lbs.)	Market Share (%)	Consumption (MM lbs.)	Market Share (%)	
PP-impact copolymer					
PP-random copolymer					
PP-homopolymer					
Total LDPE					
MMW-HDPE					
HMW-HDPE					
Total HDPE					
LLDPE-butene					
LLDPE-octene					
LLDPE-hexene					
Total LLDPE					
LDPE-homopolymer					
PC					
ABS					
Nylon					
SAN					
PCR-PP					
GRAND TOTAL					

Source: Mastio & Company Injection Molding Market Study