PMMI Business Intelligence

PMMI STATE OF THE INDUSTRY
US PACKAGING MACHINERY REPORT
2021

12930 Worldgate Drive, Suite 200 | Herndon, VA 20170

2021 State of the Industry
US Packaging Machinery Report

PMMI The Association for Packaging and Processing Technologies
12930 Worldgate Drive, Suite 200 | Herndon, VA 20170
Phone: (571) 612-3200 | **pmmi.org/research**

Publication Date: July 2021

Jorge Izquierdo, Vice President, Market Development
Paula Feldman, Senior Director, Business Intelligence, PMMI

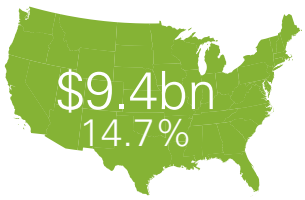
CONTENTS

CONTENTS

SECTION ONE

EXECUTIVE SUMMARY

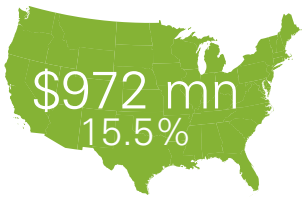
FIGURE ES.1 Summary of the US Packaging and Converting Machinery



The value of domestic shipments for packaging machinery - 14.7% to $9.4 billion in 2020.

ORDER BACKLOGS

Backlog orders of packaging machinery dollar shipments in 2020 increased by 22.3% compared to backlog orders at the end of 2019.

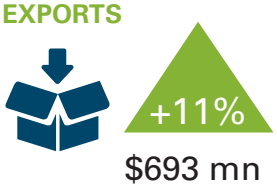


The value of domestic shipments for converting machinery - 5.5% to $972 million in 2020.

ORDER BACKLOGS

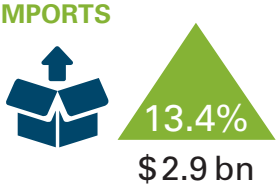
Backlog orders of converting machinery dollar shipments in 2020 increased by 12.2% compared to backlog orders at the end of 2019.

EXPORTS



Exports of packaging machinery dollar shipments in 2020 increased by 11% compared to 2019 and are now $693 million

IMPORTS



Imports increased in 2020 and are now 2.9 billion. This represents a 13.4% increase from 2019.

ES.1 - Summary of the US Packaging and Converting Machinery Industry Results, 2015 - 2020

REVENUES ($ MILLIONS)

	2015	2016	2017	2018	2019	2020	Change (%)
US Packaging Machinery Production - Domestic Shipments*	$6,756	$6,960	$7,441	$7,910	$8,237	$9,446	14.7%
US Packaging Machinery Production - Total Shipments	$7,493	$7,635	$8,094	$8,647	$8,862	$10,139	14.4%
The US Packaging Machinery Market	$8,594	$9,033	$9,546	$10,427	$10,801	$12,355	14.4%
Exports**	$737	$674	$654	$737	$626	$693	10.7%
Imports**	$1,838	$2,072	$2,105	$2,516	$2,564	$2,909	13.4%
Packaging Order Backlog as of December 31*	$2,606	$2,178	$2,508	$2,409	$2,566	$3,139	22.3%
The US Converting Machinery Production-Domestic Shipments	$757	$772	$787	$813	$842	$972	15.5%
Converting Order Backlog as of December 31*	$157	$165	$153	$285	$304	$341	12.2%

**2015 - 2019 data as shown in previous PMMI State of the Industry Studies **Source: US Census Bureau, Packaging Machinery (HS 8422.20 – 8422.40)*
Data issued: June 2021 Source: Omdia

SEGMENTATION OF THE PACKAGING AND CONVERTING MACHINERY MARKETS

The 31 machinery types defined later in the report are presented in 11 consolidated machinery categories listed below.

Machinery Types and Machinery Categories

Bottling Line Machinery
Accumulating / Collating Machines
Cleaning, Sterilizing, Cooling and Drying Machines
Feeding Machines
Orienting and Unscrambling Machines

Cartoning Machinery
Cartoning Machines

Case / Tray Handling Machinery
Case / Tray Sealing Machines
Case / Tray Loading / Unloading Machines
Case Erecting / Tray Forming Machines
Case Group / Load and Close / Seal Machines

Closing Machinery
Capping, Overcapping and Lidding Machines
Closing, Seaming and Sealing Machines

Filling and Dosing Machinery
Filling and Closing Machines
Filling – Dry / Powder / Solid Product Machines
Filling – Liquid / Gas / Viscous Product Machines

Form / Fill / Seal Machinery
Form / Fill / Seal – Horizontal Machines
Form / Fill / Seal – Vertical Machines

Labeling, Decorating and Coding Machinery
Coding Machines
Dating, Printing, Marking, Stamping and Imprinting Machines
Labeling Machines (Product Identification, Decorating)

Palletizing Machinery
Pallet Unitizing Machines
Palletizing – Ancillary Machines
Palletizing – Depalletizing Machines

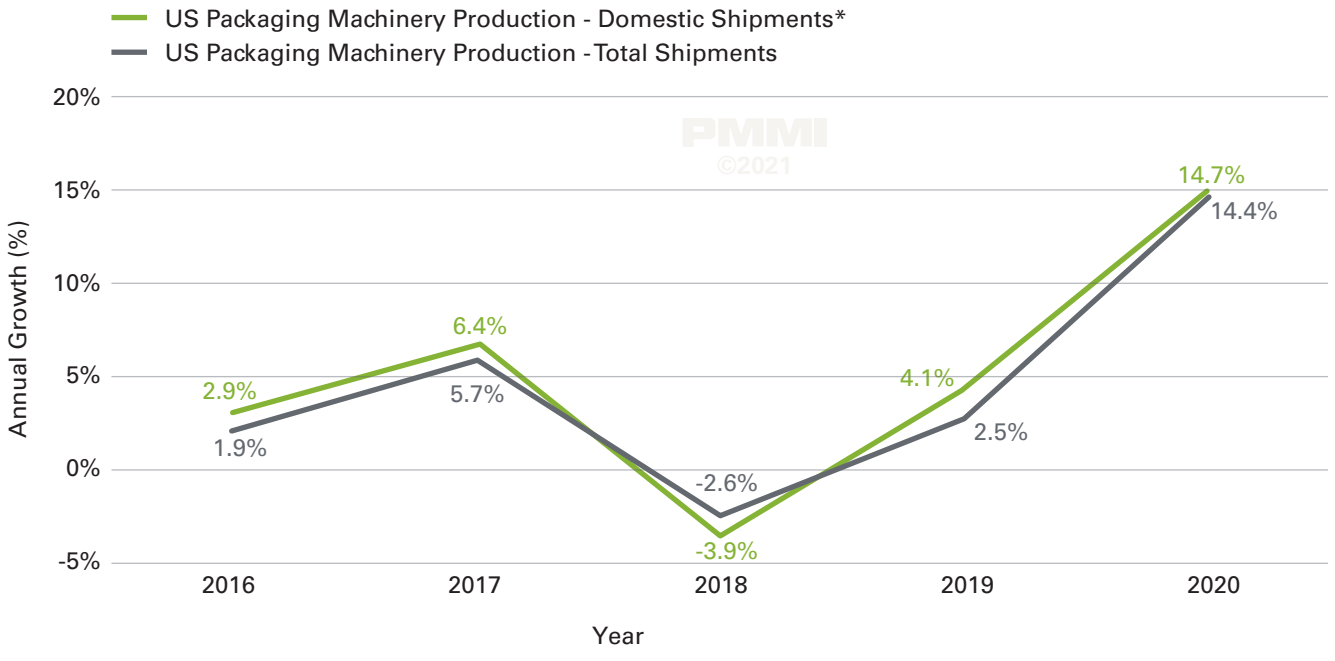
Wrapping and Bundling Machinery
Wrapping / Banding / Bundling Machines

Other Packaging Machinery
Blister Skin / Vacuum Packaging Machines
Conveying Machines
- Roller Conveyors
- Tabletop Chain Conveyors
- Belt Conveyors

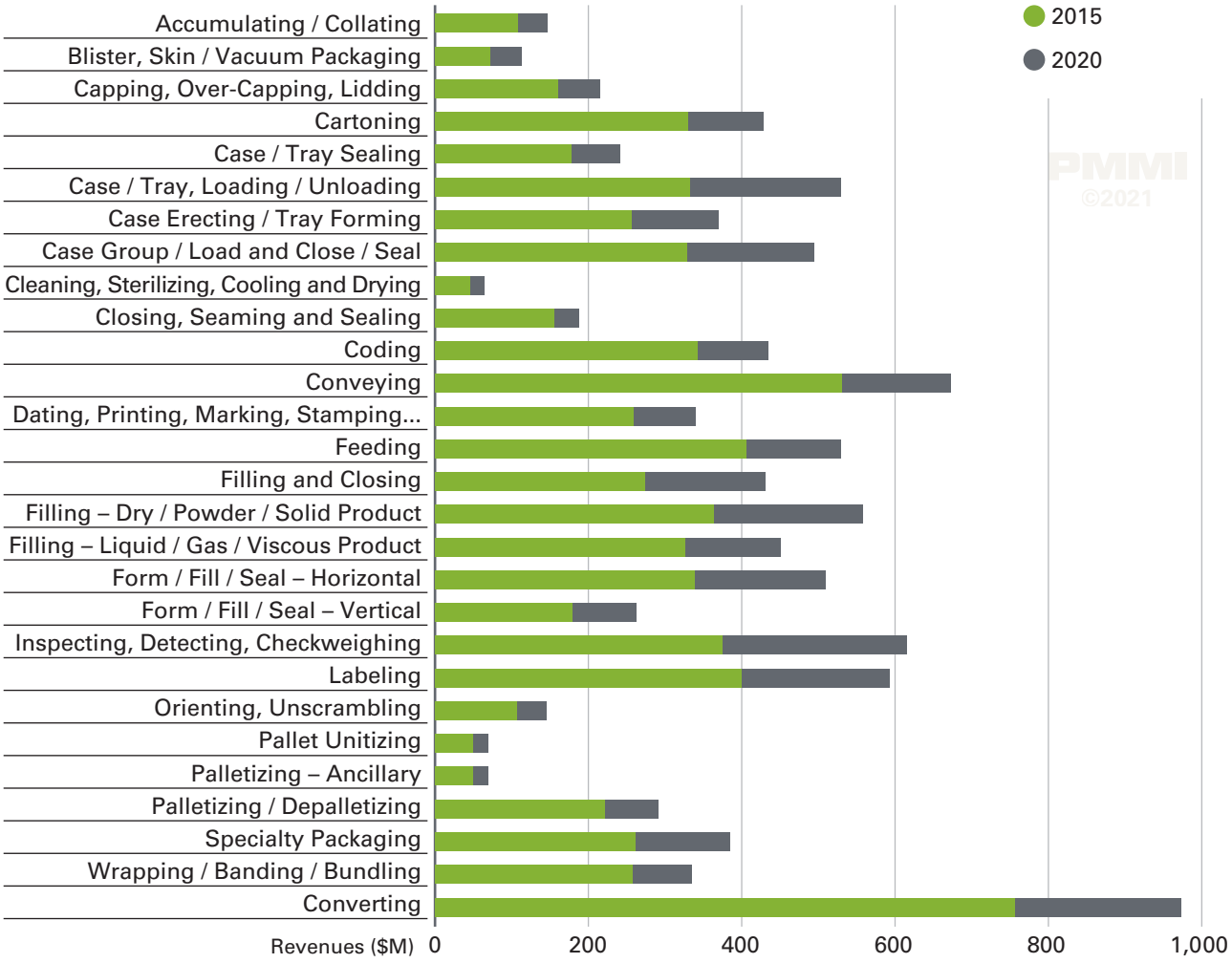
Inspecting, Detecting and Checkweighing Machines
Specialty Machines
Other Machines

Converting Machinery
Container /Material Machines

ES.2 US Packaging Machinery Production, Annual Growth 2016-2020



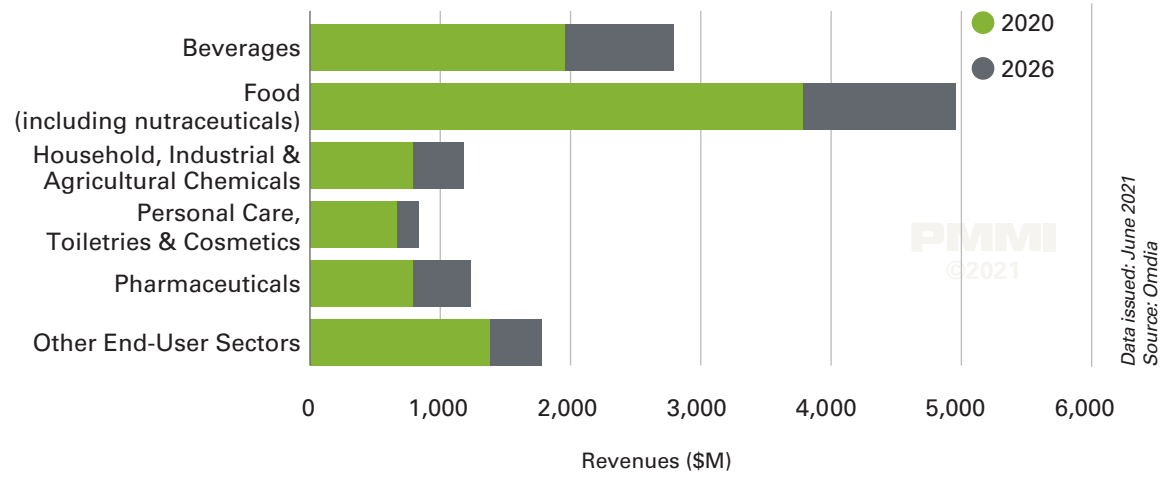
ES.3 US Packaging and Converting Machinery Shipments by Machinery Type, 2015 vs 2020



2015 - 2019 data as shown in previous PMMI State of the Industry Studies
Data issued: June 2021
Source: Omdia

ES.4 US Packaging Machinery Shipments by Industry Sector, 2020 and 2026

The household, industrial and agricultural chemicals sector is forecast to grow at a CAGR of 8.6%, the fastest of all sectors to 2020 and 2026. This is followed by the pharmaceuticals, which is forecast to grow at a CAGR of 8%.

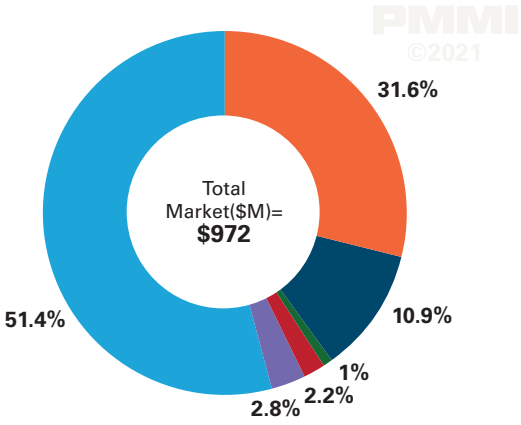


ES.5 and Figure ES. 6 - US Converting Machinery Shipments by Industry Sector, 2020

ES. 5 (Millions of Dollars)

	307 31.6%	Share in 2020
Beverages	307	31.6%
Food	106	10.9%
Household, Industrial & Agricultural Chemicals	10	1.0%
Personal Care, Toiletries & Cosmetics	21	2.2%
Pharmaceuticals	27	2.8%
Other End-User Sectors	500	51.4%
Grand Total	**$972**	

ES.6



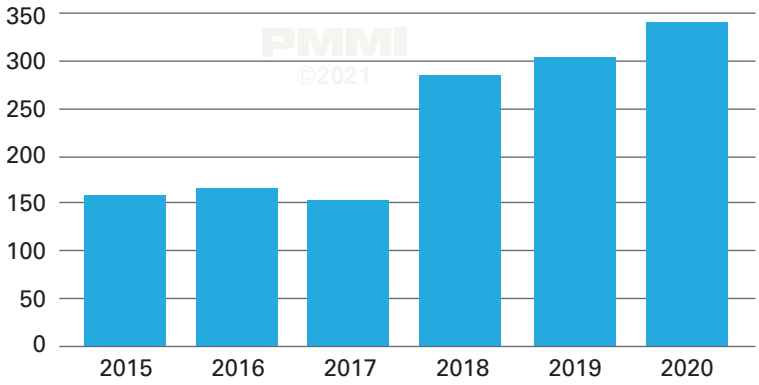
Data issued: June 2021
Source: Omdia

ES.7 - US Order Backlog of Converting Machinery, 2015 - 2020 Revenues ($ millions)

Order Backlog	2015	2016	2017	2018	2019	2020	CAGR(15-20)
Revenues ($) Millions	$157	$165	$153	$285	$304	$341	16.8%
Annual Growth	-7.1%	5.3%	-7.3%	86.1%	6.5%	12.2%	
Proportion of US Production Domestic Shipments	20.7%	21.4%	19.5%	35.0%	36.1%	35.0%	

**2015 - 2019 data as shown in previous PMMI State of the Industry Studies*
Data issued: June 2021 • Source: Omdia

Figure ES.8 - US Order Backlog of Converting Machinery, 2015 - 2020



**2015 - 2019 data as shown in previous PMMI State of the Industry Studies*
Data issued: June 2021 • Source: Omdia

GENERAL ECONOMIC TRENDS

DEMOGRAPHIC FACTORS

Population growth in the US has slowed to 0.35% in 2020 according to the World Bank. Though high by industrialized country standards, this is below the world average annual rate of 1.04%. According to the Census Bureau's data, although fertility rates continue to decline and mortality rates continue to increase, the population growth in the US remains positive because of higher net immigration. Conversely, in developing regions populations have continued to grow. Increases in the population naturally lead to increases in demand for consumers goods, which typically require packaging, resulting in increased demand for packaging machinery.

In the US, millennials have recently surpassed baby boomers as the largest generation. An estimated 73 million millennials in the United States are currently between the ages of 18 and 34. This group is now working and spending money, representing 35-40% of the U.S. workforce in 2020. Product preferences, and subsequently packaging solutions, between these two generations vary significantly, supporting demand for new and flexible machinery.

ENVIRONMENTAL FACTORS

As a result of growing attention to the depletion of natural resources, social, regulatory, and tax pressures have driven demand for environmentally friendly solutions from leading companies. This has increased the focus on optimizing machinery.

As of February 2021, the Recycling Leadership Council which is made up of multiple stakeholders ranging from packaging suppliers to academicians released the Blueprint for America's Recycling System. The blueprint highlights the need of a national strategy on recycling and policy action in tackling waste crisis.

This initiative highlights the growing importance of sustainability in the packaging industry and how the future will require industry players to view the entire added-value chain holistically, covering manufacturing, logistics, and the end user.

ECONOMIC FACTORS

The global economy has reached an important milestone in the second quarter of 2021, surpassing the pre-pandemic real GDP peak attained in the fourth quarter of 2019. The Asia-Pacific region was first to complete its recovery in late 2020, owing to a resilient mainland Chinese economy. North America's recovery has coincided with that of the world; US economists estimate that the US real GDP reached a new peak in May 2021.

After a 3.5% contraction in 2020, global real GDP is projected to increase 6.0% in 2021, its strongest advance since 1973. Growth will continue at a robust 4.6% pace in 2022 before settling to 3.0% in 2023–25. The June forecast of world growth is revised up by 0.3 percentage point in 2021, reflecting brighter outlooks for the United States, Europe, Latin America, and mainland China.

As recovery from the COVID-19 recession is completed, the global economy is moving into the sweet spot of the current expansion. World real GDP growth is picking up from an annual rate of 1.5% quarter on quarter (q/q) in the first quarter to rates of 6.0–7.0% over the remainder of 2021. As vaccination rates increase and pandemic-related restrictions are lifted, consumer spending is surging.

COVID-19 IMPACT

The COVID-19 pandemic drastically altered the economic landscape as many nations shut down all non-essential business, many workplaces moved remote or closed, and consumer habits changed.

There had been 177.11 million confirmed cases of COVID-19 worldwide, including 3.84 million deaths, as of June 2021, according to the World Health Organization (WHO). Beyond its human toll, COVID-19 has had a sizable negative economic impact across the majority of industries.

However, the US packaging machinery market has generally been resilient to the impact of the COVID-19 pandemic. While most industries Omdia tracks declined in 2020, packaging machinery revenue increased by 14.8% during the year.

There has been remarkable progress in developing and launching vaccines against COVID-19, with 2.41 billion vaccine doses administered worldwide as of 19 June 2021, according to the WHO.

PACKAGING MACHINERY TRENDS

AUTOMATION AND ROBOTICS

In recent years, increasingly more packaging machinery companies have embraced automation in their packaging lines to achieve higher efficiency and productivity. These companies today are leveraging on smart manufacturing to maintain competitive advantage and meet their pressing business needs.

Machine Vision is a rapidly maturing technology in packaging machinery market. The application varies between among small enterprises and bigger players. As some small players have only begin implementing machines with this capability, some pioneers have begun innovating the technology.

Robotics has also been penetrating the packaging machinery market, parallel to the evolution of Artificial Intelligence (AI), 5G, and expanding IoT environment. Most recent, a technology called "Cobots", an acronym for "Collaborative Robots" emerged as Human-Machine Interface (HMI) became prevalent on factory floors. Cobots are designed to be safer for humans to work in close proximity.

IIOT AND WIRELESS CONNECTIVITY

The Industrial internet of things (IIoT) has and will continue to have an impact across the product lifecycle in the packaging industry including design, operation, maintenance, and the supply chain. One of the most common early applications of IIoT solutions are focused around asset health monitoring through condition monitoring and predictive maintenance due to the ease of implementation and ROI.

Conventional wireless network in smart manufacturing did not progress much as it has faced skepticism mainly due to its inability to maintain stable connections and latencies. This is now solved by an innovative product (IO-Link Wireless) by and Israel based company, CoreTigo. The solution reportedly performs better than other wireless protocols such as Wi-Fi, Bluetooth, and Zigbee.

SUSTAINABILITY AND FLEXIBLE PACKAGING

In this consumer demand-driven packaging market, many food brands have invested in packaging innovations and started to implement sustainability initiatives in their production and packaging lines.

Machine modifications or adjustments are needed to achieve sustainable packaging goals, but some of the challenges CPGs face when moving to more sustainable packaging provide opportunities for OEMs to explore application details with customers:

- Secondary packaging machines such as conveyors must be able to handle material reduction strategies, including lightweight corrugated.
- Machines need to run different style boxes to accommodate sustainability strategies, such as using the right size box. Case packers with a smaller footprint can help achieve sustainability goals through reduction in energy usage.
- A more efficient process of unpacking the contents of a pallet and repacking them into different sizes or variety packs is needed, with a focus on reducing material usage.

Sustainability is becoming the new business reality and the flexible packaging industry is innovating towards it. Traditionally, flexible packaging faced challenges in meeting the needs of modern waste infrastructures as single polymer waste streams could not separate coextruded or laminated plastics, hence in many instances making it a non-recyclable product. This is not the case now as, brands and suppliers continue to progressively innovate compostable and sustainable components for flexible packaging, such as films and pouch closures.

MATERIAL INNOVATIONS

Many food brands have increasingly used recyclable, reusable, or compostable packaging recently. The following are examples of the latest innovations in packaging materials: Recyclable board-based packaging, compostable packaging, and 100% recycled paper packaging for food and beverages.

The use of such materials, alongside other innovative packaging materials has been on the rise in the industry. Materials innovation has been an area worth exploring in the coming years. Some companies have even pledged long-term research commitment in packaging material innovation. For example, Valio has partnered with Stora Enso to test the use of bio-composite in food packaging as part of the larger aim to reset milk's carbon footprint to zero by 2035.

E-COMMERCE

E-commerce will become an increasingly important factor in the industry, forcing packaging designed to maximize packing space. It is also motivating a trend away from glass towards pouches and easily packable trays. The market for e-commerce, has expanded rapidly in recent years, particularly in the US. This shift in purchasing habits will continue to drive demand for packaging machinery as e-commerce differs from traditional retail outlets due to increased touchpoints to reach the customer, increased packaging, and supply chain challenges.

WASTE REDUCTION LEGISLATION

In June 2020, US representatives introduced the Plastic Waste Reduction and Recycling Act. If passed, the act will guide the director of the Office of Science and Technology Policy to establish a plastic waste reduction and recycling program to improve the global competitiveness of the US recycling industry. The act further aims to reduce plastic waste, encourage research into and technologies for recycling infrastructure, and ensure US leadership in national and international standards development.

CYBERSECURITY

In June 2021, a ransomware attack on the world's largest meat processor, JBS, temporarily shut down nine beef plants and also impacted the company's pork and poultry processing plants across the US. This further highlights the vulnerability of the critical infrastructure and manufacturers across the industrial supply chain to increasing levels of cyber-attacks. A few more major players such as Cadbury, Target, and Equifax have also reported recent incidents of cyberattacks.

SECTION TWO

INTRODUCTION

2.1 INTRODUCTION

The following section analyzes trends and statistics for the US packaging and converting machinery industry. The study uses reported data from suppliers of such machinery to generate the 2020 base-year data and provides forecasts in revenues, average selling prices (ASPs) and unit shipments by year from 2021 to 2026. The ASP and unit shipments are shown only for total production and forecasts are provided only by machinery category and industry sector. Revenues are shown in US dollars.

Data presented for 2019 and previous years, is as shown in the 2020 PMMI State of the Industry Study for comparison purposes, and has not been estimated from the research for this report. Annual percentage changes have been derived from comparison of results from this and the 2019 and 2020 reports. In addition to the data for each year of the forecast period, the tables also show compound annual growth rates (CAGRs) from 2020 to 2026. Throughout this report, quoted growth rates can be assumed to be CAGRs from 2020 to 2026, unless otherwise stated.

The first part of this section provides an overview of the major trends influencing the US packaging machinery industry. The remainder of the report analyzes statistical findings from the research. These include forecasts of the value and growth of US production (excluding exports), segmented by consolidated machinery category and industry sector, as outlined later in this section. Segmentation by customer type is provided for the 2020 base year only.

Detailed statistics are also provided for each machinery type, segmented by industry sector and customer type, for 2020 only.

Report Format

- **The US Packaging Machinery Industry**
  This section provides an overview of the US market size and forecasts for US-produced packaging machinery in terms of revenues and unit shipments. The market is segmented by consolidated machinery category, industry sector, and customer type. There is also a review of the product, economic and market trends affecting the market.

  This section also presents a detailed review of each machinery type. Market size estimates are provided in terms of revenues for 2020, and segmentation is provided by industry sector and customer type.
- **Economic Outlook**
  This section provides insight into the current economic outlook and GDP data for the US.
- **Appendix A – Scope and Methodology**
  This section defines the report scope and describes the research method used.
- **Appendix B – Machinery Categories**
  This section defines the 31 different packaging machinery categories.
- **Appendix C – List of Tables**
  This section provides a list of tables presented within the report.
- **Appendix D - Copyright**
  This section provides a copyright notice and disclaimer.

PACKAGING MACHINERY TRENDS

FACTORS AFFECTING PACKAGING MACHINERY

In the following sections, factors influencing the growth in demand of packaging machinery as well as technology trends affecting packaging machinery are discussed.

The demand for packaging machinery is largely driven by the increase in consumer goods demand, rise in adoption of automated packaging machines, and development of energy efficient machines.

Advancements in electronics, computing technologies and rising awareness over the inherent benefits of automation have encouraged conventional industries to embrace integrated packaging machinery solutions.

Given the advantages of an automated production line, robotic packaging automation is poised to emerge as the future of packaging in the coming years in both primary and secondary packaging applications.

GENERAL ECONOMIC TRENDS

Global Economic Outlook

A major factor affecting the growth in demand for packaging equipment is the global economic outlook. The economic outlook is provided in full in Section Four.

The global economy has reached an important milestone in the second quarter of 2021, surpassing the pre-pandemic real GDP peak attained in the fourth quarter of 2019. The Asia-Pacific region was first to complete its recovery in late 2020, owing to a resilient mainland Chinese economy. North America's recovery has coincided with that of the world; US economists estimate that the US real GDP reached a new peak in May 2021.

After a 3.5% contraction in 2020, global real GDP is projected to increase 6.0% in 2021, its strongest advance since 1973. Growth will continue at a robust 4.6% pace in 2022 before settling to 3.0% in 2023–25. The June forecast of world growth is revised up by 0.3 percentage point in 2021, reflecting brighter outlooks for the United States, Europe, Latin America, and mainland China.

As recovery from the COVID-19 recession is completed, the global economy is moving into the sweet spot of the current expansion. World real GDP growth is picking up from an annual rate of 1.5% quarter on quarter (q/q) in the first quarter to rates of 6.0–7.0% over the remainder of 2021. As vaccination rates increase and pandemic-related restrictions are lifted, consumer spending is surging.

This is most evident in the United States, where pent-up demand for travel and all services involving social interaction is stronger than anticipated. Western Europe is in the early stages of a growth spurt as economies reopen, labor market conditions improve, and household saving rates retreat from exceptionally high levels. Business investment is also picking up in response to more robust sales prospects and favorable financing conditions. Depleted inventories will be rebuilt, supporting economic growth in the second half of 2021. Meanwhile, commodity exporting countries are benefiting from elevated prices and a strong resurgence in exports.

Global economic growth is set to slow in 2022 and 2023. The post-pandemic economic surge is expected to subside by mid-2022, as pent-up demand is satisfied and global real GDP growth settles at a 3% annual pace. The withdrawal of fiscal stimulus will become a drag on growth as governments rein in spending and contend with higher debt burdens. Government fiscal deficits widened from 3% of world GDP in 2019 to 10% in 2020 and are expected to narrow to 7% in 2021 and 4% in 2022.

Demographic factors

Population growth in the US has slowed to 0.35% in 2020 according to the World Bank. Though high by industrialized country standards, this is below the world average annual rate of 1.04%. According to the Census Bureau's data, although fertility rates continue to decline and mortality rates continue to increase, the population growth in the US remains positive because of higher net immigration. Conversely, in developing regions populations have continued to grow. Increases in the population naturally lead to increases in demand for consumers goods, which typically require packaging, resulting in increased demand for packaging machinery.

As salaries increase and urbanization continues, buying habits of end users are changing. With a growing middle class globally, disposable income has also increased. This has given a larger proportion of the population access to products that were previously unaffordable, including improved access to medicines,

processed food products, and household chemicals. The middle class continues to grow, with particularly rapid growth expected in China, India, Indonesia, Thailand, and Malaysia. It is estimated that the next billion entrants into the global middle class will be in Asia, but this has slowed down somewhat as a result of the COVID-19 pandemic.

Globally, the 'middle class' was expected to experience growth, but this is now stalled due to the COVID-19 pandemic. According to the Pew Research Center, these numbers were affected negatively when COVID-19 emerged and forced most nations into lockdowns. As a result of the pandemic, there were 54 million fewer middle incomed people in 2020 and they were mainly from South Asia (India) and in East Asia and the Pacific. It is believed the number have been further negatively impacted as post this study was carried out, several other countries in Asia were severely impacted, India and Malaysia specifically. The numbers are expected to recover as the vaccination rollout accelerates across the world and economies start to recover from the impact of COVID-19.

Additionally, millennials recently surpassed baby boomers as the largest generation. In developed regions, trends like increased travel, fast-paced lifestyles and consumer health consciousness have increased demand for convenience foods. As demand for such products continues to increase, this in turn is boosting demand for packaging machinery.

Environmental factors

Over recent years, attention in regard to reducing the depletion of natural resources, such as water, non-renewable energy sources and rainforests, has grown. Leading corporations have been increasingly expected to drive environmentally friendly solutions throughout their operations. In addition to heightened corporate social responsibility, tighter regulations and heavier taxes related to the protection of the environment have been introduced and are driving investment in solutions that optimize the use of resources and minimize damage to the environment.

Corporations also benefit from such solutions through reduced costs, for example by minimizing waste and saving energy. The demand for sustainable solutions has influenced the development of packaging machinery; increased focus on the environment coupled with tighter profit margins throughout the supply chain has meant that optimizing processes is as important as ever.

As of February 2021, the Recycling Leadership Council which is made up of multiple stakeholders ranging from packaging suppliers to academicians released the Blueprint for America's Recycling System. The blueprint highlights the need of a national strategy on recycling and policy action in tackling waste crisis.

This initiative highlights the growing importance of sustainability in the packaging industry and how the future will require industry players to view the entire added-value chain holistically, covering manufacturing, logistics, and the end user.

COVID-19 Impact

The COVID-19 pandemic drastically altered the economic landscape as many nations shut down all non-essential business, many workplaces moved remote or closed, and consumer habits changed.

There had been 177.11 million confirmed cases of COVID-19 worldwide, including 3.84 million deaths, as of June 2021, according to the World Health Organization (WHO). Beyond its human toll, COVID-19 has had a sizable negative economic impact across the majority of industries.

However, the US packaging machinery market has generally been resilient to the impact of the COVID-19 pandemic. While most industries Omdia tracks declined in 2020, packaging machinery revenue increased by 14.8% during the year.

The global number of new COVID-19 cases and deaths reported weekly has declined from a peak in April 2021, according to figures published by the WHO in mid-June.

There has been remarkable progress in developing and launching vaccines against COVID-19, with 2.41 billion vaccine doses administered worldwide as of 19 June 2021, according to the WHO.

Even as uncertainty still looms over the pandemic and vaccine roll-out, International Monetary Fund released optimistic growth for the U.S economy where it is expected to grow by 6.4% in 2021. Mainly driven by a new $1.9 trillion U.S. aid package, accelerated vaccinations and continued adaptation of economic activity to overcome pandemic restrictions.

While developing a vaccine within a year was a tremendous feat, effective distribution to the entire world will be difficult and critical. The forecasts presented in this report are subject to change based on variations in the severity and duration of the ongoing pandemic, its economic impact,

government intervention, and vaccine development and distribution. Omdia will continue to closely monitor the virus and its impact on the market and update forecasts accordingly.

he virus and its impact on the market and update forecasts accordingly.

AUTOMATION AND ROBOTICS

Robots and Humans Coexisting on Automated Factory Floors

In recent years, increasingly more packaging machinery companies have embraced automation in their packaging lines to achieve higher efficiency and productivity. These companies today are leveraging on smart manufacturing to maintain competitive advantage and meet their pressing business needs. Gerhard Schubert for instance, reported a turnover of EUR 211.5million for FY2018 as a result of its initiative in digital packaging and robotics in China, indicating a growing investments and implementation in new technologies and innovative packaging solutions.

Robotics has also been penetrating the packaging machinery market, parallel to the evolution of Artificial Intelligence (AI), 5G, and expanding IoT environment. Most recent, a technology called "Cobots", an acronym for "Collaborative Robots" emerged as Human-Machine Interface (HMI) became prevalent on factory floors. Cobots are designed to be safer for humans to work in close proximity, compared to traditional industrial robots where safety is assured by its isolation from human contact, and in order to ensure the quality and safety of the Cobots are maintained, ISO/TS 15066 :2016 safety guidelines was established for manufacturers of these machines. This technology is seen picking up especially in consumer package goods (CPGs) market. Columbia/Okura for instance, worked with Universal Robots (UR) to develop miniPAL, a mobile collaborative system that addresses various applications in machine tending, palletizing, and packaging.

Another breakthrough worth noting would be "autonomous mobile robots (AMRs)". Mobile Industrials Robots (MiR)'s AMRs are capable of transporting pallets and other heavy loads in dynamic environments. MiR also uses ROEQ's Top Roller conveyor to automate load and unload operations.

Some companies such as Omron and Kuka Robotics have also started combining AMR and Cobot technologies to create a collaborative system with more flexible manufacturing process and higher operational efficiency.

Machine Vision is a rapidly maturing technology in packaging machinery market. The application varies between among small enterprises and bigger players. As some small players have only begin implementing machines with this capability, some pioneers have begun innovating the technology.

In 2017, Broadman Lake introduced the VGR2000 Vision Guided Robotic system that is connected to the fully automatic FT120 Flow Wrapper which can be integrated with secondary and tertiary packaging equipment for a complete packaging solution. It uses Rockwell Automation's 'FactoryTalk Analytics' for real-time data analytics over the cloud. In 2019, Newtec-owned Qtechnology has developed an integrated visual inspection technology in the Celox-C-UHD optical sorting machine which helps to ensure consistent carrot grading for high-quality final packaging.

Programmable Logic Controllers (PLCs) are known to have been used widely in packaging lines. Commonly, multiple PLCs are used in separate production lines causing control issues especially in large end-to-end manufacturing facilities such in beer and wine production. Siemens, among other players, introduced a "multi-packer" into an existing packaging lines to control multiple PLCs.

Product recall is a major concern in the packaging machinery industry. The US Food and Drug Administration (FDA) recently reported that more than half of packaged products recalled were due to unreadable or incorrect labels and codes. Some companies have introduced new products to improve product quality inspection. For instance, Mettler Toledo CI-Vision recently introduced the new V15 Round Line smart camera inspection system that inspects labels and codes on round containers in wet environment. The V15 can conduct 360-degree inspections using six evenly distributed viewpoints and liquid lens focusing technology to help solve this issue.

Peco-InspX on the other hand announced HDRX, its latest automated x-ray inspection technology. Using the existing traditional power settings, HDRX delivers high-resolution images at normal production line speeds for the most efficient foreign material detection that minimizes false rejects. Stone Technologies has created an automated defect rejection process using the dedicated Profinet IO network that connects all controller communications within the entire high-speed packaging line. All cartons flagged for rejection were successfully rejected 100 percent of the time.

IIOT AND WIRELESS CONNECTIVITY

The Industrial internet of things (IIoT) has and will continue to have an impact across the product lifecycle in the packaging industry including design, operation, maintenance, and the supply chain. One of the most common early applications of IIoT solutions are focused around asset health monitoring through condition monitoring and predictive maintenance due to the ease of implementation and ROI. In the near future, packaging machines are expected to be equipped with predictive maintenance capabilities to give them a competitive advantage in the market. By utilizing machines capable of predictive maintenance, customers will be able to benefit from reduction in maintenance costs and downtime caused by unforeseen failures.

Another approach in advancing the ease of use for machines will be the adoption of wireless networks. Conventional wireless network in smart manufacturing did not progress much as it has faced skepticism mainly due to its inability to maintain stable connections and latencies. This is now solved by an innovative product (IO-Link Wireless) by and Israel based company, CoreTigo. The solution reportedly performs better than other wireless protocols such as Wi-Fi, Bluetooth, and Zigbee. Based on the solution, packaging machine builders may consider a variety of solutions throughout the design and development stages of its machines:

- Wireless communication for sensors and actuators that can travel with independent movers on transport track systems.
- Wireless communication for end effectors and linear tracks of robots and collaborative robots.
- Wireless control and monitoring of sensors and actuators on modular cells, rotary tables, and other dynamically rotating machine components.
- Wireless sensor data collection for predictive maintenance, machine performance optimization, and analytics.
- Connectivity for machine components that need to be de-coupled and run independently.

SUSTAINABILITY AND FLEXIBLE PACKAGING

In this consumer demand-driven packaging market, many food brands have invested in packaging innovations and started to implement sustainability initiatives in their production and packaging lines. In January 2020, Nestle announced an investment of up to CHF 2 billion ($2.08 billion) to create a circular economy for plastics and reduce the use of virgin plastic packaging by one third in 2025. A CHF 250 million ($259.5 million) sustainable packaging venture fund will be launched to help Nestle invest in start-up companies focusing in packaging innovation, refill systems, and recycling solutions.

Technology has transformed packaging methods and introduced more information transparency within the food and beverage industry. 2020 saw the rise of the augmented reality (AR) and QR code technology to create more interactive packaging experience for customers. Gin brand Bombay Sapphire collaborated with Zappar to let customers scan the gin bottle with phone cameras for digital content such as cocktail recipes and videos. In April 2019, Nestle and French retailer Carrefour partnered to introduce blockchain technology that allows consumers to trace the origin of Mousline mashed potato products.

After all, consumers have indicated their personal preferences in food brands that practice sustainable packaging. A research by compostable packaging company Tipa revealed that nearly half of shoppers surveyed would favor clearer labelling on products with plastic-free packaging, as well as would welcome labelling to help them identify compostable packaging.

At a global scale, the concept of circular economy, which advocates for elimination of wastes and the continuous use of resources has been on the rise. Awareness on sustainable business models amongst packaging industry players have generally increased over recent years at the back of potential benefits from reducing pressure on the ecosystem and improving the security of raw materials supply which will increase business competitiveness, stimulate innovation, and boost job creation and economic growth.

A 3-year packaging deal between UK-headquartered RPC and Norwegian dairy company Tine for instance will allow the later to create and develop innovative solutions involving production methods and materials. Tine is working to innovate plastic packaging that is well adapted for a circular economy with increased reuse and recycling. Coca-Cola meanwhile is planning to invest 1bn ($1.1bn) in its French operations over the next five years in its bid to produce 100% recyclable packaging by 2025 and accelerate its transition to a circular economy. It will be a joint investment with the Coca-Cola European Partners (CCEP) setting aside 500m to improve sustainability practices within its production and distribution network and the Coca-Cola Company investing 500m for brand and new product development. The planned changes to CCEP's manufacturing network are intended to prepare the company for dynamic consumer preferences regarding sustainable packaging.

Digitization in the packaging machinery industry to address sustainable packaging is on the rise. Tetra Pak has recently launched a connected packaging platform, leveraging Microsoft Azure's cloud service to allow consumers to have digital access to its product packaging information. The connected platform will also be scaled across the entire supply chain to provide end-to-end traceability that will improve quality of product and ensure supply chain transparency. Tetra Pak is also working with Hexagon to enhance its Smart Solutions Platform with digital twin technology and virtual visualization. The Platform will allow more efficient and sustainable use of machines and manufacturing lines. The global rollout started in 2020.

Sustainability is becoming the new business reality and the flexible packaging industry is innovating towards it. Traditionally, flexible packaging faced challenges in meeting the needs of modern waste infrastructures as single polymer waste streams could not separate coextruded or laminated plastics, hence in many instances making it a non-recyclable product. This is not the case now as, brands and suppliers continue to progressively innovate compostable and sustainable components for flexible packaging, such as films and pouch closures. An example is the packaging converter, Parkside Flexibles who developed a new innovative monopolymer, recyclable, flexible packaging laminates. Continuing the sustainability theme, Coveris, a flexible-packaging developer based in Austria also announced it has developed a new recyclable, mono-material film liner for bag-in-box cereal packaging.

Continuing the sustainability theme, flexible packaging offers a range of sustainability benefits when compared to other packaging formats. Below are the benefits that it provides throughout its entire life cycle:

- Material/resource efficiency
- Lightweight/source reduction
- Transportation benefits due to inbound format and lightweight nature
- Shelf life extension
- Reduced materials to landfill
- High product-to-package ratio
- Beneficial lifecycle metrics (carbon impact, fossil fuel used, water consumption)

Another trend that is influencing the demand for flexible packaging is E-commerce. The exponential growth in e-commerce is forcing companies to adopt flexible packaging as it allows them to maximize shipment sizes and space. In addition, durability of the packaging is an important aspect of e-commerce as consumers expect their products to be delivered without any damage. As an example, products that once relied on glass bottles may now use flexible liquid stand-up pouches with fitted taps, spouts, and gusseted bottoms. This type of flexible packaging is more often utilized for ready-to-drink water, wine, oil, dairy, and juice.

As the demand for flexible packaging increases, innovation in the materials used and machines required in manufacturing it is expected to further revolve around the importance of sustainability.

MATERIAL INNOVATIONS

Many food brands have increasingly used recyclable, reusable, or compostable packaging recently. The following are examples of the latest innovations in packaging materials:

Recyclable board-based packaging: Smurfit Kappa worked with Mitsubishi HiTec Paper to create a new fully recyclable board-based food packaging. The inner packaging contains Mitsubishi HiTec Paper's Barricote barrier paper that offers protections against grease and moisture. The outer board uses Smurfit Kappa's MB12 solution with built-in absorption technology that protects against aromas and possible migration of substances.

Compostable packaging: Finnish companies Fazer and Sulapac partnered to create a compostable box that is microplastics-free for Fazer's handmade pralines. Collaboration between Fazer and Sulapac in creating compostable, microplastic-free box for Fazer's handmade pralines. Perdue Farms meanwhile uses insulating material called Green Cell Foam which is compostable and can be dissolved. The foam is made from non-genetically modified organism (non-GMO) cornstarch.

Paper packaging: In October 2019, Carlsberg unveiled two prototype beer bottles - one bottle uses a 100% bio-based PEF polymer film barrier and the other a thin recycled PET polymer film barrier. Both are made from wood fibers with polymer barriers. In December 2019, Mondelez launched the world-first trial of 100% recycle paper packaging for its Cadbury Energy bar. It can still protect food and ensure freshness despite the non-use of laminates, foils, or plastic for fully sealed packaging. Swedish vegan food brand Oatly meanwhile has switched to Evergreen Packaging's Sentinel Fully Renewable Ice Cream Board through its packaging converting partner Stanpac Packaging. Sentinel is a paper-based packaging made with renewable coating derived from sugarcane.

The use of such materials, alongside other innovative packaging materials has been on the rise in the industry. Materials innovation has been an area worth exploring in the coming years. Some companies have even pledged long-term research commitment in packaging material innovation. For example, Valio has partnered with Stora Enso to test the use of bio-composite in food packaging as part of the larger aim to reset milk's carbon footprint to zero by 2035.

E-COMMERCE

Leveraging robotics and digital twin technologies

In 2020, e-commerce sales rapidly grew in the United States primarily fueled by the COVID-19 pandemic as countries underwent either full or partial lockdowns thus driving people to purchase goods online. Lockdowns also forced traditional retailers to transition from physical stores to having a stronger online presence – a move to survive the pandemic by continuing to make sales online. Similar exponential growth in sales was seen across most regions except for world's least developed countries. The data released by Adobe Digital Economy Index showed between March 2020 to February 2021, a total of $844 billion was spent, a 42 per cent growth compared to 2019.

With online retailers offering customized goods in this demand-driven market, manufacturers are increasingly adopting flexibility in production, packaging, and supply chain processes. This requires reconfigurable, modular machineries that can rearrange product flows.

Rockwell Automation introduced B&R Industrial Automation's flexible track systems AcoposTrak and iTrak independent cart technology. By using Ranpak's patented technology, Trident produces structured protective paper packaging more efficiently with high cost-effectiveness. The solution can either be user-controlled or automated with high-speed delivery. Massman Automation's compact HMT-Mini top only case sealer on the other hand is fully automatic and can seal a maximum 3000 cases per hour. Its modular construction allows for specific features of the sealer to be changed, enabling users to save costs by only replacing instead of investing in new sealers to meet growing future production demands.

Robots also play essential roles in automating e-commerce ready factories. For instance, Procter & Gamble (P&G) is piloting three projects focused on digitization of manufacturing sites. As part of the initiative, the company deploys automated guided vehicles (AGVs), collaborative robots (Cobots), and automated mobile robots (AMRs) to create agility and flexibility in product packaging and shipping.

Packaging companies venturing into e-commerce are foreseeing three challenges in e-commerce packaging: to be less wasteful by minimizing materials or using reusable packaging, to offer exciting boxing with better graphics or branding, and to optimize returns from the small parcel shipping environment.

WASTE REDUCTION LEGISLATION

In June 2020, US representatives introduced the Plastic Waste Reduction and Recycling Act. The act will guide the director of the Office of Science and Technology Policy to establish a plastic waste reduction and recycling program to improve the global competitiveness of the US recycling industry.

The act further aims to reduce plastic waste, encourage research into and technologies for recycling infrastructure, and ensure US leadership in national and international standards development. The key components of the legislation include:

- Requiring product manufacturers to design, manage, and finance end-of-life management for the packaging of their products. Types of packaging include food containers, packets, and wrappers; drink containers, cups, and lids; tobacco products with filters; wet wipes; and lightweight plastic bags.
- Banning the use of Styrofoam in food packaging, disposable coolers, and shipping packaging.

  Imposing labeling requirements for plastic. Plastic products would be required to bear labels indicating the presence of plastic and how the product should be disposed.
- Setting recyclability and recycled content thresholds. The legislation would require that plastic bottles, packaging, and certain other products be 100% recyclable and contain significant recycled content.
- The above-mentioned legislation could have a potential impact on the types of packaging machinery used.

CYBERSECURITY

While automation in productions through advanced servo-driven machineries, cloud servers, remote access and wireless connections have been an ongoing trend, it is also prone to cyber threats and attacks such as hackers, viruses, malwares and most recent, ransomware where cyber criminals will hold or block a company's digital property until a certain amount of ransom is paid. A report by Cybersecurity Ventures revealed that cyberattacks are expected to cost $6 trillion a year for the global economy by 2021 and are now the world's fastest-growing crime. With cyberattacks being more sophisticated over the coming years, the costs are expected to grow by 12% to 15% year-on-year.

Cyberattacks are expected to grow by

12% - 15%

year-on-year

world's fastest growing crime

In June 2021, a ransomware attack on the world's largest meat processor, JBS, temporarily shut down nine beef plants and also impacted the company's pork and poultry processing plants across the US. This further highlights the vulnerability of the critical infrastructure and manufacturers across the industrial supply chain to increasing levels of cyber-attacks. A few more major players such as Cadbury, Target, and Equifax have also reported recent incidents of cyberattacks.

The use of control systems in industrial automation, especially the Supervisory Control and Data Acquisition (SCADA) are widely used to manage Industrial Control systems (ICS), but they are also vulnerable to cyberattacks. SCADA Security was recently introduced which outlines three main approaches towards designing a secure SCADA system. Rockwell Automation for example, collaborated with Cisco to develop a design guideline called Converged Plantwide Ethernet (CPwE) Architectures as a countermeasure to cyberattacks. The protection is implemented at three levels – physical such as lockout devices to prevent unauthorized access to USB ports, application level where the software can track application access and changes based on personnel roles and authority level, and lastly, on embedded device by changing default configurations to improve security.

Although there are a number of commonly used communications protocols used in ICS, this approach is still mostly proprietary as unlike traditional IT environment, there has yet been an established industry standard for ICS protocols.

Industrial firewall is among the most commonly used protection against malwares. The trend has been picked up by some major manufacturers who are using ICS. Yokogawa and McAfee partnership to develop an enhanced the firewall against cybersecurity is among the companies with such initiative. Firewall is applied in ICS network environment and the system can be updated via a Centralized Management Server whenever virus and malware databases are updated.

Another example would the implementation of Next-Generation Firewall (NGFW) that combines traditional firewall with other network device's filtering functions. Forcepoint is among the system providers that has tested and implemented the technology.

The lack of readiness among businesses has clearly fueled such trend. Therefore, more needs to be done to combat such attacks in the future. Out of 25% of manufacturers surveyed by the National Center for Manufacturing Sciences that reported a cybersecurity incident in the past one year, only 8.5% of respondents saying that there were ready to deal with a cyberattack.

Automation using artificial intelligence (AI) is also becoming an important trend where it is capable to improve working conditions in the production process but can also expose organizations to additional security risks. AI can be used for quality control as it can replace traditional random or batch testing which has drawbacks as not all the goods are inspected. By utilizing AI in tandem with machine vision, quality control processes can cover 100% of the manufactured goods thus leaving no space for defective goods. Algorithms can be set to only accept goods that meet the quality criteria. All data gathered from it can then be used to get an exact number of defect rate.

As Industrial IoT (IIoT) and smart factories are becoming a major trend in manufacturing and packaging lines, it is expected that the cyber security strategy will evolve to cater critical operations and infrastructure. Evolving proprietary system will require equally skilled workforce to operate and continue to design scalable systems to match ongoing threats.

Industrial firewall is among the most commonly used protection against malwares.

SUMMARY OF THE US PACKAGING AND CONVERTING MACHINERY INDUSTRY

The remainder of this section analyses the results of the 2020 State of the Industry Report, including market size, value of production, import and export values, and order backlogs. Production value for domestic shipments is segmented by machinery category, industry sector and customer type and forecasts are provided to 2026. Detailed statistics are provided for each machinery type, including segmentation by industry sector and customer type.

TABLE 1 - Summary of the US Packaging and Converting Machinery Industry Results, 2015 - 2020

REVENUES ($ MILLIONS)

	2015	2016	2017	2018	2019	2020	Change (%)
US Packaging Machinery Production - Domestic Shipments*	$6,756	$6,960	$7,441	$7,910	$8,237	$9,446	14.7%
US Packaging Machinery Production - Total Shipments	$7,493	$7,635	$8,094	$8,647	$8,862	$10,139	14.4%
The US Packaging Machinery Market	$8,594	$9,033	$9,546	$10,427	$10,801	$12,355	14.4%
Exports**	$737	$674	$654	$737	$626	$693	10.7%
Imports**	$1,838	$2,072	$2,105	$2,516	$2,564	$2,909	13.4%
Packaging Order Backlog as of December 31*	$2,606	$2,178	$2,508	$2,409	$2,566	$3,139	22.3%
The US Converting Machinery Production - Domestic Shipments	$757	$772	$787	$813	$842	$972	15.5%
Converting Order Backlog as of December 31*	$157	$165	$153	$285	$304	$341	12.2%

*2015 - 2019 data as shown in previous PMMI State of the Industry Studies **Source: US Census Bureau, Packaging Machinery (HS 8422.20 – 8422.40)*
Data issued: June 2021 Source: Omdia

- The value of domestic shipments of US-produced packaging machinery is estimated to have been worth $9.4 billion in 2020. This represented 14.7% growth from 2019.

(To support this estimate, questionnaires were issued to packaging machinery suppliers to collect 2020 revenue data for US-produced machinery that was sold in the US. Questionnaire data was aggregated and estimates were made for the value of machinery produced that was not captured in the questionnaires.)

> ***Important note:*** Domestic shipments of US-produced machinery are the basis for segmentation in this report due to the way data was reported.

- Total US production of packaging machinery is estimated to have been worth %10.1 billion in 2020. This represented 14.4% growth from 2019.

(This has been compiled from the above estimated value of domestic shipments of US-produced machinery and the value of US packaging machinery exports, according to the US Census Bureau as explained on the following page.)

- The US market for packaging machinery is estimated to have been worth $12.4 billion in 2020. This represented 14.4% growth from 2019.

(This has been compiled from the above estimated value of domestic shipments of US-produced machinery and the value of US packaging machinery imports, according to the US Census Bureau as explained on the following page.)

- According to the US Census Bureau, in 2020 US packaging machinery exports were worth $693 million and imports were worth $2.9 billion. Imports grew by 13.4% between 2019 and 2020, higher than the growth of exports (10.7%).

(For consistency and comparability to previous editions of this report, Omdia has sourced packaging machinery import and export data from the US Census Bureau, as defined by HS codes 8422.20 – 8422.40.)

- The value for packaging machinery is estimated to have been worth $3.1 billion as of 31 December 2020. This represented a 22.3% increase from 2019.
- The value of converting machinery order backlog is estimated to have been worth $341 million as of 31 December 2020. This represented a 12.2% increase from 2019.

Order backlogs may suggest the outlook for future revenues; however, they must be interpreted with caution. While it is taken into account for assessing future demand, order backlogs are just one element of the forecasting process and alone cannot accurately indicate the strength and direction of a market. Strong order backlog growth does not necessarily precede a year of strong growth in shipments and revenues and, similarly, negative order backlog growth does not necessarily result in a decline in revenues the following year

(Order backlog is for domestic shipments of US-produced machinery only due to the way data has been reported, i.e. export order backlogs are not included.)

US PACKAGING MACHINERY PRODUCTION

The table below presents the estimated value of US packaging machinery produced in 2020 from this PMMI study and that from previous PMMI State of the Industry studies for the years 2015 to 2020. Values are presented for both total US packaging machinery produced (total shipments) and US-produced packaging machinery sold in the US (domestic shipments).

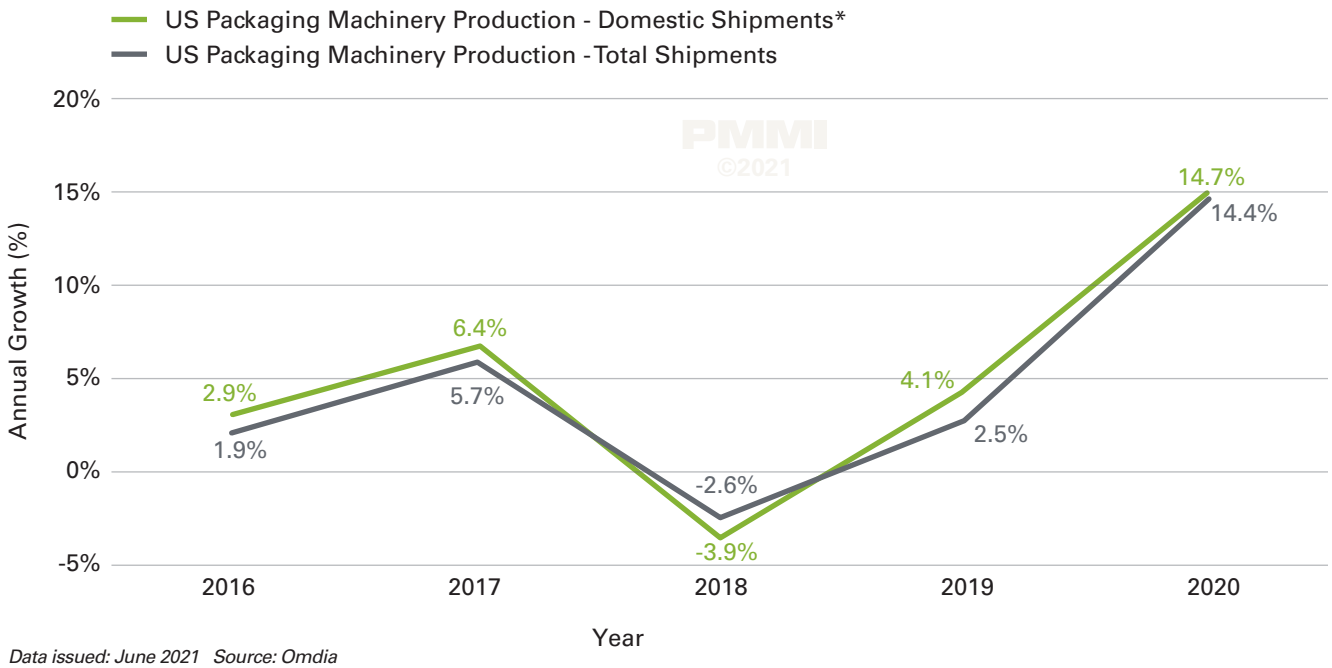
Segmentation by machinery type and a discussion of trends affecting each sector is provided later in this report.

Table 2 US Packaging Machinery Production, 2015 - 2020 (Millions of Dollars)

		2015	2016	2017	2018	2019	2020	CAGR (15-20)
US Packaging Machinery Production - Domestic Shipments*	Revenues ($ millions)	$7,513	$7,731	$8,228	$7,910	$8,237	$9,446	4.7%
	Annual Growth		2.9%	6.4%	-3.9%	4.1%	14.7%	
US Packaging Machinery Production - Total Shipments*	Revenues ($ millions)	$8,250	$8,406	$8,881	$8,647	$8,862	$10,139	4.2%
	Annual Growth		1.9%	5.7%	-2.6%	2.5%	14.4%	

**2015 - 2019 data as shown in previous PMMI State of the Industry Studies Data issued: July 2021 Source: Omdia*

FIGURE 1 US Packaging Machinery Production, Annual Growth 2016-2020



Data issued: June 2021 Source: Omdia

US ORDER BACKLOG OF PACKAGING AND CONVERTING MACHINERY

***Note:** Order backlog values are for the US market only (i.e. export order backlogs are not included).*

The table below presents the estimated value of US packaging machinery order backlogs as of 31 December 2020 from this Omdia study and that from previous PMMI State of the Industry studies as of 31 December for 2015 to 2019.

The percentages shown for 'Proportion of US Production – Domestic Shipments' represent US order backlogs as a proportion of US production of packaging machinery sold in the US.

The value of order backlog of packaging machinery is estimated to have been worth $3.1 billion as of 31 December 2020. This is equivalent to 33.2% of the value of US-produced packaging machinery sold in the US in 2020.

The value of order backlog of converting machinery is estimated to have been worth $341 million as of 31 December 2020. This is equivalent to 35% of the value of US-produced packaging machinery sold in the US in 2020.

The May 2021 PMI® (Manufacturing Purchasing Managers' Index) registered 61.2 percent, up 0.5 percentage points from the May 2021 reading of 60.7 percent, but down from its peak of 64.7 percent in March 2021.

An index value above 50 percent indicates a positive development in the manufacturing sector, whereas a value below 50 percent indicates a negative situation. This figure indicates expansion in the overall economy for the twelfth straight month after contracting in May 2020.

Beginning in June 2020 the manufacturing sector in the US entered an expansion cycle after the initial disruption caused by the coronavirus (COVID-19) pandemic.

Table 3 - US Order Backlog of Packaging Machinery, 2015 - 2020 Revenues ($ millions)

Order Backlog*	2015	2016	2017	2018	2019	2020	CAGR(15-20)
Revenues ($ millions)*	$2,606	$2,178	$2,508	$2,409	$2,566	$3,139	3.8%
Annual Growth	14.1%	-16.4%	15.2%	-4.0%	6.5%	22.3%	
Proportion of US Production - Domestic Shipments	34.7%	28.2%	33.7%	30.4%	31.2%	33.2%	

**2015 - 2019 data as shown in previous PMMI State of the Industry Studies Data issued: June 2021 Source: Omdia*

Table 4 - US Order Backlog of Converting Machinery, 2015 - 2020 Revenues ($ millions)

Order Backlog	2015	2016	2017	2018	2019	2020	CAGR(15-20)
Revenues ($) Millions	$157	$165	$153	$285	$304	$341	16.8%
Annual Growth	-7.1%	5.3%	-7.3%	86.1%	6.5%	12.2%	
Proportion of US Production Domestic Shipments	20.7%	21.4%	19.5%	35.0%	36.1%	35.0%	

**2015 - 2019 data as shown in previous PMMI State of the Industry Studies Data issued: June 2021 • Source: Omdia*

US PACKAGING AND CONVERTING MACHINERY SHIPMENTS BY INDUSTRY SECTOR

Important note: Domestic shipments of US-produced packaging and converting machinery are the basis for segmentation in this report due to the way data was reported. From here on in this study, these are referred to as solely as "shipments", unless otherwise stated. The following section provides segmentation of the US packaging and converting machinery by industry sector in 2020 in terms of revenue.

Table 5 - US Packaging Machinery Shipments by Industry Sector, 2020 - 2026

Revenues ($ millions)	Share in 2020	2019	2020	2021	2022	2023	2024	2025	2026	CAGR 20-26	DIFF 20-26
Beverages	20.9%	1,744	1,972	2,153	2,319	2,444	2,559	2,692	2,799	6.0%	827.5
			13.1%	9.2%	7.7%	5.4%	4.7%	5.2%	4.0%		
Food (including nutraceuticals)	40.2%	3,237	3,802	4,084	4,301	4,499	4,655	4,809	4,953	4.5%	1,151.7
			17.4%	7.4%	5.3%	4.6%	3.5%	3.3%	3.0%		
Household, Industrial & Agricultural Chemicals	8.5%	688	805	894	957	1,023	1,075	1,127	1,182	6.6%	376.9
			17.0%	11.1%	7.0%	6.9%	5.1%	4.8%	4.9%		
Personal Care, Toiletries & Cosmetics	7.2%	614	679	713	745	771	795	819	841	3.6%	161.5
			10.7%	5.0%	4.5%	3.5%	3.0%	3.0%	2.7%		
Pharmaceuticals	8.5%	737	800	892	980	1,041	1,107	1,172	1,239	7.6%	439.1
			8.6%	11.5%	9.9%	6.2%	6.3%	5.9%	5.7%		
Other End-User Sectors	14.7%	1,217	1,389	1,480	1,537	1,594	1,665	1,718	1,780	4.2%	391.8
			14.1%	6.6%	3.8%	3.7%	4.5%	3.2%	3.6%		
Grand Total		**8,237**	**9,446**	**10,217**	**10,839**	**11,372**	**11,856**	**12,337**	**12,795**	**5.2%**	**3,349**
Annual Growth			**14.7%**	**8.2%**	**6.1%**	**4.9%**	**4.3%**	**4.1%**	**3.7%**		

Table 6 - US Converting Machinery Shipments by Industry Sector, 2020

Table 6 (Millions of Dollars)		
	2020	**Share in 2020**
Beverages	$307	31.6%
Food	$106	10.9%
Household, Industrial & Agricultural Chemicals	$10	1.0%
Personal Care, Toiletries & Cosmetics	$21	2.2%
Pharmaceuticals	$27	2.8%
Other End-User Sectors	$500	51.4%
Grand Total	**$972**	

Data issued: June 2021
Source: Omdia

The value of US domestic shipments of packaging machinery is estimated to have been worth $9.4 billion in 2020. Omdia forecasts this to grow at a CAGR of 7.0 to $12.8 billion in 2026. The value of US shipments of converting machinery is estimated to have been worth $972 million in 2020.

The largest industry sector in terms for packaging machinery is estimated to have been food (40.2% of shipment revenues) in 2020, followed by beverages (21%).

The smallest sectors are estimated to have been personal care, toiletries and cosmetics, which accounted for 7.2% of shipment revenues in 2020. The household, industrial and agricultural chemicals sector is forecast to grow the fastest to 2026, at a CAGR of 8.6%.

This is followed by the pharmaceuticals sector, which is forecast to grow at a CAGR of 8.0% through 2026. The personal care, toiletries, and cosmetics sector is forecast to experience the slowest growth to 2026, with a CAGR of 4.9%.

The largest industry sector in terms of shipment revenues for converting machinery is estimated to have been "other" end user sector (51.4% of shipment revenues) in 2020, followed by beverages (31.6%).

The smallest sector is estimated to have been household, industrial & agricultural, which accounted for 1.0% of shipment revenues in 2020.

Total Domestic Shipments of Packaging Machinery } **$9.4** Billion in 2020

Total Shipments of Converting Machinery } **$972** Million in 2020

The largest industry sector in terms of shipment revenues for converting machinery is estimated to have been "other" end user sector (51.4% of shipment revenues) in 2020, followed by beverages (31.6%).

THE BEVERAGE INDUSTRY SECTOR

The beverage industry will be largely influenced by the wider economic and demographic trends that affect all consumer industries, such as increasing population, economic development, and the growing middle class with higher disposable income. Alongside these, there are also trends specific to the beverage sector.

The most popular beverage types are alcoholic beverages, bottled waters, coffee, and carbonated soft drinks (CSDs). In North America, demand for CSDs has been declining over the last decade. During this period, consumers have become more health conscious, which has driven the shift away from CSDs with high sugar content to low calorie/sugar content beverages. More recently, demand for zero-calorie CSDs, which were perceived as a healthier option, has been hurt due to concerns around the health implications of artificial sweeteners used in calorie-free CSDs (e.g. aspartame). Meanwhile, consumer demand for the use of natural sweeteners, such as stevia, agave, raw honey, dates, monk fruit, and others has increased substantially.

In recent years, the size of drinks being offered to consumers has been changing. Coca-Cola, the world's largest beverage company, has launched new, smaller sizes of cans and bottles. As well as simply giving consumers more variety, it enables them to compete with cheaper alternatives without devaluing the brand. It also may appeal more to consumers with concerns over the healthiness of carbonated drinks, as there is less liquid per can or bottle.

The future remains bright for the water category, particularly as consumer demand for enhanced waters and sparkling waters remains strong. The bottled water portion of the market has seen rapid growth in recent years, well above that of still water and CSDs. Flavored and sparkling (carbonated) water offerings have expanded tremendously from brands such as La Croix, Waterloo, Spindrift, and Bubly, among others. These beverages offer health conscious consumers an alternative to sugary beverages and promote health benefits by enhancing the water with vitamins, amino acids, and other natural ingredients. Such initiatives are a necessity in North America, where the beverage industry is mature, and there is concern about the healthiness of carbonated drinks. As there is an emphasis on healthy lifestyles, growth continues to be relatively strong for bottled water, fruit juices, and health drinks.

Demand for increased efficiency is also affecting beverage packaging, which offers benefits across the supply chain from the factory to the consumer. Having smaller, more efficient packaging means both more convenience for the consumer and more savings on packaging, transport, and storage for suppliers. For example, significantly smaller, ultra-concentrated juice bottles have grown in popularity in recent years as a replacement for two-liter bottles.

Other segments that are forecast for strong growth include energy/sports drinks and coffee. Craft beers and iced teas are also gaining popularity.

Trend to PET bottles

Demand for improved sustainability, reduced product weight, and even aesthetics are driving a trend toward PET bottles. However, Omdia is seeing a counter trend in select regions with some manufacturers shifting back toward glass due to a strong demand for premium beverages such as water, alcohol, cold brew coffees, and health drinks with glass packaging. Sustainability and rising environmental concerns influence product packaging that is recyclable, biodegradable, or compostable packaging material. Refill packs such as plastic pouches or flexible packaging are also gaining momentum in the market.

Legislation

Various legislation aims to ensure that the food and beverage supply is safe from contaminants. Traceability of food and beverage through the supply chain is a key part of this.

In Europe, the Falsified Medicines Directive (FMD) requires the serialization of packages to enable traceability of drugs throughout the supply chain. This includes the mandate that packaging will include 2D data matrix (barcode) and an anti-tamper device (ATD). The deadline for meeting the FMD legislation was the February of 2019, though only 15% of products were estimated to be in compliance at that point in time.

Similarly, in North America Section 204 (Enhanced Tracking and Tracing of Food and Recordkeeping) of the Food Safety Modernization Act (FSMA) requires businesses to be able to, at minimum, identify the immediate supplier and recipient (other than retailers to consumers) of a product.

The China Food and Drug Administration (CFDA) implemented its Electronic Drug Monitoring Network on 31 December 2015 as part of it plans to enable traceability of all drug products throughout the supply chain. This legislation mandated that serial numbers be assigned centrally by the government, and all transactions be reported. This legislation was quickly halted by the Chinese government in February 2016 causing confusion for pharmaceutical manufacturers in the region. The CFDA released an update that it would be revising the

Pharmaceutical Quality Management Specification, alluding to future serialization requirements. Possible revisions include alignment with serialization standards in other regions such as 2D data matrix (GS1 Compliant) barcodes used in the US and Europe and the ability for companies to generate their own codes instead of having them generated centrally by the government.

Introduction of the legislation stimulated investment by producers to comply. Additionally, stricter regulation has increased the cost of machinery maintenance and production, which will bolster future investment in the food and beverage sectors. For example, there is greater demand for machinery to include cleaning systems which make the machinery more hygienic and easier to clean. This is accomplished by (e.g. smooth surfaces, physical spaces between metal, etc. that can improve the cleanability of machinery).

Frequency of Changes to Packaging

Packaging in the food and beverage industry sectors is relatively highly susceptible to change. Consumers are increasingly becoming more discerning and demanding. Improved information on nutrition and growing consumer health conscientiousness coupled with increased travel and busier lifestyles has driven demand for different products.

This has led to the growth of indulgent yet healthy foods, convenience foods, new flavors, different portion sizes, different packaging, and completely new foods.

Changing consumer demands, coupled with the availability of real-time market information possible from social media, have made machinery that can quickly change packaging formats a high priority for producers. E-commerce has also helped to connect consumers and manufacturers to influence production of unique products or packaging.

Brands and retailers are increasingly using customized or personalized packaging to target individuals rather than using blanket marketing tactics. For example, Coke launched its “Share a Coke” campaign in summer 2014 featuring the 250 most popular names of millennials. The campaign was successful for Coke and different variations of the campaign have been brought back each summer since then. To achieve this Coke used special printers, and while the technology has not been divulged, it is speculated that digital or ink jet printing was used.

To cater for this increased demand for variety, specific equipment must be purchased. Ongoing packaging innovation (e.g. different materials, interactive packaging, various grip styles for beverage containers, etc.) and the emergence of new products are driving demand for machinery in the beverage sector.

Sustainability trends are also impacting this sector as consumers are increasingly interested in buying products made with sustainable and recyclable materials, which is driving innovative recycling methods and use of materials. For example, development of biodegradable bottles made from green fiber. Furthermore, Coca Cola UK has been working to double the amount of recycled plastic content in its bottles from 25% to 50% by 2020.

THE FOOD INDUSTRY SECTOR

There are various trends present in the food sector that affect packaging machinery.

As mentioned in the beverage industry sector section, with economic development there is a tendency towards increasingly busy lifestyles. This is fueling growth in processed convenience foods and ready to eat meals, which are perceived as convenient, but not particularly healthy options. As consumers become more health conscious, there is also a growing demand for healthy, convenient options, for example packed sliced vegetables, ready-made salads, etc. Additionally, the rise of food delivery services has further triggered the ready to eat packaging segment.

The increasing emphasis put on a healthier lifestyle drives demand for new alternatives, such as wheat-free, gluten-free, low-fat, and low-sugar products, as well as fruit and vegetables.

During the recent COVID-19 economic downturn, consumers in North America had to be more constrained with their spending. This led to the emergence and growth of value retailers (including US supplier, Dollar General and German suppliers, Aldi and Lidl). Even now that the economy is on the path of recovery, these types of companies continue to gain ground on traditional retail outlets.

Conversely, amongst some consumers there has remained a willingness to pay a premium for quality. This is visible through the continued strength of premium food retailers. Consequently, middle-market demand has been hurt as consumer trends signal a preference to either low-cost or premium food retailers.

This is reflected in consumer preferences for food products. The oligopolistic food retail sector has enabled growth in sales of low-cost, private-label goods that has increased pressure on branded food producers. These have previously been perceived as low-quality, budget foods. However, their sales have grown considerably over recent years, partly because of improved marketing and expansion of product lines, but

largely because economic conditions have increased the price sensitivity of consumers in recent years. The success of private labels has increased supermarkets' power and increased pressure on the food supply chain. Many premium brands have responded by focusing on high-quality products and differentiating their product ranges through modifications to content, packaging, and portion size to increase demand. This has driven investment in packaging machinery as producers make modifications and introduce new lines and is expected to continue as the millennial generation prefers healthy, sustainable, and premium products and are willing to pay higher prices than baby boomers.

Private label goods have been less successful in Asia in recent years as market share declined in most major countries. A key factor restricting growth include brand loyalty. Selecting a private label can represent a risk for consumers in such regions where food safety has been a major concern. Consumers tend to prefer to stick to trusted, well-established brands. However, as the middle class continues to grow rapidly in this region, food and beverage sales are expected to do the same.

As with retail in general, there is a trend towards e-commerce shopping with consumers able to have their groceries delivered to their doors. Most major grocery stores also significantly expanded their curbside pickup capabilities during the height of the COVID-19 pandemic. Shopper preferences have shifted partially as a result with some consumers continuing to solely utilize curbside pickup even as store restrictions have eased in the US.

Also, not unique to the food sector is the tendency towards more efficient and sustainable packaging. This is increasing in the food sector through the use of more easily recyclable materials, as discussed earlier in this report. This trend is evidenced by innovative sustainable packaging materials being tested across sectors such as edible and compostable packaging, and even a solution created from juice industry by-products. Additionally, consumer demand is also driving growth for reusable packaging options and in some cases food with no packaging at all. Another initiative implemented by some retailers is offering refills rather than consumers continually buying the original package, e.g. many brands offer coffee in a glass jar that can be refilled from a small, lightweight foil package.

There has been an ongoing trend in recent years towards single portions, driven by consumer lifestyle. Increased travel and busier lifestyles, in addition to growth of single-person households, have driven demand for single portion packages. Portion control is also driving sales of products in single-serve packaging. This has led to OEMs adding and modifying existing lines for the packaging of single-serve containers and has added to shipment revenues. From snack packs to single-serve style of wine packing, each design has its own packaging considerations filled with opportunities to target a new market.

HOUSEHOLD, INDUSTRIAL AND AGRICULTURAL CHEMICALS

The household chemicals market is quite distinct from the performance of industrial chemicals. In terms of product development, it is quite slow moving and is mainly dependent on the general economic performance of a region.

Traditionally, North America, Western Europe, and Japan have been major regions for this sector. However, production has shifted from these regions to other parts of the world such as the Middle East and Asia. China has become the largest producer in recent years.

The major drops in oil prices in 2014 and again in early 2020, along with the partial recovery to date, has and will continue to hinder the chemicals sector. Lower prices have increased chemical product margins due to lower feedstock prices, particularly in North America, which has benefitted from the increased domestic feedstock supply, making the region more competitive in the chemicals sector. However, the relatively low price of oil does not benefit all regions. While lower feedstock prices are generally a net benefit to North America and Europe, many Asian producers have been particularly hurt by this driving down the cost of chemical products.

Most of the trends seen in household chemicals are not unique to the sector. Diminishing brand loyalty, a willingness to buy value brands, and sustainable packaging are three such factors being seen from consumers in this sector.

Like other sectors, convenience is a key factor in the development of products in this industry as consumers lead increasingly busy lifestyles. A consequence of this is that alternatives to traditional household cleaning products are growing, such as cleaning wipes for everything from bathroom surfaces and kitchen tops to laptop computers and glasses.

The chemical industry is extremely diverse and covers a wide range of products that serve a broad array of end-user markets, such as agricultural, automotive, construction, consumer, electronics, manufacturing, and retail. The industrial chemicals market serves, in one way or another, the vast majority of manufactured goods. Therefore, the outlook for the sector is closely linked to consumer purchasing and the general health of the economy.

Consumer requirements for packaging are generally functional, at least more so than for other sectors such as food, beverage, personal care, toiletries, and cosmetics, where aesthetically pleasing packaging are typically more important.

PERSONAL CARE, TOILETRIES AND COSMETICS

The personal care, toiletries, and cosmetics industry sector is well established and mature, particularly in Europe and North America, so it tends not to change rapidly or dramatically. The importance of packaging tends to act as a differentiator, distinguishing one product from another in a saturated marketplace. For manufacturers in North America, where the market is congested and opportunity for growth limited, the greatest future opportunities will come from exports to faster growing developing regions.

There is a lot of variation in packaging types and associated costs. For lower-cost, generic products, the packaging design tends to be mostly functional, and less of a purchasing factor for a consumer. One of the notable trends in this sector is the reduction of container size while maintaining the content quantity, for example smaller aerosol containers that hold the same amount of product as the former bulkier containers. Essentially, this is simply a reduction in the amount of packaging, a trend synonymous across all sectors with the same associated benefits such as less material used, less waste, and easier and lower cost to store and transport.

In Asia, packaging size is an important factor to meet consumer demands. Manufacturers are focusing on both small packages that offer consumers the lowest cost option and large packages that offer greater value.

At the high end of the market, such as designer perfumes, packaging plays a significant part in the marketing of the product. In this area, significant investment is made on creating a bottle and box design that helps make the product stand out on the shelf and presents the image of the product. Demand in this sector is driving growth of glass packaging.

Changes in fashion also influence this market, particularly within the cosmetics sector, where major cosmetic companies are constantly placing new products into the market to entice consumers.

Similar to other sectors, the trend toward high quality products is also driving innovative packaging solutions in this industry. For example, airless pump dispensers have recently become popular in this category as they are hygienic, preserve premium ingredients from sources of light or oxidation and easily enable users to access nearly the entire contents of the packaging.

Seasonal product launches in this sector are a driver of growth for packaging machinery. Consumers have become increasingly aware of the impact that changing weather conditions, have on their hair and skin. Manufacturers are not only using the change of seasons to introduce different color themes and scents. They are also increasingly introducing products that are positioned to offer benefits demanded in the particular season. For example, a company may target a skin product that provides additional hydration for the winter and dry seasons, while having different products that protect skin from heat and UV damage or enhance tanning in the summer when sun exposure levels are high. Seasonal releases can help manufacturers drive sales and build brand loyalty. The increasingly frequent new product launches and modifications are driving demand for new machinery as well as flexibility so that machinery can be used for different product lines throughout the year.

Sustainability

An example of sustainable and efficient packaging can be seen from the handmade cosmetics company Lush, which tries to stay away from packaging altogether. By developing products that are solid, it has significantly reduced the need for packaging, which would otherwise be a necessity. Approximately 70% of its products are packaging-free, and any packaging is entirely recyclable. There are initiatives in place to encourage and reward customers for cleaning and returning containers.

Customization

Another notable trend in the cosmetics industry sector is the ability to customize products to suit consumer demands. Examples include consumers designing their own colors of lipsticks, eye shadows, etc. One eyeshadow manufacturer enables consumers to create their own palette by designing packaging with removable parts to allow consumers to select their desired colors. The next step for this company would be mass customization, where consumers could order their product with desired colors via an electronic system, and the customized order information determines which parts are packaged for the specific order. This trend is further driven by increased use of e-commerce, easily connecting consumers to customization platforms, as well as social media, where custom designs are often shared or publicly "unboxed" by consumers. Additionally, the growing popularity of personal care subscriptions such as Birchbox and Dollar Shave Club is also supporting this trend.

PHARMACEUTICALS

The pharmaceutical industry is highly concentrated and consolidated, with relatively few very big, multinational corporations dominating production. These companies are usually focused principally on pharmaceuticals, with little diversification.

As with other industries, growth will be influenced by general economic development; as more people are able to afford access to drugs, this will in turn drive growth in packaging and packaging equipment for pharmaceuticals. The relatively fast-growing levels of disposable income in China are a key factor driving particularly strong growth in this sector, while slower-growing levels of disposable income in Europe and North America are contributing to more conservative levels of growth.

Legislation

A complexity of the pharmaceutical industry, in addition to the high initial capital investment that is required, is that there are very strict regulatory controls that the companies must adhere to, making the sector challenging to thrive in and dominated by large multinationals that have the resources to meet financial and regulatory requirements.

In particular, legislation around traceability is largely affecting this sector. For instance, printing labels with high-quality graphics plus real-time variable data, such as barcodes, is challenging, particularly for pharmaceutical packaging applications, in which serialized data is essential for track and trace.

In Europe, the Falsified Medicines Directive (FMD) requires the serialization of packages to enable the traceability of drugs throughout the supply chain. This includes the mandate that packaging will include 2D codes. While until recently the deadline for meeting the FMD legislation was the start of 2020, this has now been extended to the start of 2019 to allow companies to fully implement and comply. Despite Brexit, the UK still plans to comply with this legislation.

Europe also adopted, in April 2020, the final version of the Medical Devices Regulation (MDR) and IVD Regulations, requiring unique device identification for all medical devices throughout the supply chain.

In North America, the deadlines imposed for meeting the Drug Quality and Security Act (DQSA) of 2013 will come into full force by 2023, though manufacturers had to meet serialization requirements in 2018. The regulation requires a transaction document and serialization of all prescription products, enabling the electronic transfer of specified transaction information and history through the supply chain.

Starting in 2011, the China Food and Drug Administration (CFDA) began working towards traceability throughout the supply chain resulting in the implementation of its Electronic Drug Monitoring Network on 31 December 2015. Legislation mandated that serial numbers be assigned centrally by the government and all transactions be reported, but was it quickly suspended by the Chinese government in February 2016 causing confusion for pharmaceutical manufacturers. In July 2016, the CFDA released an update that it would be revising the Pharmaceutical Quality Management Specification, alluding to future serialization requirements. Possible revisions include alignment with serialization standards in other regions such as 2D data matrix barcodes used in the US and Europe and the ability for companies to generate their own codes instead of having them generated centrally by the government, however an official update has yet to be released.

In Brazil, RDC 54, required serialization at the item and container levels as well as aggregation relationships between case and unit by December 2016, but was suspended in September 2016 before full implementation. In January 2020, new serialization law number 13.140/16 was signed appointing ANVISA, the Brazilian healthcare regulatory body, to publish regulations for the pharmaceutical industry regarding implementation. In line with the proposed schedule, ANVISA published their guidelines in April 2020. According to law 13.140/16, there will be several implementation deadlines leading up to the 2021 deadline requiring all products to be serialized and traced.

Research and development

One of the main features of the pharmaceutical industry is the extent to which research and development plays an important role. Billions of dollars are invested every year into the discovery and development of new medicines. It can often take over a decade to take a drug from inception to release, meaning that a huge amount of capital is invested long before any return is seen. Consequently, the pharmaceutical industry has one of the highest research and development budgets as a percentage of sales compared to that of any industry. The relatively frequent development and release of new medicines means that growth of the sector is more susceptible to sudden changes than other sectors.

Functional packaging

Growth and development of the pharmaceuticals sector is less driven by consumer habits than those of other sectors and more by developments in medicine and packaging technology. Similar to the chemicals sector, packaging tends to be much more functional than other industry sectors, with aesthetics of lesser importance.

As mentioned earlier in this report, there is an ageing population across many regions in Europe, the Americas, and Asia. For example, in the United States, it is predicted that the number of people aged 65 and older will more than double from now to 2060 to reach 98 million. The increased elderly population will impact the pharmaceuticals packaging industry as there will be a greater focus on easy-to-understand labeling and easy-to-open packaging. This trend is driving innovative packaging designs that maintain product quality and tamper prevention, while balancing convenience needs for older or impaired consumers. One example of a company working to balance these demands is Selig with its easy-open Lift'n'Peel packaging.

Patent cliff

Over the last several years, the pharmaceutical market has been severely hurt by the expiration of patents for a number of blockbuster drugs, also known as the patent cliff. While this has had a significant impact on revenues of some of the leading pharmaceutical suppliers, which are no longer able to charge a premium for their product, this has also resulted in competitors entering the market with low-cost products. Although this has lowered total revenue in the industry, it has also increased the number of products being sold to the market and therefore the number of different packages that are being produced. This trend is expected to continue through the forecast period as several other patents are due to expire in the next few years. An estimated $60 billion of drug sales from leading pharmaceutical companies may be at risk for competition.

Over the last several years, the pharmaceutical market has been severely hurt by the expiration of patents for a number of blockbuster drugs – also known as the patent cliff.

AN ESTIMATED

$60 bn

of drug sales from leading pharmaceutical companies will be at risk for competition.

Blockbuster drugs return

While patents for a number of blockbuster drugs have expired in recent years, the recent introduction of a wide range of new medicines is stimulating growth in the industry. COVID-19 treatments have also spurred recent drug sales.

For example, the US Food and Drug Administration (FDA) approved 53 novel drugs in 2020; the second highest number ever and just behind the record year of 59 new drugs approved in 2018. This includes breakthrough medicines for infectious disease, neurology, autoimmune, inflammatory, and lung diseases, heart diseases, and various cancers.

Some of these examples are already multi-billion-dollar medicines, and several that are not yet are expected to reach such levels in the future. The slowing of patent expiries and rise of drug launches are expected to stimulate growth in the pharmaceutical industry and demand for packaging machinery therein.

The market has also consolidated in recent years, for example the GSK acquisition of Novartis and Actavis acquiring Allergan (at approximately $66 billion), making it one of the largest pharmaceutical acquisitions ever. With a number of leading drugs now off-patent, additional acquisitions are expected, as large multinationals look to add new technologies and revenue streams.

Cabinet-less packaging machinery

The innovative, frequently changing pharmaceuticals industry is typically one of the most open to adopting new technologies. One of the recent developments in this sector is packaging machinery without electrical cabinets, also referred to as cabinet-less machinery. This is possible by having the servo modules within the decentralized control architecture for robots, significantly reducing the number of electronic parts. Benefits of this include lower maintenance costs (due to reduced electronics) and greater efficiency and availability and use of identical system parts.

This innovative technology has initially been positioned into the pharmaceutical industry sector. Should it prove to be successful, solutions may later be introduced to other sectors that are typically slower to adopt new technologies. The entire pharmaceutical industry is expected to be more open to the adoption of Industry 4.0 technology. Previously, Rockwell Automation and GE Healthcare announced a collaboration that combines Rockwell technology with GE Healthcare's FlexFactory single use biomanufacturing equipment. The goal of the collaboration is to deliver a flexible and scalable platform that enables pharmaceutical companies to manufacture smaller batches of tailored medicines. Specifically, the two companies will digitize batch files and will also enable them to deliver instructions to workers with augmented reality (AR) to improve batch execution, operations, and equipment setup and training. Omdia expects these technologies will be deployed into certain types of pharmaceutical packaging machineries which require high focus on accuracy, hygiene, and traceability such as the bottling and seal, or glass swap packaging.

US PACKAGING AND CONVERTING MACHINERY SHIPMENTS BY CUSTOMER TYPE

The following section provides segmentation of US shipments of packaging and converting machinery by customer type in 2020, in terms of revenues. A new segment, OEMs, was added to the survey this year to better reflect the various sales channels within the market.

As previously mentioned, the value of US domestic shipments of packaging machinery is estimated to have been worth $9.4 billion in 2020. Unsurprisingly, the largest customer type in terms of shipment revenues is estimated to have been end-users, which accounted for 69.1% of shipment revenues.

The second-largest customer type is estimated to have been distributors / dealers in 2020, which accounted for 18.7% of revenue. Sales to OEM's ranked third with 10.3% of the market and only a small proportion (2.3%) of revenues were to "other" customer types.

While end users were the largest customer type for all machinery categories, there was some variation.The proportion of shipments to end users in 2020 was particularly lower than average for the following machinery categories:

- Case / tray sealing machines
- Case erecting / tray forming machines
- Cleaning, sterilizing, cooling, and drying machines
- Closing, seaming, and sealing machines
- Coding machines
- Dating, printing, marking, stamping, and imprinting machines
- Labeling machines (product identification, decorating)
- Specialty packaging machines
- Wrapping / banding / bundling machines

The second-largest customer type in packaging and converting is estimated to have been distributors / dealers in 2020.

18.7% in packaging machinery > 10.6% converting machinery

Table 7 - US Packaging Machinery Shipments by Customer Type, 2020

Table 7 (Millions of Dollars)

	2020	Share in 2020
OEMs	$983	10.4%
End-Users	$6,437	68.1%
Distributors/Dealers (including agents)	$1,848	19.6%
Other	$178	1.9%
Grand Total	**$9,446**	

Data issued: June 2021 *Source:Omdia*

Figure 7

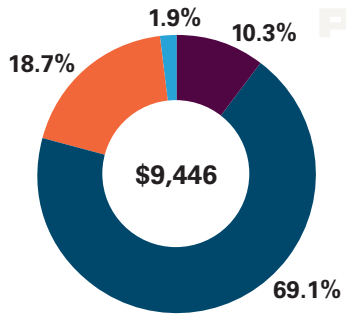
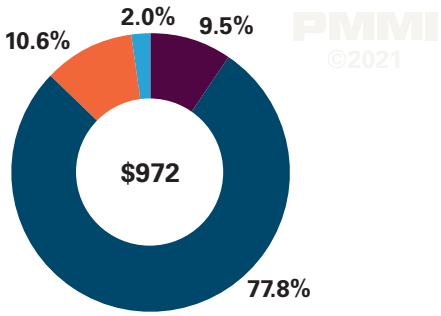


Table 8 - US Converting Machinery Shipments by Customer Type, 2020

Table 8 (Millions of Dollars)		
	2020	**Share in 2020**
OEMs	$92	9.5%
End-Users	$756	77.8%
Distributors/Dealers (including agents)	$103	10.6%
Other	$20	2.0%
Grand Total	**$972**	

Data issued: June 2021 *Source:Omdia*

Figure 8



SEGMENTATION OF THE PACKAGING AND CONVERTING MACHINERY MARKET

The 31 machinery types defined later in the report are presented in 11 consolidated machinery categories listed below.

Machinery Category and Machinery Type

Bottling Line Machinery
Accumulating / Collating Machines
Cleaning, Sterilizing, Cooling and Drying Machines
Feeding Machines
Orienting and Unscrambling Machines

Cartoning Machinery
Cartoning Machines

Case / Tray Handling Machinery
Case / Tray Sealing Machines
Case / Tray Loading / Unloading Machines
Case Erecting / Tray Forming Machines
Case Group / Load and Close / Seal Machines

Closing Machinery
Capping, Overcapping and Lidding Machines
Closing, Seaming and Sealing Machines

Filling and Dosing Machinery
Filling and Closing Machines
Filling – Dry / Powder / Solid Product Machines
Filling – Liquid / Gas / Viscous Product Machines

Form / Fill / Seal Machinery
Form / Fill / Seal – Horizontal Machines
Form / Fill / Seal – Vertical Machines

Labeling, Decorating and Coding Machinery
Coding Machines
Dating, Printing, Marking,Stamping and Imprinting Machines
Labeling Machines (Product Identification, Decorating)

Palletizing Machinery
Pallet Unitizing Machines
Palletizing – Ancillary Machines
Palletizing – Depalletizing Machines

Wrapping and Bundling Machinery
Wrapping / Banding / Bundling Machines

Other Machinery
Blister Skin / Vacuum Packaging Machines
Conveying Machines
- Roller Conveyors
- Tabletop Chain Conveyors
- Belt Conveyors

Inspecting, Detecting and Checkweighing Machines
Specialty Machines
Other Machines

Converting Machinery
Container /Material Machines

SECTION THREE

US PACKAGING AND CONVERTING MACHINERY BY CATEGORY & TYPE

US PACKAGING AND CONVERTING MACHINERY SHIPMENTS BY MACHINERY CATEGORY

The following section provides segmentation of US shipments of packaging machinery by machinery category in terms of revenues, units and ASPs. Forecasts are presented to 2026. A discussion of trends affecting each machinery category is also provided.

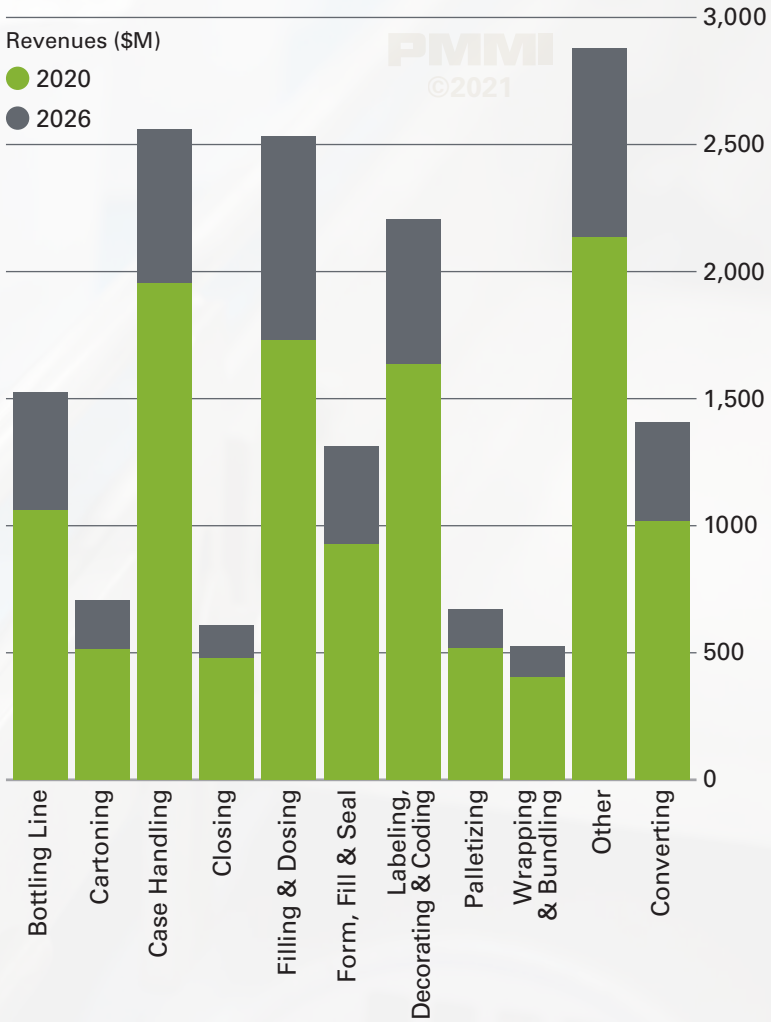
In this section, the 31 machinery types analyzed in this report have been organized into 11 categories, which are defined in earlier in this report.

As previously mentioned, the value of US domestic shipments of packaging machinery is estimated to have been worth $9.4 million in 2020, and Omdia forecasts this to grow at a CAGR of 5.2% to $12.8 billion in 2026.
The value of US shipments of converting machinery is estimated to have been worth $972 million in 2020.

The largest categories in 2020 in terms of shipment revenues are estimated to have been other machinery (17.0% of shipment revenues), case handling machinery (15.6%), and filling & dosing machinery (13.8%).

The filling and dosing, bottling line, and form, fill and seal machinery types are forecast to grow the fastest of all machinery categories to 2026, with CAGRs of 6.5%, 6.1%, and 5.9%, respectively.

FIGURE 9 US Packaging Machinery Shipments by Machinery Category, 2020 and 2026



US PACKAGING PACKAGING AND CONVERTING MACHINERY SHIPMENTS BY MACHINERY CATEGORY - 2020-2026

Table 9 US Packaging Machinery Shipments by Machinery Category, 2020 - 2026
(Revenues - Millions of Dollars, Units - Thousands, and ASPs - Dollars)

		Share in 2020	2019	2020	2021	2022	2023	2024	2025	2026	CAGR 20-26	DIFF 20-26
Bottling Line	Revenues ($ M)	8.5%	801	883	964	1,035	1,098	1,153	1,207	1,260	6.1%	377.4
	Units (k)		9	10	11	11	12	12	12	12	3.3%	2.2
	ASP ($)		85,388	86,966	88,632	91,504	94,426	97,364	99,647	101,902	2.7%	14,935.9
Cartoning	Revenues ($ M)	4.1%	371	429	458	479	495	508	523	537	3.8%	107.7
	Units (k)		3	4	4	4	4	4	4	4	3.3%	0.8
	ASP ($)		116,281	118,326	117,925	118,539	119,286	120,224	120,972	121,743	0.5%	3,417.1
Case/Tray Handling	Revenues ($ M)	15.6%	1,378	1,624	1,748	1,842	1,922	1,994	2,061	2,123	4.6%	499.8
	Units (k))		11	12	13	14	14	14	15	15	3.4%	2.7
	ASP ($)		130,981	133,243	133,794	135,617	137,723	140,199	141,690	142,940	1.2%	9,697.2
Closing	Revenues ($ M)	3.8%	359	401	427	445	460	472	483	494	3.5%	92.6
	Units (k)		9	10	11	11	11	11	12	12	3.3%	2.1
	ASP ($)		39,995	40,724	40,495	40,630	40,836	41,149	41,209	41,274	0.2%	549.8
Filling & Dosing	Revenues ($ M)	13.8%	1,266	1,437	1,581	1,695	1,802	1,904	2,003	2,099	6.5%	661.8
	Units (k)		8	9	10	10	11	11	11	11	3.3%	2.0
	ASP ($)		149,925	152,614	156,682	161,623	167,370	173,672	178,682	183,522	3.1%	30,908.8
Form, Fill & Seal	Revenues ($ M)	7.4%	664	770	840	895	944	987	1,037	1,083	5.9%	313.8
	Units (k)		4	5	5	5	5	5	5	6	3.5%	1.0
	ASP ($)		165,273	168,175	171,138	175,007	179,441	184,017	188,694	192,922	2.3%	24,746.5
Labeling, Decorating & Coding	Revenues ($ M)	13.1%	1,194	1,363	1,471	1,555	1,627	1,694	1,761	1,826	5.0%	463.6
	Units (k)		49	55	59	62	64	65	67	68	3.5%	12.8
	ASP ($)		24,203	24,634	24,770	25,137	25,563	26,067	26,455	26,826	1.4%	2,191.4
Palletizing	Revenues ($ M)	4.1%	377	429	460	487	506	521	537	550	4.2%	120.7
	Units (k)		4	4	4	4	5	5	5	5	3.4%	0.9
	ASP ($)		105,087	106,966	106,915	108,813	109,931	111,185	111,776	112,167	0.8%	5,201.0
Wrapping & Bundling	Revenues ($ M)	3.2%	284	335	359	377	392	405	418	429	4.2%	93.9
	Units (k)		6	7	8	8	8	9	9	9	3.5%	1.7
	ASP ($)		45,160	45,940	45,849	46,258	46,742	47,360	47,661	47,878	0.7%	1,938.1
Other	Revenues ($ M)	17.0%	1,543	1,776	1,909	2,028	2,127	2,219	2,308	2,393	5.1%	617.2
	Units (k)		38	43	46	48	50	51	52	53	3.3%	9.4
	ASP ($)		40,235	40,947	41,068	41,968	42,843	43,879	44,612	45,321	1.7%	4,374.9
Total	**Revenues ($ M)**		**8,237**	**9,446**	**10,217**	**10,839**	**11,372**	**11,856**	**12,337**	**12,795**	**5.2%**	**3,349**
	Annual Growth			**14.7%**	**8.2%**	**6.1%**	**4.9%**	**4.3%**	**4.1%**	**3.7%**		
	Units (k)		**142**	**160**	**171**	**178**	**183**	**187**	**191**	**195**	**3.4%**	**36**
	Annual Growth			**12.5%**	**7.2%**	**4.1%**	**2.8%**	**1.9%**	**2.4%**	**2.2%**		
Converting	Revenues ($ M)	9.3%	842	972	1,049	1,110	1,161	1,206	1,252	1,294	4.9%	322.5
	Units (k)		18	20	22	23	23	24	24	25	3.4%	4.5
	ASP ($)		46,664	47,487	47,793	48,616	49,482	50,454	51,156	51,805	1.5%	4,318.8
Grand Total	**Revenues ($ M)**		**9,078**	**10,418**	**11,265**	**11,949**	**12,533**	**13,062**	**13,588**	**14,089**	**5.2%**	**3,671**
	Annual Growth			**14.8%**	**8.1%**	**6.1%**	**4.9%**	**4.2%**	**4.0%**	**3.7%**		
	Units (k)		**160**	**180**	**193**	**201**	**207**	**211**	**216**	**220**	**3.4%**	**40**
	Annual Growth			**12.6%**	**7.2%**	**4.1%**	**2.8%**	**1.9%**	**2.4%**	**2.1%**		

ASP - average selling prices (further explained in Appendix A Data issued: June 2021 Source: Omdia

US PACKAGING AND CONVERTING MACHINERY DOMESTIC SHIPMENTS BY MACHINERY TYPE

The following section provides segmentation of US shipments of packaging and converting machinery by machinery type. Detailed results for each machinery type are provided later in the report.

The value of US domestic shipments of packaging and converting machinery is estimated to have been worth $10.4 Billion in 2020.

$10.4
Billion in 2020

The largest machinery categories in shipment revenues:

9.3% Converting Machinery

7.1% Conveying Machinery

6.5% Inspecting, Detecting and Checkweighing Machinery

FIGURE 10 US Packaging and Converting Machinery Domestic Shipments by Machinery Type, 2016 vs 2020

2015 - 2019 data as shown in previous PMMI State of the Industry Studies
N/A - Not available in 2014-2017 PMMI State of the Industry Studies
Data issued: June 2021
Source: Omdia

The smallest machinery types are estimated to have been cleaning, sterilizing, cooling and drying machinery, palletizing - ancillary machinery, and pallet unitizing machinery; each accounting for less than 1% of total revenues in 2020.

The value of order backlogs for packaging machinery is estimated to have been $3.1 billion as of 31 December 2020. The majority of machinery types had a healthy backlog at the end of 2020. The following machinery types had the greatest values of order backlogs, each with over $200 million:

- Cartoning machines
- Coding machines
- Conveying machines
- Form / fill / seal machines – horizontal
- Inspecting, detecting and checkweighing machines
- Specialty packaging machines
- Converting machines - container / material manufacture

The following machinery categories had the smallest values of order backlogs, each with less than $20 million:

- Blister, skin / vacuum packaging machines;
- Cleaning, sterilizing, cooling and drying machines

Table 10 - US Packaging and Converting Machinery Domestic Shipments by Machinery Type, 2015 - 2020
(Revenues - Millions of Dollars, Units - Thousands, and ASPs - Dollars)

	2015	2016	2017	2018	2019	2020	Share in 2020	Change in 2020	Backlog
Accumulating / Collating Machines	$109	$114	$122	$126	$129	$147	1.6%	13.8%	53
Blister, Skin / Vacuum Packaging Machines	$73	$78	$87	$92	$96	$107	1.1%	11.8%	16
Capping, Over-Capping, Lidding Machines (uses a closure)	$163	$172	$187	$190	$191	$215	2.3%	12.5%	74
Cartoning Machines	$332	$328	$350	$364	$371	$429	4.5%	15.7%	212
Case / Tray Sealing Machines	$181	$189	$196	$203	$207	$236	2.5%	14.0%	66
Case / Tray, Loading / Unloading Machines	$333	$341	$386	$414	$437	$526	5.6%	20.5%	157
Case Erecting / Tray Forming Machines	$259	$267	$280	$295	$306	$369	3.9%	20.7%	81
Case Group / Load and Close / Seal machine	$329	$346	$376	$405	$428	$492	5.2%	14.9%	184
Cleaning, Sterilizing, Cooling and Drying Machines	$47	$48	$51	$52	$52	$63	0.7%	20.8%	18
Closing, Seaming & Sealing Machines	$159	$161	$164	$168	$168	$186	2.0%	10.8%	28
Coding Machines	$345	$348	$373	$387	$394	$433	4.6%	9.9%	281
Conveying Machines	$530	$535	$547	$578	$597	$671	7.1%	12.4%	229
Roller Conveyors	N/A	N/A	N/A	$185	$195	$208	2.2%	7.0%	72
Tabletop Chain Conveyors	N/A	N/A	N/A	$166	$169	$200	2.1%	18.2%	58
Belt Conveyors	N/A	N/A	N/A	$227	$233	$262	2.8%	12.7%	99
Dating, Printing, Marking, Stamping and Imprinting Machines	$260	$270	$290	$299	$303	$338	3.6%	11.6%	62
Feeding Machines	$407	$422	$443	$470	$489	$528	5.6%	7.9%	45
Filling and Closing Machines	$276	$284	$315	$354	$382	$430	4.6%	12.6%	121
Filling Machines - Dry / Powder / Solid Product	$364	$379	$414	$455	$487	$557	5.9%	14.5%	90
Filling Machines - Liquid / Gas / Viscous Product	$327	$330	$362	$383	$397	$450	4.8%	13.3%	103
Form / Fill / Seal Machines - Horizontal	$341	$354	$382	$409	$431	$508	5.4%	17.7%	210
Form / Fill / Seal Machines - Vertical	$180	$184	$201	$218	$233	$262	2.8%	12.6%	84
Inspecting, Detecting and Checkweighing Machines	$377	$403	$438	$491	$528	$613	6.5%	16.2%	253
Labeling Machines (product identification, decorating)	$401	$417	$446	$475	$497	$592	6.3%	19.0%	73
Orienting, Unscrambling Machines	$110	$112	$118	$125	$130	$145	1.5%	11.2%	49
Pallet Unitizing Machines	$52	$53	$59	$61	$61	$69	0.7%	13.6%	87
Palletizing - Ancillary Machines	$52	$54	$56	$61	$64	$69	0.7%	7.7%	59
Palletizing / Depalletizing Machines	$224	$231	$235	$246	$252	$291	3.1%	15.5%	96
Specialty Packaging Machines	$263	$274	$286	$308	$322	$385	4.1%	19.4%	291
Wrapping / Banding / Bundling Machines	$261	$266	$274	$281	$284	$335	3.5%	17.8%	115
Total	**$7,512**	**$7,732**	**$8,228**	**$7,910**	**$8,237**	**$9,446**		**14.7%**	**3,139**
Converting Machines - Container / Material Manufacture	$757	$772	$787	$813	$842	$972	9.3%	15.5%	341
Grand Total	**$8,269**	**$8,503**	**$9,015**	**$8,724**	**$9,078**	**$10,418**		**14.8%**	**3,479**

2015 - 2019 data as shown in previous PMMI State of the Industry Studies *N/A - Not available in 2014-2017 PMMI State of the Industry Studies*
Data issued: June 2021 *Source: Omdia*

BOTTLING LINE MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes the filling of bottles and instead relates to the processes involved in getting the bottle to the point of filling, including cleaning, accumulating, and feeding the bottles. This also excludes PET blow molders, etc.

The value of US shipments of bottling line machinery is estimated to have been worth $883 million in 2020, about 8.5% of total packaging machinery revenues. It is forecast to grow at a CAGR of 6.1% to $1,260 million in 2026.

Demand for bottling line machinery is strongly influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). The market is experiencing increasing demand for non-alcoholic beverages as well as an increase in the number of beverage products that require diverse packaging solutions with enhanced safety features and extended shelf-life.

As bottling line production continues to evolve for matching the increase in consumer demands, manufacturers are investing in flexible equipment that allows for modification in products. Bottling line machinery is now designed to accommodate a diversified range of products.

In addition to the general trends affecting the packaging machinery market as a whole discussed earlier in this report, there are also some trends specific to bottling line machinery.

Hygiene

The increased focus on hygiene in recent years has resulted in growth in demand for cleaning machinery, which includes that used in bottling lines. As legislation has become more stringent globally (for example, through local laws such as the FSMA that was introduced in the US in 2011 and, more recently, revisions to the Food Safety Law in China in 2015), there has been more attention focused on food safety and hygiene throughout the supply chain. This has led to developments in packaging machinery and driven growth in demand for cleaning machinery in untapped markets and the replacement of machinery not meeting requirements.

Sustainability

The push for more recyclable materials in packaging is influencing this sector. The next generation of consumers will help to push this trend further for the foreseeable future as they purposefully seek out products with recyclable or renewable packaging. Recent developments include a bottle created from recycled ocean plastic. The demand for easily recyclable material (and machinery that can handle such material) in this sector is expected to continue growing. Companies need to review and address their entire sustainability equation.

Trend to PET bottles

Demands for improved sustainability, reduced product weight, and even aesthetics are driving a continued trend away from glass toward other materials, especially PET bottles. PET bottles are the primary solution for fast-growing products such as water and sports drinks and there is still a significant opportunity for growth in PET bottle use for products such as alcoholic beverages, fruit juices, dairy, etc. New PET bottles with better air barriers are expected to hit the market in the near future. This will make PET better suited for smaller sizes, such as 8 oz. PET bottles for carbonated soft drinks.

However, at the same time, evolving consumer demands toward high-end products are driving a counter trend in the US as premium vendors increasingly choose glass to differentiate their products. For example, healthy foods and beverages such as alcohol and cold brew coffees. This trend will impact struggling glass production positively, helping to limit lost market share from PET bottles in affected areas. As companies slowly move to different materials, such as PET or glass, for bottles in a wider range of applications, this will necessitate a change in machinery, boosting growth in this sector.

Flexible packaging opportunities

As discussed earlier in this report, the market for flexible packaging is growing quickly, at the expense of other packaging types. Most industry experts foresee continued growth in the flexible packaging industry, fueled by two developments: increasing consumer demands for convenient packages, and an industry push for sustainable, shelf-ready product designs.

While PET bottles have some advantages over glass, some of the same benefits can be attributed to flexible pouches when compared to PET bottles. This is especially true when comparing weight, with estimates that the weight of a pouch can be almost half that of a PET bottle. While this may have a slight negative impact over the mid to long term of the forecast period, the impact will be small.

BOTTLING LINE MACHINERY: ACCUMULATING / COLLATING MACHINERY SHIPMENTS

The value of accumulating / collating machinery shipments is estimated to have been worth 146.6 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $53.2 million.

Food was the largest industry sector in 2020, accounting for over half of total revenues (54%). This was followed by the pharmaceutical sector (16%). The personal care, toiletries and cosmetics sector was the smallest, accounting for less than 2% of revenues.

As with most machinery types, the largest customer type was end users; accounting for 76.6% of revenues.

Accumulating / Collating Machines Shipments, 2019 and 2020

Table 1.1 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$128.9	$146.6	1.4%	13.8%	$53.2

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

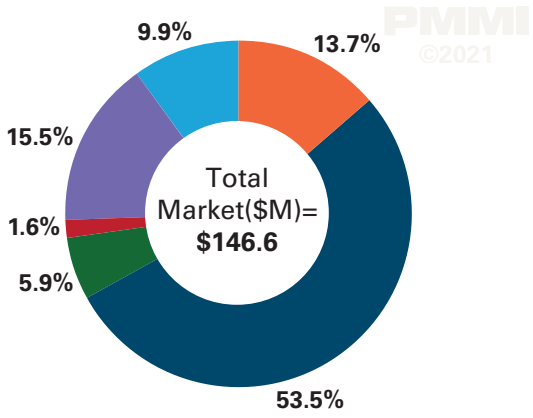
Accumulating / Collating Machines Shipments by Industry Sector, 2020

Table 1.2 (Millions of Dollars)

	2020	Share in 2020
Beverages	$20.0	13.7%
Food	$78.4	53.5%
Household, Industrial & Agricultural Chemicals	$8.6	5.9%
Personal Care, Toiletries & Cosmetics	$2.3	1.6%
Pharmaceuticals	$22.7	15.5%
Other End-User Sectors	$14.6	9.9%
Grand Total	**$146.6**	

Data issued: June 2021
Source: Omdia

Figure 1.2



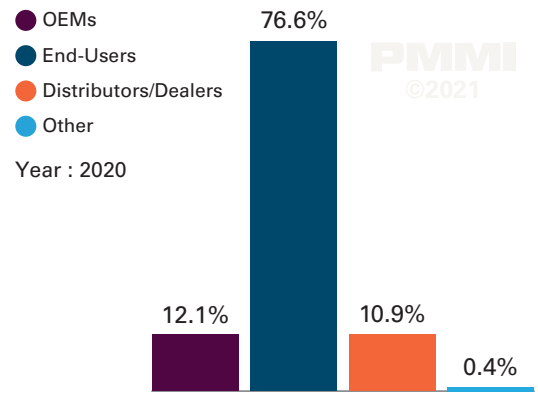
Accumulating / Collating Machines Shipments by Customer Type, 2020

Table 1.3 (Millions of Dollars)

	2020	Share in 2020
OEMs	$17.8	12.1%
End-Users	$112.3	76.6%
Distributors/Dealers (including agents)	$15.9	10.9%
Other	$0.6	0.4%
Grand Total	**$146.6**	

Data issued: June 2021
Source: Omdia

Figure 1.3



BOTTLING LINE MACHINERY: CLEANING, STERILIZING, COOLING AND DRYING MACHINERY SHIPMENTS

The value of cleaning, sterilizing, cooling and drying machinery shipments is estimated to have been worth $63.3 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $18.4 million.

The beverage industry sector was the largest in 2020, accounting for 32.2% of total revenues. This was followed by the food (including (neutraceuticals) sector (31.1%). The "other" end-user sectors category was the smallest, accounting for 2.6% of revenues.

Unlike other machinery types, the largest customer type was distributors/dealers (including agents); accounting for almost 50% of revenues.

Cleaning, Sterilizing, Cooling and Drying Machines Shipments, 2019 and 2020

Table 1.25 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$52.4	$63.3	0.6%	20.8%	$18.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

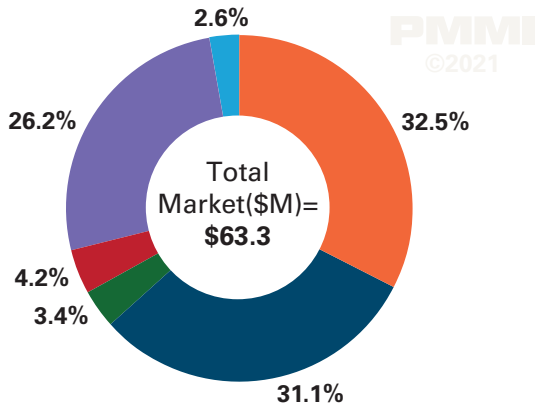
Cleaning, Sterilizing, Cooling and Drying Machines Shipments by Industry Sector, 2020

Table 1.26 (Millions of Dollars)

	2020	Share in 2020
Beverages	$20.6	32.5%
Food	$19.7	31.1%
Household, Industrial & Agricultural Chemicals	$2.1	3.4%
Personal Care, Toiletries & Cosmetics	$2.7	4.2%
Pharmaceuticals	$16.6	26.2%
Other End-User Sectors	$1.7	2.6%
Grand Total	**$63.3**	

Data issued: June 2021
Source: Omdia

Figure 1.26



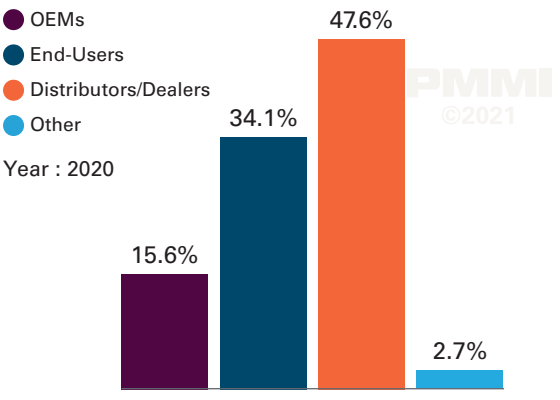
Cleaning, Sterilizing, Cooling and Drying Machines Shipments by Customer Type, 2020

Table 1.27 (Millions of Dollars)

	2020	Share in 2020
OEMs	$9.9	15.6%
End-Users	$21.6	34.1%
Distributors/Dealers (including agents)	$30.1	47.6%
Other	$1.7	2.7%
Grand Total	**$63.3**	

Data issued: June 2021
Source: Omdia

Figure 1.27



BOTTLING LINE MACHINERY: FEEDING MACHINERY SHIPMENTS

The value of feeding machinery shipments is estimated to have been worth $528.1 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $45 million.

The food industry sector was the largest in 2020, accounting for 28% of total revenues. This was followed by the beverage sector (27%). Household, industrial and agricultural chemicals and personal care, toiletries and cosmetics accounted for the smallest share of revenues at 5%.

As with most machinery categories, the largest customer type was end users; accounting for nearly 70% of revenues.

Feeding Machines Shipments, 2019 and 2020

Table 1.49 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$489.5	$528.1	5.1%	7.9%	$45.3

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

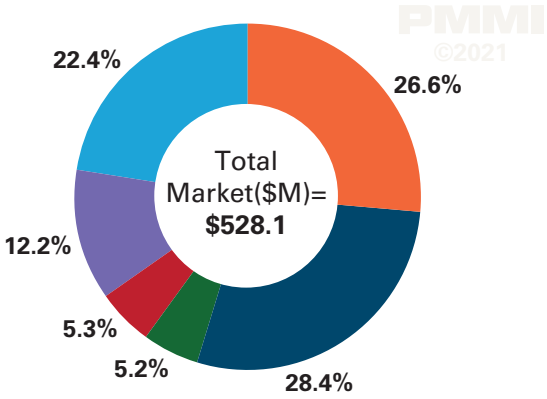
Feeding Machines Shipments by Industry Sector, 2020

Table 1.50 (Millions of Dollars)

	2020	Share in 2020
Beverages	$140.4	26.6%
Food	$149.8	28.4%
Household, Industrial & Agricultural Chemicals	$27.3	5.2%
Personal Care, Toiletries & Cosmetics	$27.9	5.3%
Pharmaceuticals	$64.3	12.2%
Other End-User Sectors	$118.4	22.4%
Grand Total	**$528.1**	

Data issued: June 2021
Source: Omdia

Figure 1.50



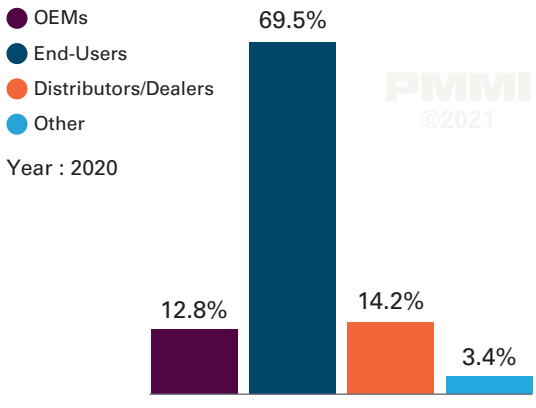
Feeding Machines Shipments by Customer Type, 2020

Table 1.51 (Millions of Dollars)

	2020	Share in 2020
OEMs	$67.7	12.8%
End-Users	$367.1	69.5%
Distributors/Dealers (including agents)	$75.1	14.2%
Other	$18.1	3.4%
Grand Total	**$528.1**	

Data issued: June 2021
Source: Omdia

Figure 1.51



BOTTLING LINE MACHINERY: ORIENTING, UNSCRAMBLING MACHINERY SHIPMENTS

The value of orienting, unscrambling machinery shipments is estimated to have been worth $144.8 million in 2020. The order backlog as of 31 December 2019 is estimated to have been worth $49.4 million.

The "other" end-user sector category was the largest in 2020, accounting for 26.5% of total revenues. This was followed by the beverages sector with 21%. The household, industrial and agricultural chemicals sector was the smallest, accounting for 11% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for over 70% of revenues.

Orienting, Unscrambling Machines Shipments, 2019 and 2020

Table 1.73 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$130.3	$144.8	1.4%	11.2%	$49.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

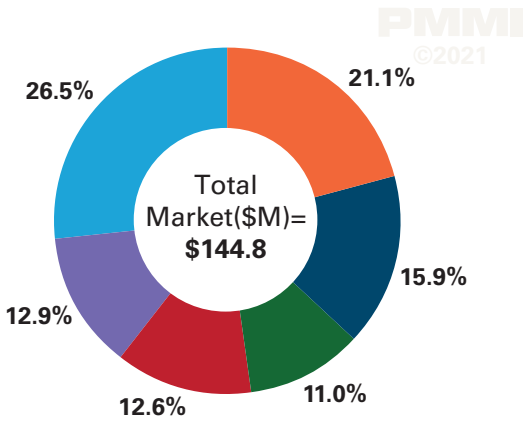
Orienting, Unscrambling Machines Shipments by Industry Sector, 2020

Table 1.74 (Millions of Dollars)

	2020	Share in 2020
Beverages	$30.6	21.1%
Food	$23.0	15.9%
Household, Industrial & Agricultural Chemicals	$16.0	11.0%
Personal Care, Toiletries & Cosmetics	$18.3	12.6%
Pharmaceuticals	$18.7	12.9%
Other End-User Sectors	$38.3	26.5%
Grand Total	**$144.8**	

Data issued: June 2021
Source: Omdia

Figure 1.74



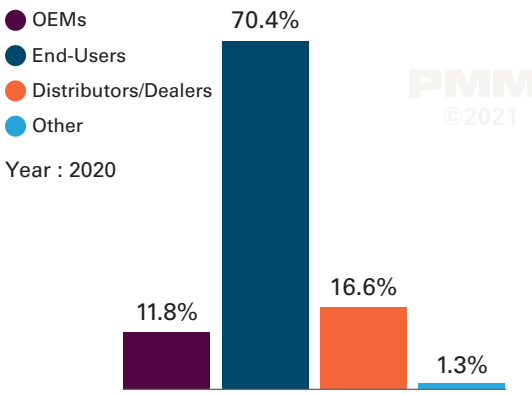
Orienting, Unscrambling Machines Shipments by Customer Type, 2020

Table 1.75 (Millions of Dollars)

	2020	Share in 2020
OEMs	$17.0	11.8%
End-Users	$102.0	70.4%
Distributors/Dealers (including agents)	$24.0	16.6%
Other	$1.8	1.3%
Grand Total	**$144.8**	

Data issued: June 2021
Source: Omdia

Figure 1.75



CARTONING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes the filling of cartons and instead relates to the erecting and loading of cartons.

The value of US shipments of cartoning machinery is estimated to have been worth $429 million in 2020, 4.1% of total packaging machinery revenues. It is forecast to grow at a CAGR of 3.8% to $537 million in 2026.

Demand for cartoning machinery is strongly influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). Growth of these industries is relatively moderate and consistent, which has contributed to the low, steady growth of this machinery category.

The Value of US Shipments of Cartoning Machinery } $429 Million in 2020 > 4.1% of Total Revenues > $537 Million in 2026 (Estimated Growth)

Demand for cartoning machinery is strongly influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). Growth of these industries is relatively consistent, which has contributed to the low, steady growth of this machinery category.

In addition to the general trends affecting the packaging machinery market as a whole, there are also some trends specific to cartoning machinery.

The cartoning machinery category is forecast to grow at a slightly slower rate than that of total packaging machinery. Several factors are expected to negatively influence growth (as has been the case in recent years), including:

- The trend to PET (as discussed earlier in this report)
- The trend to using flexible packaging as an alternative to cartons, such as pouches
- The decline in demand for cartoned beverages, such as milk

Demands for flexibility, speed & compactness

End users are increasingly demanding more flexible machines capable of running multiple material types, such as corrugated cartons and paperboard. This demand has resulted in new machine designs, replacing previous models that were only capable of handling one type of material.

As consumer demands increase and packaging designs evolve, so does cartoning machinery. Flexibility demands have also resulted in a variety of machine designs including horizontal, vertical, top, side, compact, and full size cartoners to serve different cartoning applications. Apart from machine flexible machine platform, end users increasingly demand machines that can flexibly connect with another system within the process line.

End users are also increasingly demanding quick-changeover machinery, particularly in the pharmaceuticals industry, due to the growing demand for medicines in smaller lot sizes.

Sustainability

Additionally, more precise machines are being developed that are capable of using thinner materials. This reduces material consumption and therefore product weight, ultimately reducing material and transportation costs.

Robotics

With today's robot, more flexible, dexterous, and less expensive than earlier generations, return on investment (ROI) is much faster, driving adoption in packaging applications outside of traditional palletizing applications to include functions such as cartoning, pick and place, and primary product loading. Robotics are a good alternative to fixed-automation solutions for these applications as operators can more accurately control the pressure applied to products, preventing damage of increasingly thinner packaging designs. Innovative robot applications for cartoning machines are expected to continue into the foreseeable the future.

CARTONING MACHINERY SHIPMENTS

The value of cartoning machinery shipments is estimated to have been worth $429 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $212 million.

The beverage industry sector was the largest in 2019 accounting for over 38.1% of total revenues. This was followed by the food sector (35.9%). The household, industrial and agricultural chemicals sector was the smallest, accounting for less than 1% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 77% of revenues.

Cartoning Machines Shipments, 2019 and 2020

Table 1.10 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$370.7	$429.0	4.1%	15.7%	$212.0

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

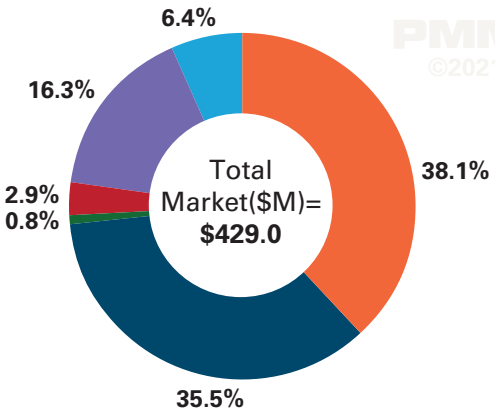
Cartoning Machines Shipments by Industry Sector, 2020

Table 1.11 (Millions of Dollars)

	2020	Share in 2020
Beverages	$163.5	38.1%
Food	$152.4	35.5%
Household, Industrial & Agricultural Chemicals	$3.3	0.8%
Personal Care, Toiletries & Cosmetics	$12.5	2.9%
Pharmaceuticals	$69.8	16.3%
Other End-User Sectors	$27.5	6.4%
Grand Total	**$429.0**	

Data issued: June 2021
Source: Omdia

Figure 1.11



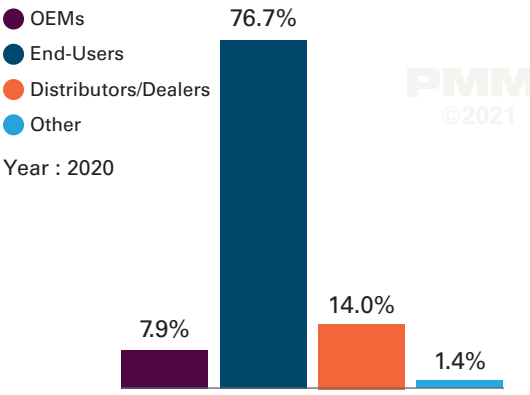
Cartoning Machines Shipments by Customer Type, 2020

Table 1.12 (Millions of Dollars)

	2020	Share in 2020
OEMs	$33.8	7.9%
End-Users	$329.2	76.7%
Distributors/Dealers (including agents)	$60.0	14.0%
Other	$5.9	1.4%
Grand Total	**$429.0**	

Data issued: June 2021
Source: Omdia

Figure 1.12



CASE/TRAY HANDLING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes cartoning machines and instead relates to the erecting and loading of cases or trays that contain other packaging products.

The value of US shipments of case handling machinery is estimated to have been worth $1.6 billion in 2020, making it the second largest of all machinery categories (behind Other machinery) with 15.6% of total packaging machinery revenues. It is forecast to grow at a 4.6% to just over $2.1 billion in 2026.

The Value of US Shipments of Case/Handling Machinery

$1.6 Billion in 2020 > 15.6% of Total Revenues > $2.1 Billion in 2026 (Estimated Growth)

Demand for case handling machinery is strongly influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). Growth of these industries is relatively moderate and consistent, which has contributed to the steady, conservative growth of this machine category.

In addition to the general trends affecting the packaging machinery market as a whole, there are also some trends specific to case handling machinery.

The trend to sustainable packaging is driving case handling machinery to become more flexible as end users are requiring the flexibility to handle both non-recycled and recycled card from the same machine. One example is in the type of tape used for sealing. It is one of the drivers for water-based tape, which in addition to forming a stronger bond, is more environmentally friendly than pressure-sensitive tape.

Additionally, sustainability is driving demand for non-heated adhesive application machinery, which eliminates the need for heat by using adhesives such as foam, ultimately saving energy and increasing safety. The amount of material being used is also being optimized to reduce waste while maintaining the integrity of the case.

There is also a trend to more flexible packaging in case handling machinery, with growth in pouches particularly strong.

In recent years, there has been a demand for cases to be retail or shelf ready. As such, instead of simple brown boxes, cases or trays are often produced with attractive graphics, tear away lids, and windows that help market the product so it can be placed directly on the shop floor. Having these cases in the eye of the customer also means there is an increased need to protect the packaging from marks and scuffing, which was less of an issue in the past. With the increase in the number of case shapes and sizes, the reduced thickness of the material, and the need for unblemished end products, automation is being used to ensure smooth acceleration and precise movements throughout the packaging process.

As with cartoning machinery, there is also a trend toward the use of pick and place robotics in case handling machinery. These robots can handle lightweight products precisely, reducing the risk of damage to products with delicate packaging associated with sustainability trends.

CASE/TRAY HANDLING MACHINERY: CASE / TRAY SEALING MACHINERY SHIPMENTS

The value of case / tray sealing machinery shipments is estimated to have been worth $236 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $66.3 million.

The food industry sector was the largest in 2020, accounting for 40% of total revenues. This was followed by the "other" end-user sectors category (29.3%). The household, industrial and agricultural chemicals sector was the smallest, accounting for 5% of revenues.

Different than all other machinery categories, the largest customer type were distributors / dealers (48.1%). Unlike for most other machinery categories, distributors / dealers are a key customer type for case / tray sealing machinery because a considerable proportion of equipment is sold by tape distributors. End-users was second and accounted for around 37.1% of revenues in 2020.

Case / Tray Sealing Machines Shipments, 2019 and 2020

Table 1.13 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$207.1	$236.0	2.3%	14.0%	$66.3

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

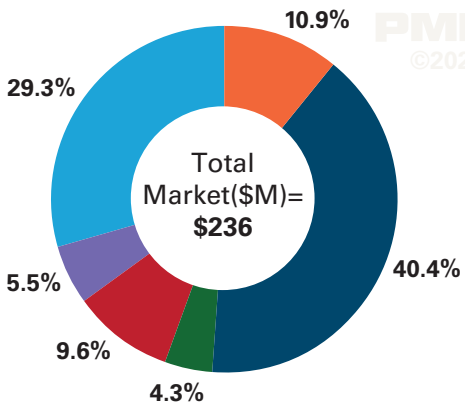
Table 1.14 - Case / Tray Sealing Machines Shipments by Industry Sector, 2020

Table 1.14 (Millions of Dollars)

	2020	Share in 2020
Beverages	$25.7	10.9%
Food	$95.4	40.4%
Household, Industrial & Agricultural Chemicals	$10.2	4.3%
Personal Care, Toiletries & Cosmetics	$22.7	9.6%
Pharmaceuticals	$13.0	5.5%
Other End-User Sectors	$69.1	29.3%
Grand Total	**$236.0**	

Data issued: June 2021
Source: Omdia

Figure 1.14



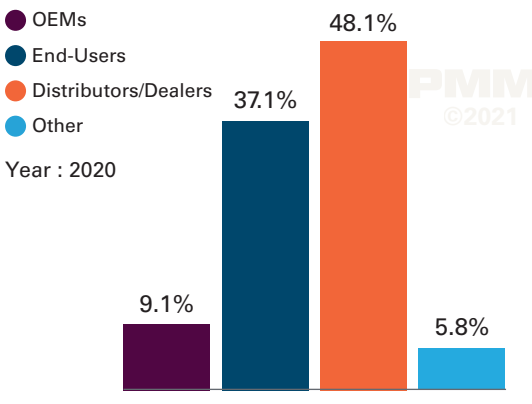
Case / Tray Sealing Machines Shipments by Customer Type, 2020

Table 1.15 (Millions of Dollars)

	2020	Share in 2020
OEMs	$21.5	9.1%
End-Users	$87.5	37.1%
Distributors/Dealers (including agents)	$113.5	48.1%
Other	$13.6	5.8%
Grand Total	**$236.0**	

Data issued: June 2021
Source: Omdia

Figure 1.15



CASE/TRAY HANDLING MACHINERY: CASE / TRAY, LOADING / UNLOADING MACHINERY SHIPMENTS

The value of case / tray, loading / unloading machinery shipments is estimated to have been worth $526.4 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $157.5 million.

The food industry sector was the largest in 2020, accounting for 54% of total revenues. This was followed by the beverage sector (22.3%). The household, industrial and agricultural chemicals sector was the smallest, accounting for 3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 76% of revenues.

Case / Tray, Loading / Unloading Machines Shipments, 2019 and 2020

Table 1.16 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$436.9	$526.4	5.1%	20.5%	$157.5

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

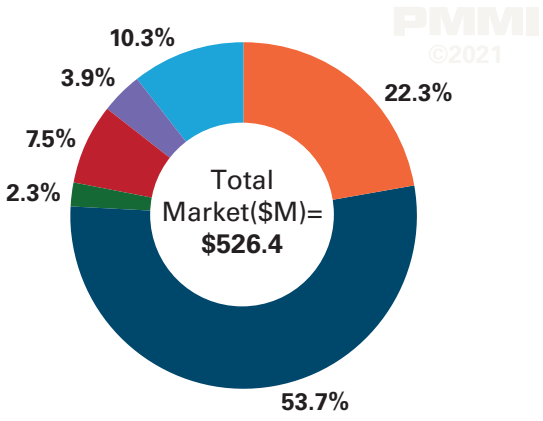
Case / Tray, Loading / Unloading Machines Shipments by Industry Sector, 2020

Table 1.17 (Millions of Dollars)

	2020	Share in 2020
Beverages	$117.2	22.3%
Food	$282.8	53.7%
Household, Industrial & Agricultural Chemicals	$12.1	2.3%
Personal Care, Toiletries & Cosmetics	$39.6	7.5%
Pharmaceuticals	$20.3	3.9%
Other End-User Sectors	$54.4	10.3%
Grand Total	**$526.4**	

Data issued: June 2021
Source: Omdia

Figure 1.17



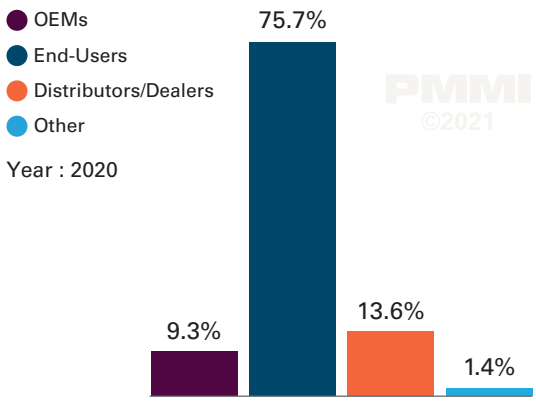
Case / Tray, Loading / Unloading Machines Shipments by Customer Type, 2020

Table 1.18 (Millions of Dollars)

	2020	Share in 2020
OEMs	$48.9	9.3%
End-Users	$398.7	75.7%
Distributors/Dealers (including agents)	$71.4	13.6%
Other	$7.4	1.4%
Grand Total	**$526.4**	

Data issued: June 2021
Source: Omdia

Figure 1.18



CASE/TRAY HANDLING MACHINERY: CASE ERECTING / TRAY FORMING MACHINERY SHIPMENTS

The value of case erecting / tray forming machinery shipments is estimated to have been worth $369.2 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $81 million.

The food industry sector was the largest in 2020, accounting for 43.8% of total revenues. This was followed by the beverage sector (28.6%). The pharmaceuticals sector was the smallest, accounting for less than 3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for nearly 50.1% of revenues. However, this is considerably below the average proportion for this customer type for all machinery categories (69.1%) due to the greater proportion of business via distributors / dealers and OEM customer types.

Case Erecting / Tray Forming Machines Shipments, 2019 and 2020

Table 1.19 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$305.9	$369.3	3.5%	20.7%	$81.0

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

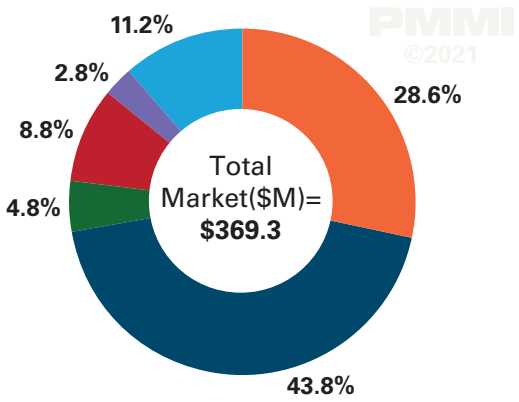
Case Erecting / Tray Forming Machines Shipments by Industry sector, 2020

Table 1.20 (Millions of Dollars)

	2020	Share in 2020
Beverages	$105.6	28.6%
Food	$161.9	43.8%
Household, Industrial & Agricultural Chemicals	$17.8	4.8%
Personal Care, Toiletries & Cosmetics	$32.4	8.8%
Pharmaceuticals	$10.2	2.8%
Other End-User Sectors	$41.4	11.2%
Grand Total	**$369.3**	

Data issued: June 2021
Source: Omdia

Figure 1.20



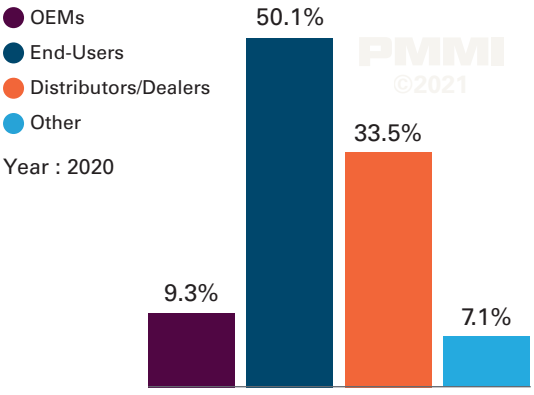
Case Erecting / Tray Forming Machines Shipments by Customer Type, 2020

Table 1.21 (Millions of Dollars)

	2020	Share in 2020
OEMs	$34.5	9.3%
End-Users	$185.0	50.1%
Distributors/Dealers (including agents)	$123.5	33.5%
Other	$26.3	7.1%
Grand Total	**$369.3**	

Data issued: June 2021
Source: Omdia

Figure 1.21



CASE/TRAY HANDLING MACHINERY: CASE GROUP / LOAD AND CLOSE / SEAL MACHINERY SHIPMENTS

The value of case group / load and close / seal machinery shipments is estimated to have been worth $492 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $184.3 million.

The food industry sector was the largest in 2020, accounting for 43% of total revenues. This was followed by the beverage sector (29%). The personal care, toiletries and cosmetics sector was the smallest, accounting for just under 3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 74% of revenues.

Case Group / Load and Close / Seal Machine Shipments, 2019 and 2020

Table 1.22 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$428.0	$491.8	4.7%	14.9%	$184.3

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

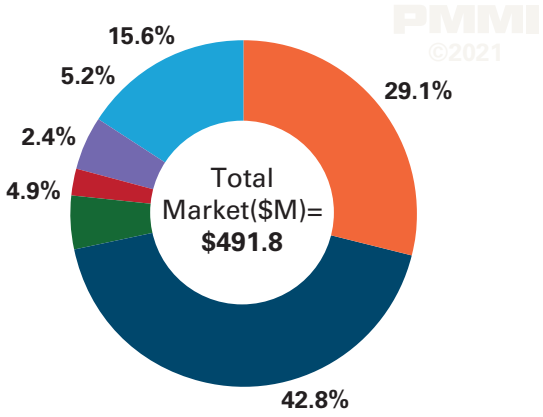
Case Group / Load and Close / Seal Machine Shipments by Industry Sector, 2020

Table 1.23 (Millions of Dollars)

	2019	Share in 2019
Beverages	$143.0	29.1%
Food	$210.4	42.8%
Household, Industrial & Agricultural Chemicals	$24.1	4.9%
Personal Care, Toiletries & Cosmetics	$11.9	2.4%
Pharmaceuticals	$25.4	5.2%
Other End-User Sectors	$77.0	15.6%
Grand Total	**$491.8**	

Data issued: June 2021
Source: Omdia

Figure 1.23



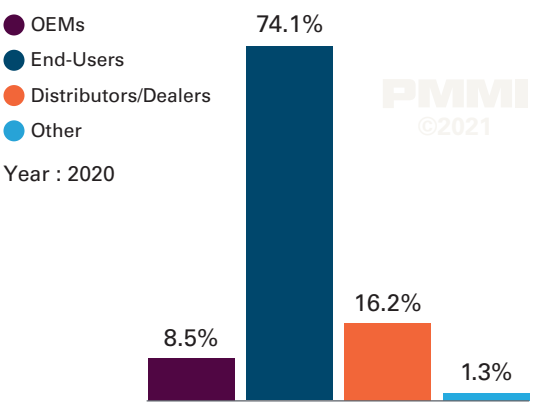
Case Group / Load and Close / Seal Machine Shipments by Customer Type, 2020

Table 1.24 (Millions of Dollars)

	2020	Share in 2020
OEMs	$41.7	8.5%
End-Users	$364.4	74.1%
Distributors/Dealers (including agents)	$79.4	16.2%
Other	$6.2	1.3%
Grand Total	**$491.8**	

Data issued: June 2021
Source: Omdia

Figure 1.24



CLOSING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes form, fill and seal machines that would include closing as part of a single multi-operation machine. This category includes a broad range of different techniques for closing/sealing filled packages, from thermoforming to capping.

The value of US shipments of closing machinery is estimated to have been worth $401 million in 2020, about 3.8% of total packaging machinery revenues. It is forecast to grow at a CAGR of 3.5% to $494 million in 2026.

The Value of US Shipments of Closing Machinery

$401 Million in 2020 > 3.8% of Total Revenues > $494 Million in 2026 (Estimated Growth)

Closing machinery is largely influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.).

In addition to the general trends affecting the packaging machinery market as a whole, there are also some trends specific to closing machinery.

Closing machinery shipments are forecast for low growth relative to the packaging machinery market as a whole. A notable factor influencing this is the ongoing replacement of closing machinery by form, fill, and seal machinery.

Market studies have shown that resealable technology has been a deciding factor in the purchase of products by consumers. While innovations have been made for packaging cheese and lunch meats, companies are broadening the implementation of this type of packaging to other food and beverage categories, for example cereal. One of the latest technologies that has been introduced is the use of audible and tactile feedback to inform the user that the package has been correctly resealed.

With increasingly stringent health and safety legislation, and producers looking to increase the shelf life of their products, it has never been more important to ensure that products are closed and sealed correctly.

Demand for ready to eat or convenience foods and sustainability trends have helped to bring about a recent surge in polypropylene demand. Benefits of using polypropylene include its light weight, clarity (allowing customers to see through to the product), affordability, sustainability, and resistance to high and low temperature, such as that in a microwave oven or a freezer, while maintaining freshness and durability. As this material satisfies many current consumer and manufacturer packaging concerns, it is expected that demand for polypropylene packaging will increase and potentially take share from PET in food packaging applications.

The trend towards sustainable packaging has been gaining momentum in the US, which has also helped to drive other changes in this market such as reduction in cap size and use of lighter materials.

Various methods have been used to seal products, including thermoforming, which includes products sealed in a normal atmosphere, or Modified Atmosphere Packaging (MAP), where gases are rebalanced to extend product life.

Similar to case sealing machinery, sustainability is driving demand for non-heated adhesive application machinery, which eliminates the need for heat by using adhesives such as foam, ultimately saving energy and increasing safety.

Within carton and case sealing, as well as tray forming, there have also been developments in melt temperature to seal packaging. Advancements have been made in the glues used (typically thermoplastic adhesives) with a lower melting point, which enables a melting device to operate at lower temperatures. Advancements also include significantly reducing energy consumption of closing machines, reduced temperatures, and shorter dwell times, which can result in both faster throughput speeds and reduced exposure of drugs and foods to unnecessary heat.

The reduction in the temperature required to seal products can also benefit the machine by reducing maintenance, as higher temperatures can result in more frequent failures of pumps and glue applicator hoses.

One widely recognized technology is ultrasonic sealing, which seals products through heat generated from friction from an oscillating tool, eliminating the need for a heating element. Its lower energy usage, and material and labor savings have made it an attractive option for manufacturers.

Such developments in sealing machinery support growth of the sector, which is bolstered by migration from other closing techniques to sealing. An example of this is the growing demand for migration from sewing to sealing for closing laminated woven polypropylene bags, which are often used to package pet food. This is driven by producers wanting superior product shelf presence, which is restricted by a sewing closure. A sealed closure better accommodates full-panel graphics and enables varied positioning on a shelf, e.g. on its side, standing up, etc. (as closure is more secure and the product is less likely to escape the package).

Consumer demographics are also very important to packaging companies. Generally, people are living longer, and ageing populations have become increasingly noticeable. This is important as an increasing proportion of packaged products are being consumed by the elderly, which also have different needs from the younger generations. For example, in recent years there has been growth in easy-open closures, which are user friendly, particularly for older consumers whose eyesight or grip may have deteriorated. Such consumers also tend to live in a household with zero to few occupants and purchase products in small quantities, which makes smaller packages more appealing. This further supports the trend to single-serve portions.

Skin packaging

Vacuum skin packaging is also popular. By having a film form around the food on a flat tray, a tight seal around the product is created. This both increases shelf life and improves the interaction the consumer has with the product, allowing a greater 3D view and the opportunity to handle the product.

Such packaging is particularly popular with wet products such as meats. In some applications, this product is forecast to increasingly compete with MAP solutions. Beyond a traditional tray sealer, such a machine must also incorporate a compressor in order to create the necessary vacuum to form the film around the food, adding to the cost of the machine. In some cases, this additional functionality was quoted as adding almost 50% to the cost of the machine.

Blister, skin / vacuum packaging machinery

Consumer convenience and ease of use factors are influencing these types of packaging machinery. An example of this is in the pharmaceuticals industry, where there is growth in demand for packages designed specifically to suit how products are consumed, such as a blister pack packaged such that it has seven rows of two capsules to indicate that two pills should be consumed each day of the week. Such demands are driving growth of new and flexible machinery.

CLOSING MACHINERY:
CAPPING, OVERCAPPING, LIDDING MACHINERY SHIPMENTS

The value of capping, over-capping, and lidding machinery shipments is estimated to have been worth $215 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $73.5 million.

The beverage industry sector was the largest in 2020, accounting for 32.9% of total revenues. This was followed by the household, industrial and agricultural chemicals sector (24.3%). The pharmaceutical end-user sectors category was the smallest, accounting for 7.2% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for approximately 70% of revenues.

Capping, Over-Capping, Lidding Machines (uses a closure) Shipments, 2019 and 2020

Table 1.7 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$191.0	$214.9	2.1%	12.5%	$73.5

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

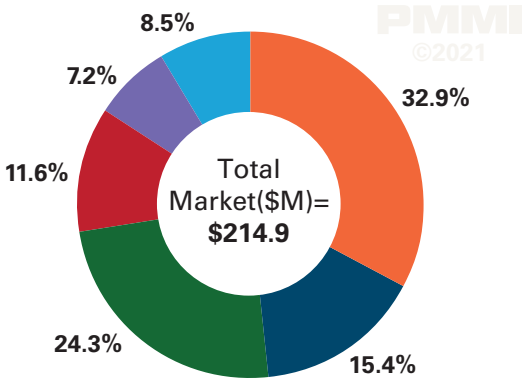
Capping, Over-Capping, Lidding Machines (uses a closure) Shipments by Industry Sector, 2020

Table 1.8 (Millions of Dollars)

	2020	Share in 2020
Beverages	$70.6	32.9%
Food	$33.2	15.4%
Household, Industrial & Agricultural Chemicals	$52.2	24.3%
Personal Care, Toiletries & Cosmetics	$25.0	11.6%
Pharmaceuticals	$15.5	7.2%
Other End-User Sectors	$18.4	8.5%
Grand Total	**$214.9**	

Data issued: June 2021
Source: Omdia

Figure 1.8



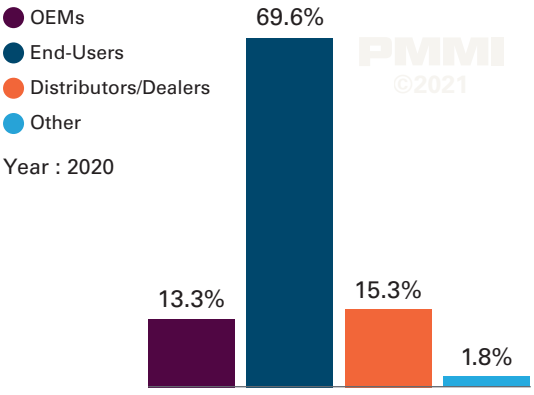
Capping, Over-Capping, Lidding Machines (uses a closure) Shipments by Customer Type, 2020

Table 1.9 (Millions of Dollars)

	2020	Share in 2020
OEMs	$28.7	13.3%
End-Users	$149.5	69.6%
Distributors/Dealers (including agents)	$32.9	15.3%
Other	$3.8	1.8%
Grand Total	**$214.9**	

Data issued: June 2021
Source: Omdia

Figure 1.9



CLOSING MACHINERY: CLOSING, SEAMING AND SEALING MACHINERY SHIPMENTS

The value of closing, seaming and sealing machinery shipments is estimated to have been worth $186 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $28 million.

The food industry sector was the largest in 2020, accounting for 42.2% of total revenues. This was followed by the "other" end-user sector category (25.5%). The personal care, toiletries and cosmetics sector was the smallest, accounting for under 2% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 52% of revenues.

Closing, Seaming & Sealing Machinery Shipments, 2019 and 2020

Table 1.28 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$168.0	$186.1	1.8%	10.8%	$28.3

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

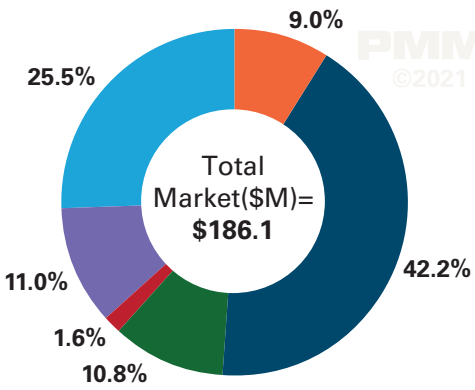
Closing, Seaming & Sealing Machinery Shipments by Industry Sector, 2020

Table 1.29 (Millions of Dollars)

	2020	Share in 2020
Beverages	$16.7	9.0%
Food	$78.5	42.2%
Household, Industrial & Agricultural Chemicals	$20.1	10.8%
Personal Care, Toiletries & Cosmetics	$2.9	1.6%
Pharmaceuticals	$20.5	11.0%
Other End-User Sectors	$47.5	25.5%
Grand Total	**$186.1**	

Data issued: June 2021
Source: Omdia

Figure 1.29



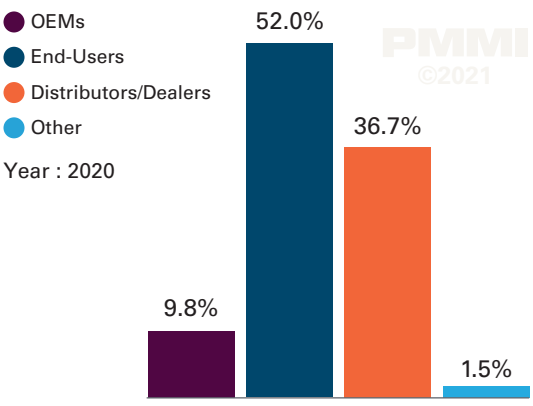
Closing, Seaming & Sealing Machinery Shipments by Customer Type, 2020

Table 1.30 (Millions of Dollars)

	2020	Share in 2020
OEMs	$18.2	9.8%
End-Users	$96.9	52.0%
Distributors/Dealers (including agents)	$68.3	36.7%
Other	$2.8	1.5%
Grand Total	**$186.1**	

Data issued: June 2021
Source: Omdia

Figure 1.30



FILLING AND DOSING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes form, fill and seal machines that would include filling as part of a single multi-operation machine.

The value of US shipments of filling and dosing machinery is estimated to have been worth $1.4 billion in 2020, which made it one of the largest machinery categories with approximately 13.8% of total packaging machinery revenues. It is forecast to grow at a CAGR of 6.5% to $2.1 billion in 2026.

The Value of US Shipments of Filling & Dosing Machinery

$1.44 Billion in 2020 > 13.8% of Total Revenues > $2.10 Billion in 2026 (Estimated Growth)

Filling and dosing machinery largely influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). However, with a smaller proportion of shipments to the food and beverage industries than the average of all machinery categories, closing machinery is more influenced by trends in other industry sectors than most other machinery categories.

As with closing machinery, over recent years this group has been affected by competition from multi-function machines, specifically form, fill and seal (FFS) machines. However, there are other factors driving the filling and dosing machinery market, including demand for increased flexibility, ease of use, energy efficiency, reduced changeover times, clean-in-place machines, and aseptic filling.

These factors have resulted in significant upgrades in the levels of automation used in these machines over the last five to ten years, including shifts from standard to servo motors, increased functionality (such as touchscreen operator terminals), a transition from pneumatic to electromechanical actuators, and even automation of filling valves.

Legislation related to food hygiene standards has resulted in significant developments in how machines are cleaned and designed. Hygienic design features, such as sloped surfaces to support improved drainage, or designs that reduce product buildup are common solutions. One example of a feature designed to aid the cleaning of filling machinery is an LED that lights up dirty areas, making it easier and faster for operators to clean.

In addition to automation being used with higher levels of Ingress Protection (IP Rating) in place to allow the wash down of machines, machine builders have also introduced more innovative solutions to maintain the cleanliness of machines, while minimizing the impact on production.

Some companies have done this by integrating automated cleaning systems that are able to clean the complete path of the food without manual intervention by flushing a cleaning fluid through the system to wash nozzles, pipes, or vessels at programmed cycles.

Another notable concern for the filling and dosing machinery market is filling optimization. Not only do companies stand to lose money from over-filling containers, they also stand to get complaints or even go to court in extreme examples, due to under filled containers. With many varying products and high speed of today's machinery, optimized filling can be difficult to maintain. This is another issue that is being addressed by the increased use of automation. For example, PLCs are increasingly used to control and adjust the filling process to ensure measurements are precise and efficient.

FILLING AND DOSING MACHINERY: FILLING AND CLOSING MACHINERY SHIPMENTS

The value of filling and closing machinery shipments is estimated to have been worth $430 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $120.5 million.

The household, industrial and agricultural chemicals sector was the largest in 2020, accounting for 24.4% of total revenues. This was followed closely by the pharmaceuticals sector (21.2%). The "other" end-user sector was the smallest, accounting for 8.9% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 77.7% of revenues.

Filling and Closing Machines Shipments, 2019 and 2020

Table 1.52 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$381.9	$430.0	4.1%	12.6%	$120.5

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

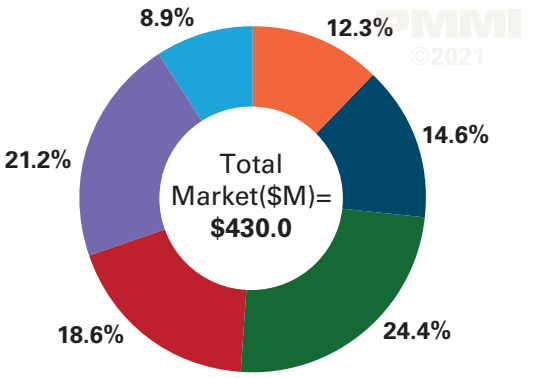
Filling and Closing Machines Shipments by Industry Sector, 2020

Table 1.53 (Millions of Dollars)

	2020	Share in 2020
Beverages	$53.0	12.3%
Food	$63.0	14.6%
Household, Industrial & Agricultural Chemicals	$104.8	24.4%
Personal Care, Toiletries & Cosmetics	$79.9	18.6%
Pharmaceuticals	$91.3	21.2%
Other End-User Sectors	$38.1	8.9%
Grand Total	**$430.0**	

Data issued: June 2021
Source: Omdia

Figure 1.53



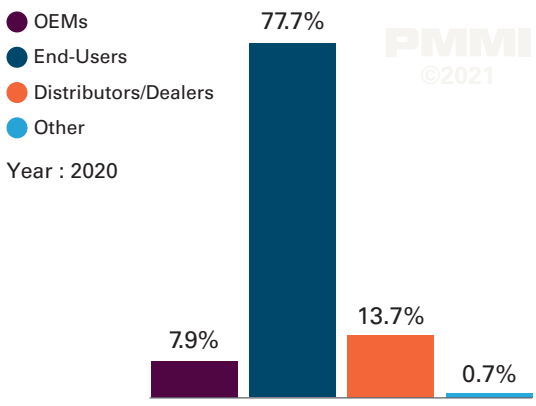
Filling and Closing Machines Shipments by Customer Type, 2020

Table 1.54(Millions of Dollars)

	2020	Share in 2020
OEMs	$34.1	7.9%
End-Users	$334.0	77.7%
Distributors/Dealers (including agents)	$59.0	13.7%
Other	$2.9	0.7%
Grand Total	**$430.0**	

Data issued: June 2021
Source: Omdia

Figure 1.54



FILLING AND DOSING MACHINERY:
FILLING MACHINERY - DRY / POWDER / SOLID PRODUCT SHIPMENTS

The value of dry / powder / solid product filling machinery shipments is estimated to have been worth $557.3 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $89.7 million.

The food industry sector was the largest in 2020, accounting for 69.8% of total revenues. This was followed by the household, industrial and agricultural chemicals sector (13.0%). Less than 4% of shipments went to the beverage and personal care, toiletries, and cosmetics sectors, as this machinery type specializes on dry / powder / solid products.

As with most machinery types, the largest customer type was end users; accounting for approximately 72.5% of revenues.

Filling Machines - Dry / Powder / Solid Product Shipments, 2019 and 2020

Table 1.55 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$486.9	$557.3	5.3%	14.5%	$89.7

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

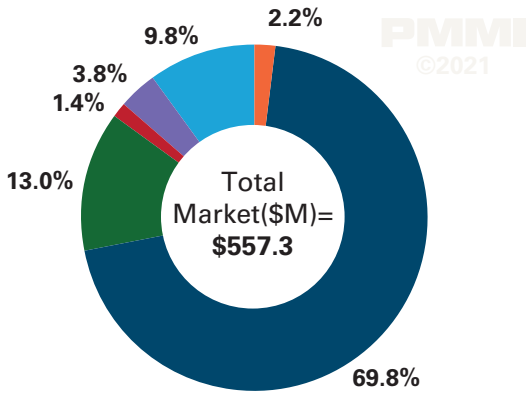
Filling Machines - Dry / Powder / Solid Product Shipments by Industry Sector, 2020

Table 1.56 (Millions of Dollars)

	2020	Share in 2020
Beverages	$12.2	2.2%
Food	$389.0	69.8%
Household, Industrial & Agricultural Chemicals	$72.3	13.0%
Personal Care, Toiletries & Cosmetics	$7.5	1.4%
Pharmaceuticals	$21.3	3.8%
Other End-User Sectors	$54.8	9.8%
Grand Total	**$557.3**	

Data issued: June 2021
Source: Omdia

Figure 1.56



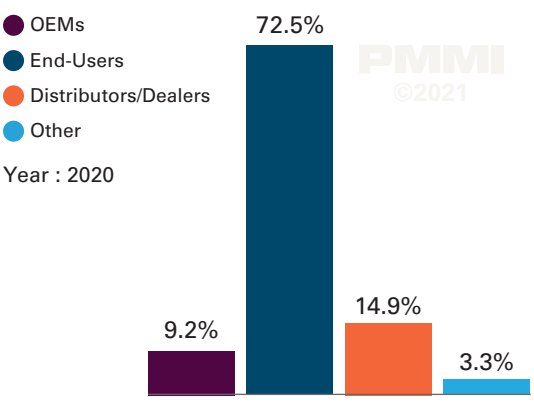
Filling Machines - Dry / Powder / Solid Product Shipments by Customer Type, 2020

Table 1.57 (Millions of Dollars)

	2020	Share in 2020
OEMs	$51.5	9.2%
End-Users	$404.0	72.5%
Distributors/Dealers (including agents)	$83.2	14.9%
Other	$18.6	3.3%
Grand Total	**$557.3**	

Data issued: June 2021
Source: Omdia

Figure 1.57



FILLING AND DOSING MACHINERY: FILLING MACHINERY - LIQUID / GAS / VISCOUS PRODUCT SHIPMENTS

The value of liquid / gas / viscous product filling machinery shipments is estimated to have been worth $450 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $103 million.

The beverage industry sector was the largest in 2020, accounting for 67.9% of total revenues. This was followed by the household sector (11%). The "other" end user industry sector was the smallest, accounting for 3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 79% of revenues.

Filling Machines - Liquid / Gas / Viscous Product Shipments, 2019 and 2020

Table 1.58 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$397.3	$450.0	4.3%	13.3%	$102.6

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

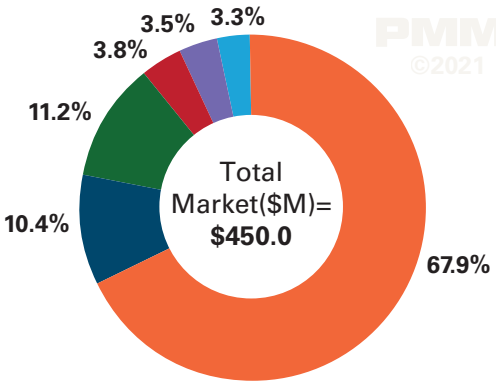
Filling Machines - Liquid / Gas / Viscous Product Shipments by Industry Sector, 2020

Table 1.59 (Millions of Dollars)

	2020	Share in 2020
Beverages	$305.6	67.9%
Food	$46.6	10.4%
Household, Industrial & Agricultural Chemicals	$50.4	11.2%
Personal Care, Toiletries & Cosmetics	$17.0	3.8%
Pharmaceuticals	$15.7	3.5%
Other End-User Sectors	$14.6	3.3%
Grand Total	**$450.0**	

Data issued: June 2021
Source: Omdia

Figure 1.59



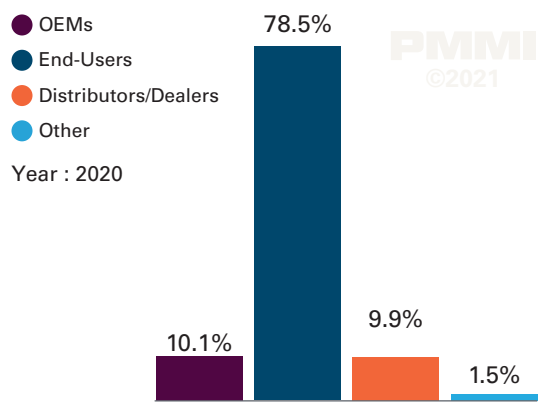
Filling Machines - Dry / Powder / Solid Product Shipments by Customer Type, 2020

Table 1.60 (Millions of Dollars)

	2020	Share in 2020
OEMs	$45.4	10.1%
End-Users	$353.1	78.5%
Distributors/Dealers (including agents)	$44.5	9.9%
Other	$7.0	1.5%
Grand Total	**$450.0**	

Data issued: June 2021
Source: Omdia

Figure 1.60



FORM, FILL AND SEAL MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes standalone filling or closing machinery. This category includes both horizontal and vertical FFS machines.

The value of US shipments of FFS machinery is estimated to have been worth $770 million in 2020 with 7.4% of total packaging machinery revenues. It is forecast to grow at a CAGR of 5.9% to $1,083 million in 2026.

The Value of US Shipments of Form, Fill & Seal Machinery

$770 Million in 2020 > 7.4% of Total Revenues > $1.1 Billion in 2026 (Estimated Growth)

FFS machinery is largely influenced by trends in the food industry (e.g. trends to single-serving portions, food safety, cleanability, etc.). The FFS machinery category is forecast to experience above average market growth to 2026, boosted by the continued replacement of single function forming, closing, and filling machines.

The benefits of this type of multi-format machine, which is capable of conducting multiple operations within one machine, are numerous and include:

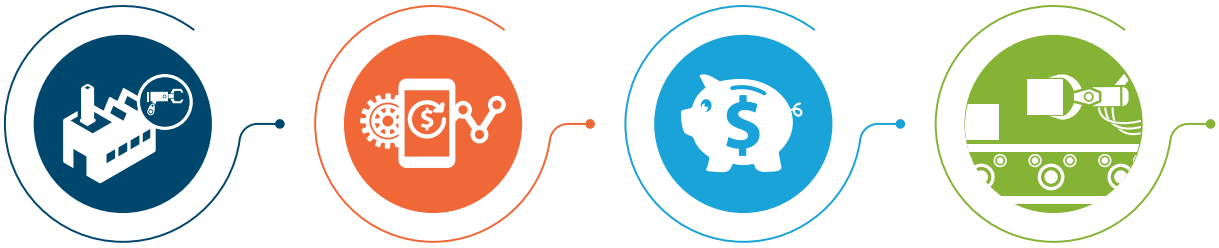
- Reduced footprint of machinery
- Reduced integration, maintenance and operational costs
- Cost savings (compared to purchasing multiple stand-alone machines)
- High throughput

The average selling price of these machines is the highest of all machinery categories. Historically, this has meant they were primarily purchased by the large national or multinational corporations that could afford the high upfront capital cost. However, new solutions suitable for smaller businesses are more common.

Two popular designs of FFS machines are horizontal FFS machines (HFFS) and vertical FFS machines (VFFS), with each having associated advantages and being better suited to particular situations. The main differentiator is how the product is dispensed. The primary driver for what type of solution issued is the type of product being packaged.

The average selling price of these machines is the highest of all machinery categories. Historically, this has meant they were primarily purchased by the large national or multinational corporations that could afford the high upfront capital cost. However, new solutions suitable for smaller businesses are more common.

The benefits of this type of multi-format machine



HFFS

These machines are primarily used for the filling of solid products that can be easily contained. One of the main benefits of the technology is the high throughput achievable with these machines. HFFS machines can be designed to have multiple fillers on a single line. These machines are also believed to be more flexible than VFFS machines.

VFFS

As well as being used for solid products, this solution is also able to address liquid, amorphous and granulated products that are more difficult to contain. These machines typically have a smaller footprint and are easy-to-use, lower-cost solutions. So, during difficult economic conditions, this may be an attractive solution.

With its ability to fill multiple products (solids and liquids), its smaller footprint and end users still seemingly price sensitive, Omdia projects that VFFS machines will grow at a faster rate than that of HFFS over the short term.

Another significant, continuing trend in the filling industry is towards flexible packaging. The growth of this type of packaging (discussed earlier in this report) is forecast to have a positive impact on the growth of FFS machines, as new machines are purchased to produce such packaging.

The majority of FFS machinery is sold into the food industry, food safety and hygiene regulations and considerations heavily influence this sector. Hence, aseptic packaging and clean-in-place systems (discussed earlier in this report) that help to achieve high food safety standards are particularly important in this sector.

The increasing demand by customers for complete solutions supports the growth of FFS machinery. As discussed earlier in this report, OEMs are more often integrating additional third-party machinery into their offerings to provide turnkey solutions, rather than selling individual modules only. This provides assurance to customers as the machinery has been tested and validated as a system prior to installation.

A recent development in this sector is the ability to create packages that perform like a stand-up pouch with slightly modified conventional vertical FFS machinery (through a change in gusset application). This provides the benefits of stand-up pouches (high product visibility, efficient stocking, improved top shelf presence, additional product facings per shelf, etc.) with less investment than is required for conventional stand-up pouches.

Another trend in this market, like in other machinery markets, is the increased use of automation (e.g. servo-driven jaws and vacuum belts for sealing applications).

Trends toward flexible machinery and sustainable packaging material are also influencing this market, as in other machinery markets. For example, cold chain applications may switch between reusable and single-use packaging depending on the best fit.

FORM, FILL AND SEAL MACHINERY: HORIZONTAL SHIPMENTS

The value of horizontal form / fill / seal machinery shipments is estimated to have been worth $507.5 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $209.6 million.

The food industry sector was the largest in 2020, accounting for 70.5% total revenues. This was followed by the "Other" sector (8.6%). The pharmaceutical sector was the smallest amount accounting for 3.0% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 78.1% of revenues.

Form / Fill / Seal Machines - Horizontal Shipments, 2019 and 2020

Table 1.61 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$431.3	$507.5	4.9%	17.7%	$209.6

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

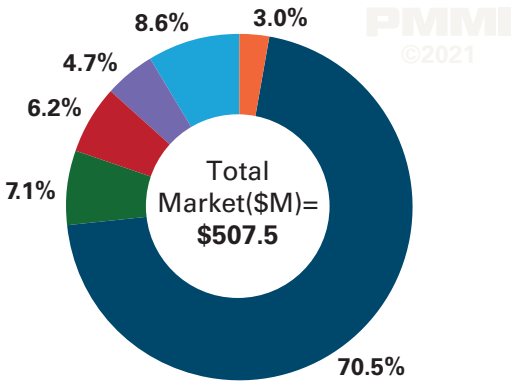
Form / Fill / Seal Machines - Horizontal Shipments by Industry Sector, 2020

Table 1.62 (Millions of Dollars)

	2020	Share in 2020
Beverages	$15.1	3.0%
Food	$357.9	70.5%
Household, Industrial & Agricultural Chemicals	$36.0	7.1%
Personal Care, Toiletries & Cosmetics	$31.3	6.2%
Pharmaceuticals	$23.6	4.7%
Other End-User Sectors	$43.6	8.6%
Grand Total	**$507.5**	

Data issued: June 2021
Source: Omdia

Figure 1.62



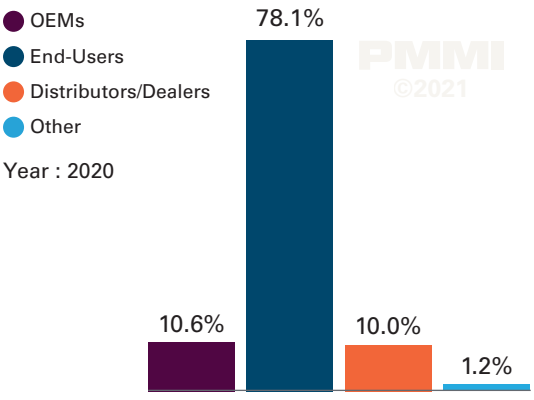
Form / Fill / Seal Machines - Horizontal Shipments by Customer Type, 2020

Table 1.63(Millions of Dollars)

	2020	Share in 2020
OEMs	$54.0	10.6%
End-Users	$396.6	78.1%
Distributors/Dealers (including agents)	$50.7	10.0%
Other	$6.2	1.2%
Grand Total	**$507.5**	

Data issued: June 2021
Source: Omdia

Figure 1.63



FORM, FILL AND SEAL MACHINERY: VERTICAL SHIPMENTS

The value of vertical form / fill / seal machinery shipments is estimated to have been worth $262 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $83.9 million.

The food industry sector was the largest in 2020, accounting for 84% of total revenues. This was followed by the "other" end-user sector category (6.8%). The beverages, pharmaceuticals, and personal care, toiletries, and cosmetics sectors were all very small, accounting for less than 2% of revenues each.

As with most machinery categories, the largest customer type was end users; accounting for 87% of revenues.

Form / Fill / Seal Machines - Vertical Shipments, 2019 and 2020

Table 1.64 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$232.7	$262.0	2.5%	12.6%	$83.9

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

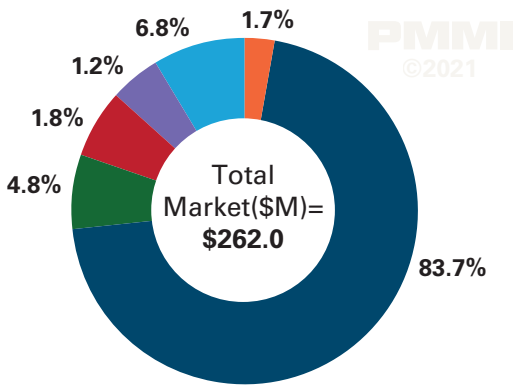
Form / Fill / Seal Machines - Vertical Shipments by Industry Sector, 2020

Table 1.65 (Millions of Dollars)

	2020	Share in 2020
Beverages	$4.6	1.7%
Food	$219.2	83.7%
Household, Industrial & Agricultural Chemicals	$12.6	4.8%
Personal Care, Toiletries & Cosmetics	$4.6	1.8%
Pharmaceuticals	$3.2	1.2%
Other End-User Sectors	$17.8	6.8%
Grand Total	**$262.0**	

Data issued: June 2021
Source: Omdia

Figure 1.65



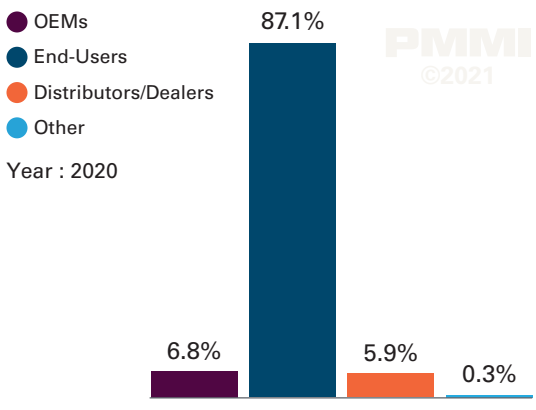
Form / Fill / Seal Machines - Vertical Shipments by Customer Type, 2020

Table 1.66 (Millions of Dollars)

	2020	Share in 2020
OEMs	$17.8	6.8%
End-Users	$228.1	87.1%
Distributors/Dealers (including agents)	$15.4	5.9%
Other	$0.7	0.3%
Grand Total	**$262.0**	

Data issued: June 2021
Source: Omdia

Figure 1.66



LABELING, DECORATING AND CODING MACHINERY

Labeling, decorating, and coding machinery is largely influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.).

Labeling, decorating, and coding machinery is forecast to be one of the fastest-growing groups to 2026, as a result of legislation demanding new or increased labeling and coding on products and the continuing developments in printing technologies and the proliferation in SKUs.

The Value of US Shipments of Labeling, Decorating & Coding Machinery

$1.4 Billion in 2020 > 13.1% of Total Revenues > $1.8 Billion in 2026 (Estimated Growth)

There have been a number of regulations that are driving demand for improved labeling and coding that have consequently driven demand for new machinery. This is most prominent in the pharmaceutical, food, and beverage sectors.

Within the pharmaceutical industry legislation is affecting the market. The deadlines imposed for meeting the Drug Quality and Security Act (DQSA) of 2013 came into effect in for manufacturers 2018, with final implementation for all parties in the supply chain by 2023. The regulation requires a transaction document and serialization of all prescription products, enabling the electronic transfer of specified transaction information and history through the supply chain.

This caused many end users to bring forward the planning and purchasing of new packaging machinery (potentially as upgrades to existing machines) earlier than they were previously expected to, to comply with the legislation.

To comply with legislation, end users may need to retrofit existing lines and ensure new machines meet serialization requirements. For example, printing systems may need to be upgraded so that line management software can interface with ERP software to be able to receive a string of numbers and codes that can be printed onto packages. Machine vision products may be integrated for inspection.

The legislation is expected to boost sales in the years preceding the final 2023 deadline, though Omdia also forecasts a dip in the growth rate following the deadline as the market becomes more saturated.

These legislative factors are forecast to have a strong influence on growth over the forecast period, while continued technological developments also boost growth.

Linked to the trend for more information and greater visibility through the supply chain is the increasing amount of information marked on packages. For example, where typical information previously included "best before" and "sell by" dates only, there are demands for variable data to indicate country of origin and lot, batch, and line-specific information.

Changing information on packaging labels is not only driven by traceability and safety demands, but also by the growing need for product differentiation and brand engagement due to increasing consumer demands (as mentioned earlier in the report). This trend mainly affects the food, beverage and cosmetics and personal care sectors. Innovative uses of packaging driven by differentiation trends include interactive or customized labels and QR codes to engage directly with customers.

Printing and labeling technologies continue to evolve as manufacturers look to distinguish their products on the shelf by using different packaging shapes and sizes. Printing techniques, label materials, inks and coatings can help differentiate a product from its competitors. For instance, use of special coatings such as pearlescent, holographic, matte and gloss are currently very popular in helping products stand out on the shelf.

Hybrid printing technology is gaining momentum in the recent years as it enables high flexibility in the label printing process. It has expanded the digital color gamut to include colors that lie outside the CMYK range. With hybrid printing technology, it is possible to add special inks to the production line or elevating the appearance of a label. Hybrid printing provides the flexibility to convert inline, decorate, and finish a product in a single

pass. One of the most visible benefits of hybrid technology is increased production speed. Hybrid printing enables more work to be done in a shorter time span. Increased speed is also facilitated by perfect registration from print to cut. Most of the tasks; including labeling, finishing, coating, packaging, and cutting are accomplished automatically.

Another popular example is the use of thermochromic ink, which changes color based on temperature. For instance, that used on a beer can that changes color to alert consumers its contents are at a desirable temperature to drink. Additionally, some manufacturers use photochromic ink that can remain invisible until exposed to sunlight. These color-changing inks can also be used to display product promotions, hidden messages, or interactive games.

While pressure sensitive labels are very common within the packaging industry, technologies such as heat-shrink labels, stretch sleeve labels and in-mold labels are gaining popularity. The use of heat-shrink labeling is growing quickly due to its ability to fit tightly around a variety of shapes and provide plenty of space for graphics across the entire product surface area.

Additionally, much of the labeling and printing equipment used today is multi-functional, combining various printing and decorating processes. These trends will help to further drive the labeling machinery market throughout the forecast period.

There is also a continued move from traditional types of printing, such as hot-foil, to technologies such as ink-jet and laser, which can support printing multi-color labels with greater flexibility for adjustment of the label content. Advances in laser printing technology, leading to longer replacement cycles and minimal maintenance requirements, have helped to reduce environmental concerns. For this reason, Omdia expects the laser printing market to experience particularly fast growth due to these perceived consumer advantages compared to other printing technologies.

Another example of this is the development of systems that allow printing directly onto the container, replacing the need for labels. This technology enables decoration of 3D surfaces, allowing for emphasis to be placed on grooves and ridges of the packaging by the design of the print.

These machines are also increasingly using machine vision products, which can review the labels to check for errors. This allows for products with faulty labels to be rejected immediately. The demand for smart labels is one the rise, From luxury goods to pharmaceuticals and household goods. Growing capacities at the label producers open completely new application cases for technology like NFC (Near Field Communication) or RFID (Radio Frequency Identification). 2D barcodes are a major opportunity within smart packaging as this technology is being adopted across multiple industries and is being enforced by serialization laws, such as upcoming US legislation. These technologies are expecting to disrupt the labeling machinery industry in the near future.

Flexibility is also an important factor influencing labeling, decorating, and coding machinery, with growing demands for machinery to be able to handle new materials and run multiple label types.

As with other machinery categories, sustainability is becoming more important, and there are growing demands to reduce label thickness and material waste. To enable this, OEMs are making efforts to ensure that machines can handle thinner materials and optimize material usage.

LABELING, DECORATING AND CODING MACHINERY: CODING MACHINERY SHIPMENTS

The value of coding machinery shipments is estimated to have been worth $433 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $281 million.

The food industry sector was the largest in 2020, accounting for over one-third of total revenues (38%). This was followed by the beverages sector category (17.1%). The household, industrial and agricultural chemicals sector was the smallest, accounting for 6.2% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 63.9% of revenues.

NOTE: In the 2015 and 2016 editions coding, dating, printing, marking, stamping and imprinting machinery were one category, but this was split for the 2017 edition into two separate categories: coding machinery and dating, printing, marking, stamping and imprinting machinery shipments.

Coding Machinery Shipments, 2019 and 2020

Table 1.31 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$394.1	$433.0	4.2%	9.9%	$280.8

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

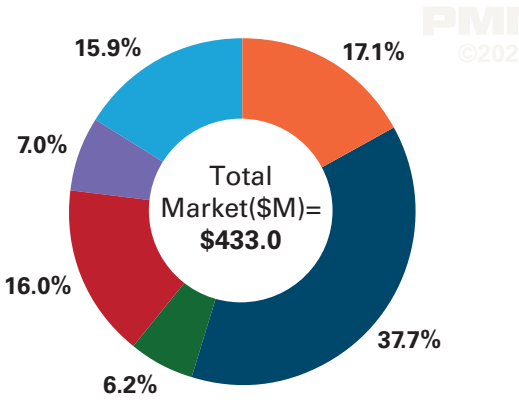
Coding Machinery Shipments by Industry Sector, 2020

Table 1.32 (Millions of Dollars)

	2020	Share in 2020
Beverages	$74.0	17.1%
Food	$163.4	37.7%
Household, Industrial & Agricultural Chemicals	$26.8	6.2%
Personal Care, Toiletries & Cosmetics	$69.5	16.0%
Pharmaceuticals	$30.4	7.0%
Other End-User Sectors	$69.0	15.9%
Grand Total	**$433.0**	

Data issued: June 2021
Source: Omdia

Figure 1.32



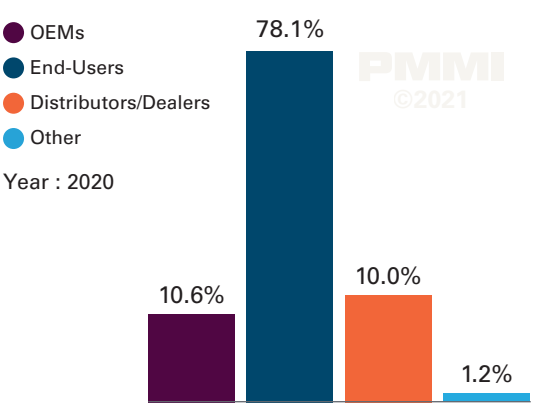
Coding Machinery Shipments by Customer Type, 2020

Table 1.33(Millions of Dollars)

	2020	Share in 2020
OEMs	$68.3	15.8%
End-Users	$276.7	63.9%
Distributors/Dealers (including agents)	$82.6	19.1%
Other	$5.4	1.2%
Grand Total	**$433.0**	

Data issued: June 2021
Source: Omdia

Figure 1.33



LABELING, DECORATING AND CODING MACHINERY: DATING, PRINTING, MARKING, STAMPING AND IMPRINTING MACHINERY SHIPMENTS

The value of dating, printing, marking, stamping and imprinting machinery shipments is estimated to have been worth $338.3 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $62.4 million.

The food industry sector was the largest in 2020, accounting for over one-third of total revenues (34.7%). This was followed by "other" end user sectors (19%). The household, industrial and agricultural chemicals sector was the smallest, accounting for 9.3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 62% of revenues.

NOTE: In the 2015 edition coding, dating, printing, marking, stamping and imprinting machinery were one category, but this was split for the 2017 edition into two separate categories: coding machinery and dating, printing, marking, stamping and imprinting machinery shipments.

Dating, Printing, Marking, Stamping and Imprinting Machinery Shipments, 2019 and 2020

Table 1.46 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$303.1	$338.3	3.2%	11.6%	$62.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

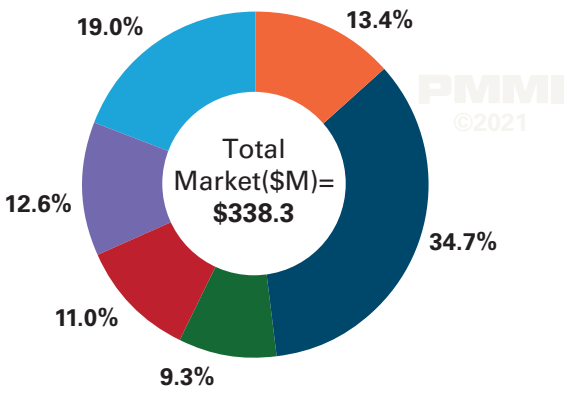
Dating, Printing, Marking, Stamping and Imprinting Machinery Shipments by Industry Sector, 2020

Table 1.47 (Millions of Dollars)

	2020	Share in 2020
Beverages	$45.2	13.4%
Food	$117.3	34.7%
Household, Industrial & Agricultural Chemicals	$31.4	9.3%
Personal Care, Toiletries & Cosmetics	$37.3	11.0%
Pharmaceuticals	$42.8	12.6%
Other End-User Sectors	$64.2	19.0%
Grand Total	**$338.3**	

Data issued: June 2021
Source: Omdia

Figure 1.47



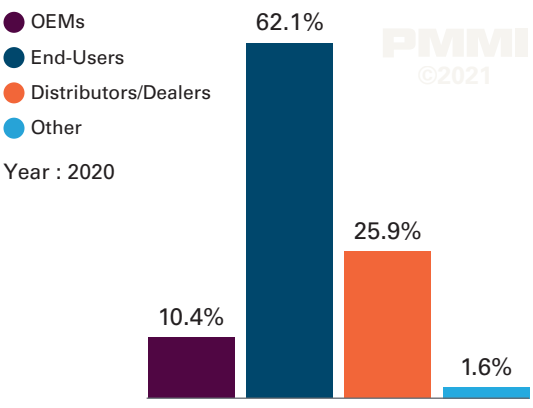
Dating, Printing, Marking, Stamping and Imprinting Machinery Shipments by Customer Type, 2020

Table 1.48 (Millions of Dollars)

	2020	Share in 2020
OEMs	$35.2	10.4%
End-Users	$210.2	62.1%
Distributors/Dealers (including agents)	$87.5	25.9%
Other	$5.4	1.6%
Grand Total	**$338.3**	

Data issued: June 2021
Source: Omdia

Figure 1.48



LABELING, DECORATING AND CODING MACHINERY

LABELING MACHINERY SHIPMENTS

The value of labeling machinery shipments is estimated to have been worth $592 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $72.9 million.

The food industry sector was the largest in 2020, accounting for nearly one-third of total revenues (31.2%). This was followed by the beverage sector (28.4%). The pharmaceuticals sector was the smallest, accounting for 7% of revenues.

However, this is considerably below the average proportion for this customer type for all machinery categories (69.1%) due to the greater proportion of business via distributors / dealers.

Labeling Machinery Shipments, 2019 and 2020

Table 1.70 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$497.0	$591.5	5.7%	19.0%	$72.9

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

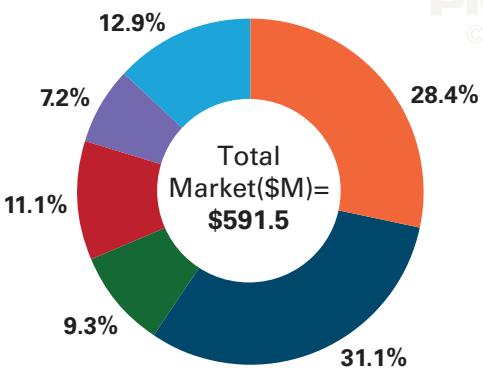
Labeling Machines (Product Identification, Decorating) Shipments by Industry Sector, 2020

Table 1.71 (Millions of Dollars)

	2020	Share in 2020
Beverages	$168.2	28.4%
Food	$183.7	31.1%
Household, Industrial & Agricultural Chemicals	$54.8	9.3%
Personal Care, Toiletries & Cosmetics	$65.9	11.1%
Pharmaceuticals	$42.5	7.2%
Other End-User Sectors	$76.5	12.9%
Grand Total	**$591.5**	

Data issued: June 2021
Source: Omdia

Figure 1.71



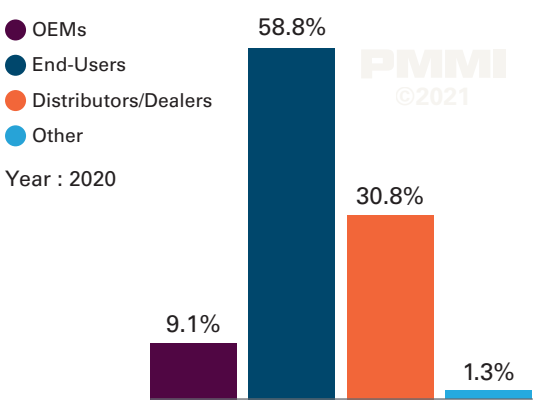
Labeling Machines (Product Identification, Decorating) Shipments by Customer Type, 2020

Table 1.72(Millions of Dollars)

	2020	Share in 2020
OEMs	$54.0	9.1%
End-Users	$347.8	58.8%
Distributors/Dealers (including agents)	$182.2	30.8%
Other	$7.5	1.3%
Grand Total	**$591.5**	

Data issued: June 2021
Source: Omdia

Figure 1.72



PALLETIZING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B. It is important to note that this category excludes the wrapping of pallets.

The value of US shipments of palletizing machinery is estimated to have been worth $429 Million in 2020, around 4.1% of total packaging machinery revenues. It is forecast to grow at a CAGR of 4.2% to $550 million in 2026.

The Value of US Shipments of Palletizing Machinery

$429 Million in 2020 > 4.1% of Total Revenues > $550 Million in 2026 (Estimated Growth)

Palletizing machinery is largely influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). However, with a smaller proportion of shipments to the food and beverage industries than the average of all machinery categories, palletizing machinery is more influenced by trends in other industry sectors than most other machinery categories.

Robots are increasingly being used in a range of applications in primary and secondary packaging. However, their use in tertiary packaging applications, such as palletizing machinery, is already well established.

The advantages of robots are multiple, including increased flexibility. Robotized palletizers can support multiple operations to be conducted at the same time, such as packing a product into a case, and then placing the packed case onto a pallet. These can also be used to select mixed products from a single conveyor line and separate them onto multiple pallets.

There is a growing demand for mixed load palletizing, where a pallet may include numerous different products and case sizes of different dimensions for a single customer. Here, in combination with a machine vision system and software, the robots can select and load cases in a suitable configuration to ensure the pallet is built up in the most appropriate and efficient way.

There have been recent developments in collaborative robots (discussed in the packaging machinery trends section earlier in this report), which have been a key focus for some automation companies. A benefit of collaborative robots is flexibility as they can more easily adapt to changes in production lines, which can be frequent in the food, beverage, and pharmaceutical industries. They are also less restrictive than typical industrial robots, which are often caged away for safety reasons, allowing for greater efficiency in the use of factory space, where robots can work directly with humans.

While robots are increasingly common in packaging machinery, the industry is now seeing a move from general purpose robots to products optimized specifically for packaging operations, in order to improve performance.

Also, the growing demand for logistics plants, particularly as the region imports a large amount of packaging machinery, will support growth for palletizing machinery.

PALLETIZING MACHINERY:
PALLET UNITIZING MACHINERY SHIPMENTS

The value of pallet unitizing machinery shipments is estimated to have been worth $69.4 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $86.8 million.

The "other" end user sectors were the largest in 2020, accounting for 24.8% of total revenues. This was followed by the household, industrial and agricultural chemicals sector category (21.2%). The beverages sector was the smallest, accounting for 7.1% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 69.1% of revenues.

Pallet Unitizing Machines Shipments, 2019 and 2020

Table 1.76 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$61.1	$69.4	0.7%	13.6%	$86.8

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

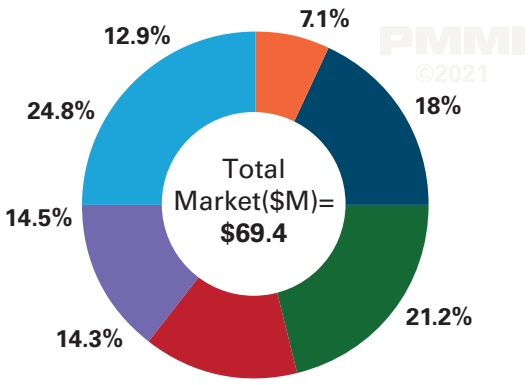
Pallet Unitizing Machines Shipments by Industry Sector, 2020

Table 1.77 (Millions of Dollars)

	2020	Share in 2020
Beverages	$4.9	7.1%
Food	$12.5	18.0%
Household, Industrial & Agricultural Chemicals	$14.7	21.2%
Personal Care, Toiletries & Cosmetics	$9.9	14.3%
Pharmaceuticals	$10.1	14.5%
Other End-User Sectors	$17.2	24.8%
Grand Total	**$69.4**	

Data issued: June 2021
Source: Omdia

Figure 1.77



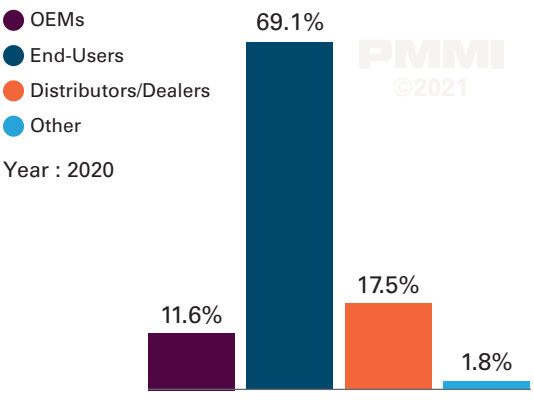
Pallet Unitizing Machinery Shipments by Customer Type, 2020

Table 1.78 (Millions of Dollars)

	2020	Share in 2020
OEMs	$8.0	11.6%
End-Users	$47.9	69.1%
Distributors/Dealers (including agents)	$12.1	17.5%
Other	$1.3	1.8%
Grand Total	**$69.4**	

Data issued: June 2021
Source: Omdia

Figure 1.78



PALLETIZING MACHINERY: PALLETIZING - ANCILLARY MACHINERY SHIPMENTS

The value of ancillary palletizing machinery shipments is estimated to have been worth $69 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $59.4 million.

The food sector was the largest in 2020, accounting for 26.4% of total revenues. This was followed by the household, industrial and agricultural chemicals sector (17.7%). The pharmaceuticals sector was the smallest, accounting for 9.3% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 73.4% of revenues.

Palletizing - Ancillary Machines Shipments, 2019 and 2020

Table 1.79 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$64.0	$69.0	0.7%	7.7%	$59.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

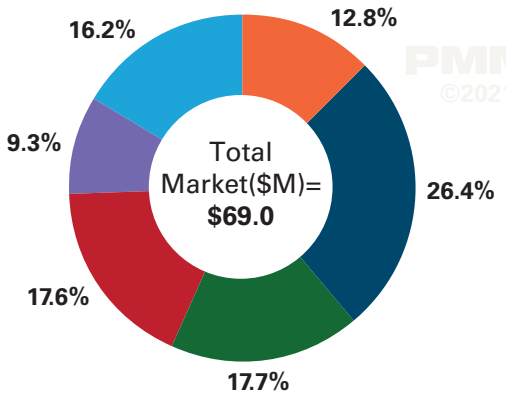
Palletizing - Ancillary Machinery Shipments by Industry Sector, 2020

Table 1.80 (Millions of Dollars)

	2020	Share in 2020
Beverages	$8.8	12.8%
Food	$18.2	26.4%
Household, Industrial & Agricultural Chemicals	$12.2	17.7%
Personal Care, Toiletries & Cosmetics	$12.2	17.6%
Pharmaceuticals	$6.4	9.3%
Other End-User Sectors	$11.2	16.2%
Grand Total	**$69.0**	

Data issued: June 2021
Source: Omdia

Figure 1.80



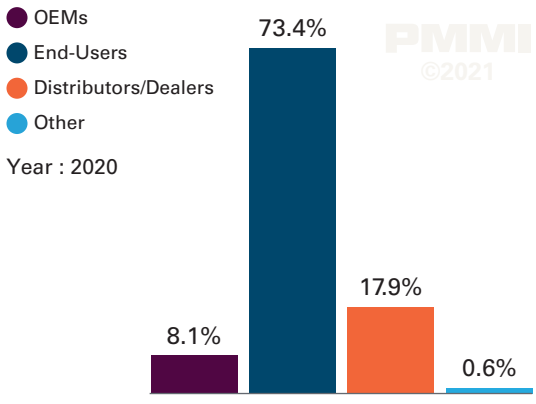
Palletizing - Ancillary Machinery Shipments by Customer Type, 2020

Table 1.81 (Millions of Dollars)

	2020	Share in 2020
OEMs	$5.6	8.1%
End-Users	$50.7	73.4%
Distributors/Dealers (including agents)	$12.3	17.9%
Other	$0.4	0.6%
Grand Total	**$69.0**	

Data issued: June 2021
Source: Omdia

Figure 1.81



PALLETIZING MACHINERY:
PALLETIZING / DEPALLETIZING MACHINERY SHIPMENTS

The value of palletizing / depalletizing machinery shipments is estimated to have been worth $290.9 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $96.4 million.

The food sector industry sector was the largest in 2020, accounting for 31.7% of total revenues. This was closely followed by the "other" end user sectors (23.3%). The pharmaceuticals sector was the smallest, accounting for less than 10% of revenues (8.6%).

As with most machinery categories, the largest customer type was end users; accounting for 76.8% of revenues.

Palletizing / Depalletizing Machines Shipments, 2019 and 2020

Table 1.82 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$251.8	$290.9	2.8%	15.5%	$96.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

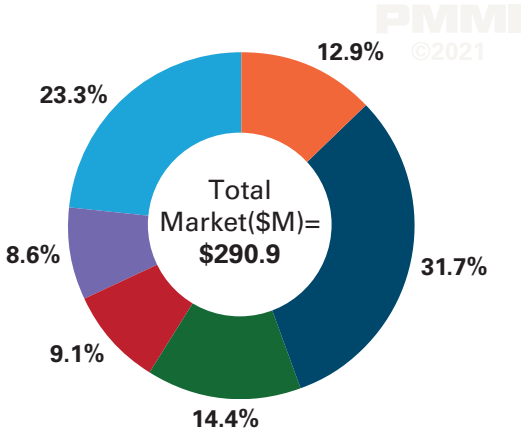
Palletizing / Depalletizing Machinery Shipments by Industry Sector, 2020

Table 1.83 (Millions of Dollars)

	2020	Share in 2020
Beverages	$37.6	12.9%
Food	$92.1	31.7%
Household, Industrial & Agricultural Chemicals	$41.9	14.4%
Personal Care, Toiletries & Cosmetics	$26.6	9.1%
Pharmaceuticals	$25.0	8.6%
Other End-User Sectors	$67.8	23.3%
Grand Total	**$290.9**	

Data issued: June 2021
Source: Omdia

Figure 1.83



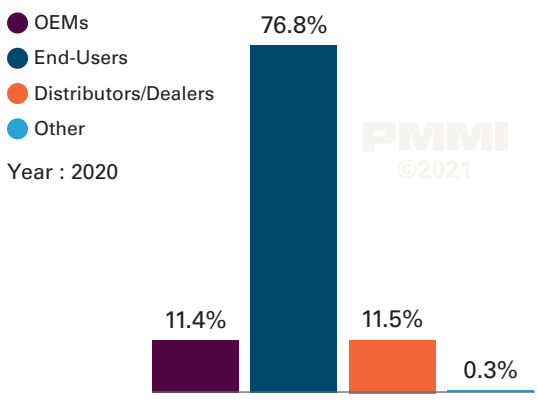
Palletizing / Depalletizing Machinery Shipments by Customer Type, 2020

Table 1.84 (Millions of Dollars)

	2020	Share in 2020
OEMs	$33.2	11.4%
End-Users	$223.4	76.8%
Distributors/Dealers (including agents)	$33.5	11.5%
Other	$0.8	0.3%
Grand Total	**$290.9**	

Data issued: June 2021
Source: Omdia

Figure 1.84



WRAPPING AND BUNDLING MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B.

The value of US shipments of wrapping and bundling machinery is estimated to have been worth $335 million in 2020, 3.2% of total packaging machinery revenues. It is forecast to grow at a CAGR of 4.2% to $429 million in 2026

The Value of US Shipments of Wrapping and Bundling Machinery

$335 Million in 2020 > 3.2% of Total Revenues > $429 Million in 2026 (Estimated Growth)

Wrapping and bundling machinery is largely influenced by trends in the food and beverage industries (e.g. trends to single-serving portions, food safety, cleanability, etc.). However, with a smaller proportion of shipments to the food and beverage industries than the average of all machinery categories, wrapping and bundling machinery is more influenced by trends in other industry sectors than most other machinery categories.

Wrapping and bundling machinery is one of the less technically sophisticated categories, with a higher proportion of semi-automatic machines than in many of the other industry categories.

In line with other parts of the packaging process, there is an ongoing demand for eliminating waste and reducing the amount of material used, as well as sustainability requirements driving the demand for recycled products.

In efforts to minimize waste, wrapping machines are being required to operate with thinner films. However, similar to the greater use of thinner materials in labeling, at the same time it is imperative that these machines do not break the film, which can result in delays in production and costly downtime. Methods to counteract this include the use of machine vision systems to detect the quality of the film, which are capable of monitoring a process operating better than the human eye.

For the purpose of pallet wrapping, synchronization between the rotation of the pallet and the wrapper is needed. This can be done with servo motors, which enable the high level of synchronization.

As the US is a major importer, there is demand for logistics plants in the region, which will support growth for wrapping machinery. Some consumer goods companies have outsourced distribution to logistics companies, requiring significant repacking of products to be undertaken at the logistics company's warehouse. Depending on the scale of this business, this may require entry-level and semiautomatic machinery. As a result, Omdia expects a higher degree of price erosion in the market as the product mix shifts to lower-cost solutions.

WRAPPING AND BUNDLING MACHINERY SHIPMENTS
WRAPPING /BANDING/ BUNDLING MACHINERY SHIPMENTS

The value of wrapping / banding / bundling machinery shipments is estimated to have been worth $334.9 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $115.2 million.

The food industry sector was the largest in 2020, accounting for over 30% of total revenues. This was followed by the "other" end user sectors (25.2%). The pharmaceuticals sector was the smallest, accounting for less than 3% of revenues.

Unlike other machinery categories, the largest customer type was distributors/dealers (including agents), accounting for 43% of revenues. End-users came in second at 41.5%, which is considerably below the average proportion for this customer type for all machinery categories (69.1%) due to the greater proportion of business via distributors / dealers.

Wrapping / Banding / Bundling Machinery Shipments, 2019 and 2020

Table 1.88 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$284.3	$334.9	3.2%	17.8%	$115.2

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

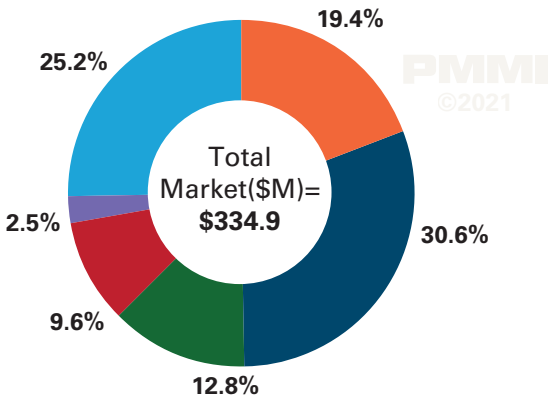
Wrapping / Banding / Bundling Machinery Shipments by Industry Sector, 2020

Table 1.89 (Millions of Dollars)

	2019	Share in 2019
Beverages	$64.9	19.4%
Food	$102.4	30.6%
Household, Industrial & Agricultural Chemicals	$43.0	12.8%
Personal Care, Toiletries & Cosmetics	$32.1	9.6%
Pharmaceuticals	$8.3	2.5%
Other End-User Sectors	$84.3	25.2%
Grand Total	**$334.9**	

Data issued: June 2021
Source: Omdia

Figure 1.89



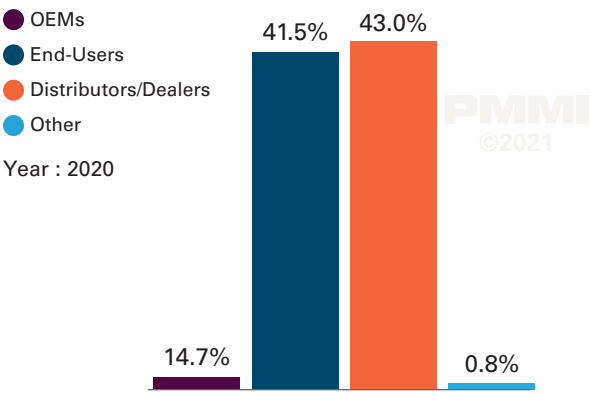
Wrapping / Banding / Bundling Machinery Shipments by Customer Type, 2020

Table 1.90 (Millions of Dollars)

	2020	Share in 2020
OEMs	$49.2	14.7%
End-Users	$139.0	41.5%
Distributors/Dealers (including agents)	$143.9	43.0%
Other	$2.8	0.8%
Grand Total	**$334.9**	

Data issued: June 2021
Source: Omdia

Figure 1.90



OTHER MACHINERY

The machine types included in this category are listed later in this section and definitions are provided in Appendix B.

The value of US shipments of "other" machinery is estimated to have been worth $1.8 billion in 2020, which made it the largest machinery category with 17.0% of total packaging machinery revenues. It is forecast to grow at a CAGR of 5.1% to $2.4 billion in 2026.

The Value of US Shipments of Other Machinery } $1.8 Billion in 2020 > 17.0% of Total Revenues > $2.4 Billion in 2026 (Estimated Growth)

"Other" machinery is largely influenced by trends in the food and beverage industries (e.g. trends to single serving portions, food safety, cleanability, etc.), which are discussed earlier in this report. However, with a smaller proportion of shipments to the food and beverage industries than the average of all machinery groups, "other" machinery is more influenced by trends in other industry sectors (such as household, industrial and agricultural chemicals, personal care, toiletries and cosmetics, pharmaceuticals, and other sectors), discussed earlier in this report, than most other machinery categories.

In general, "other" machinery is being driven by the various growth factors discussed throughout this report.

Some trends specific to machinery types in this category include:

Blister, skin / vacuum packaging machinery

Consumer convenience and ease of use factors are influencing these types of packaging machinery. An example of this is in the pharmaceuticals industry, where there is growth in demand for packages designed specifically to suit how products are consumed, such as a blister pack packaged such that it has seven rows of two capsules to indicate that two pills should be consumed each day of the week. Such demands are driving growth of new and flexible machinery.

Skin packaging

More recently, another technique, known as vacuum skin packaging, has become more popular. By having a film form around the food on a flat tray, a tight seal around the product is created. This both increases shelf life and improves the interaction the consumer has with the product, allowing a greater 3D view and the opportunity to handle the product.

Such packaging is particularly popular with wet products such as meats. In some applications, this product is forecast to increasingly compete with MAP solutions. Beyond a traditional tray sealer, such a machine must also incorporate a compressor in order to create the necessary vacuum to form the film around the food, adding to the cost of the machine. In some cases, this additional functionality was quoted as adding almost 50% to the cost of the machine.

Conveying machinery

With the trend towards multi-function machinery, such as FFS machinery discussed earlier in this report, the demand for conveying machinery is expected to weaken. Because multi-function machines perform multiple functions previously done by individual machines, there is less demand for conveying machinery to transport items between machines. However, there remains a sizeable market for conveying machinery despite this trend.

Inspecting, detecting and checkweighing machinery

The DQSA and FSMA referred to in the labeling, decorating and coding machinery section of this report are also driving demand for inspecting machinery. As discussed, machine vision products are increasingly integrated into machinery and lines to ensure products meet regulatory requirements. Such products also support quality control, as products that do not meet company standards can be identified and removed.

OTHER MACHINERY: BLISTER, SKIN / VACUUM PACKAGING MACHINERY SHIPMENTS

The value of blister and skin / vacuum packaging machinery shipments is estimated to have been worth $106.8 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $16.0 million.

Unlike most other machinery categories, the pharmaceuticals industry sector was the largest in 2020, accounting for 47% of total revenues. This was followed by the food sector just under one-third (34%).

As with most machinery categories, the largest customer type was end users; accounting for 69.8% of revenues.

Blister, Skin / Vacuum Packaging Machinery Shipments, 2019 and 2020

Table 1.4 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$95.5	$106.8	1.0%	11.8%	$16.0

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

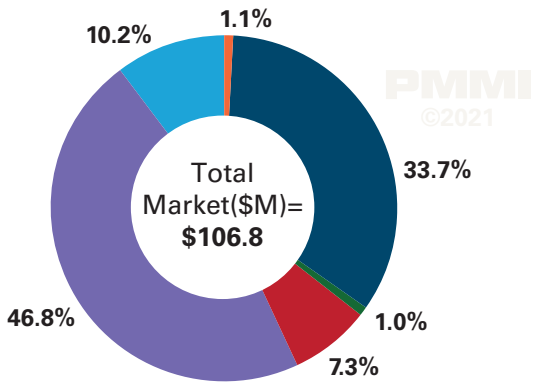
Blister, Skin / Vacuum Packaging Machinery Shipments by Industry Sector, 2020

Table 1.5 (Millions of Dollars)

	2020	Share in 2020
Beverages	$1.2	1.1%
Food	$36.0	33.7%
Household, Industrial & Agricultural Chemicals	$1.1	1.0%
Personal Care, Toiletries & Cosmetics	$7.8	7.3%
Pharmaceuticals	$50.0	46.8%
Other End-User Sectors	$10.9	10.2%
Grand Total	**$106.8**	

Data issued: June 2021
Source: Omdia

Figure 1.5



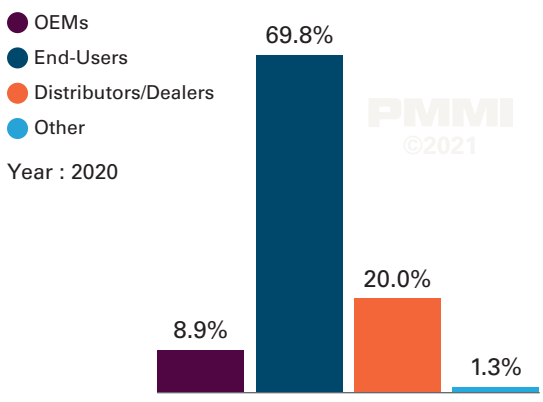
Blister, Skin / Vacuum Packaging Machinery Shipments by Customer Type, 2020

Table 1.6 (Millions of Dollars)

	2020	Share in 2020
OEMs	$9.5	8.9%
End-Users	$74.5	69.8%
Distributors/Dealers (including agents)	$21.3	20.0%
Other	$1.4	1.3%
Grand Total	**$106.8**	

Data issued: June 2021
Source: Omdia

Figure 1.6



OTHER MACHINERY: CONVERTING MACHINERY - CONTAINER / MATERIAL MANUFACTURE SHIPMENTS

The value of converting machinery shipments is estimated to have been worth $971.9 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $340.6 million.

The "other" end-user sector category was the largest in 2020, accounting for 51.4% of total revenues. This was followed by the beverage sector (31.6%). The household, industrial and agricultural chemicals sector was the smallest, accounting for 1% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 77.8% of revenues.

Converting Machinery - Container / Material Manufacture Shipments, 2019 and 2020

Table 1.91 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$841.8	$971.9	9.3%	15.5%	$340.6

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

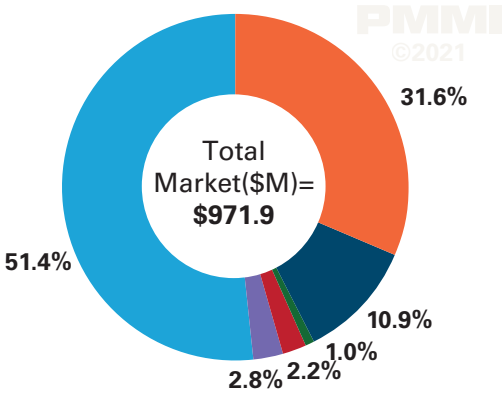
Converting Machinery - Container / Material Manufacture Shipments by Industry Sector, 2020

Table 1.92 (Millions of Dollars)

	2020	Share in 2020
Beverages	$307.3	31.6%
Food	$106.3	10.9%
Household, Industrial & Agricultural Chemicals	$10.2	1.0%
Personal Care, Toiletries & Cosmetics	$21.4	2.2%
Pharmaceuticals	$27.0	2.8%
Other End-User Sectors	$499.8	51.4%
Grand Total	**$971.9**	

Data issued: June 2021
Source: Omdia

Figure 1.92



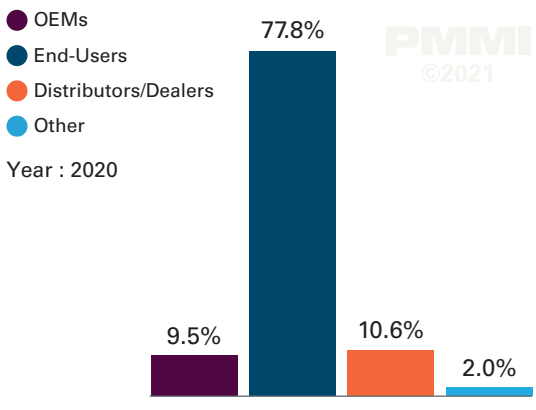
Converting Machinery - Container / Material Manufacture Shipments by Customer Type, 2020

Table 1.93 (Millions of Dollars)

	2020	Share in 2020
OEMs	$92.3	9.5%
End-Users	$756.5	77.8%
Distributors/Dealers (including agents)	$103.5	10.6%
Other	$19.7	2.0%
Grand Total	**$971.9**	

Data issued: June 2021
Source: Omdia

Figure 1.93



OTHER MACHINERY:
CONVEYING MACHINERY SHIPMENTS

The value of roller conveyors shipments is estimated to have been worth $670.9 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $228.6 million.

The "other" end-user sector industry sector was the largest in 2020, accounting for 30.4% of total revenues. This was followed by the food sector category (26.8%). The personal care, toiletries & cosmetics sector was the smallest, accounting for 7.2% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 71.9% of revenues.

Conveying Machinery Shipments, 2019 and 2020

Table 1.34 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$596.9	$670.9	6.4%	12.4%	$228.6

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

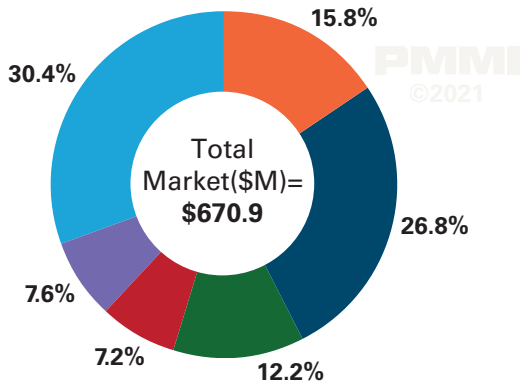
Conveying Machinery Shipments by Industry Sector, 2020

Table 1.35 (Millions of Dollars)

	2020	Share in 2020
Beverages	$106.1	15.8%
Food	$179.8	26.8%
Household, Industrial & Agricultural Chemicals	$81.6	12.2%
Personal Care, Toiletries & Cosmetics	$48.2	7.2%
Pharmaceuticals	$51.0	7.6%
Other End-User Sectors	$204.1	30.4%
Grand Total	**$670.9**	

Data issued: June 2021
Source: Omdia

Figure 1.35



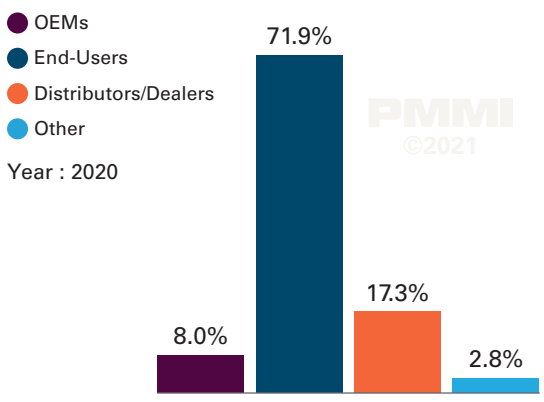
Conveying Machinery Shipments by Customer Type, 2020

Table 1.36 (Millions of Dollars)

	2020	Share in 2020
OEMs	$53.5	8.0%
End-Users	$482.3	71.9%
Distributors/Dealers (including agents)	$116.0	17.3%
Other	$19.1	2.8%
Grand Total	**$670.9**	

Data issued: June 2021
Source: Omdia

Figure 1.36



OTHER MACHINERY: CONVEYING MACHINERY SHIPMENTS – ROLLER CONVEYORS SHIPMENTS

The value of roller conveyors shipments is estimated to have been worth $208.4 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $71.7 million.

The "other" end-user sector industry sector was the largest in 2020, accounting for 31.4% of total revenues. This was followed by the food sector category (28.4%). The personal care, toiletries and cosmetics sector was the smallest, accounting for less than 5% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 77.1% of revenues.

Roller Conveyors Shipments, 2019 and 2020

Table 1.37 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$194.8	$208.4	2.0%	7.0%	$71.7

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

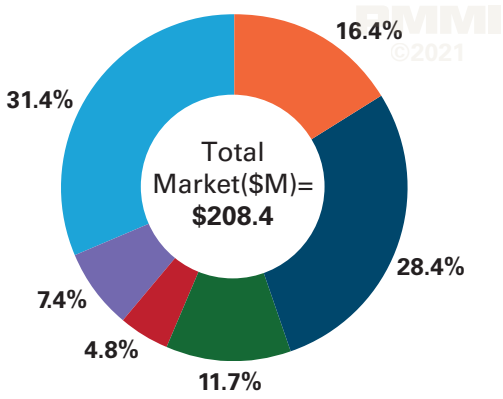
Roller Conveyors Shipments by Industry Sector, 2020

Table 1.38 (Millions of Dollars)

	2020	Share in 2020
Beverages	$34.2	16.4%
Food	$59.1	28.4%
Household, Industrial & Agricultural Chemicals	$24.3	11.7%
Personal Care, Toiletries & Cosmetics	$10.1	4.8%
Pharmaceuticals	$15.3	7.4%
Other End-User Sectors	$65.4	31.4%
Grand Total	**$208.4**	

Data issued: June 2021
Source: Omdia

Figure 1.38



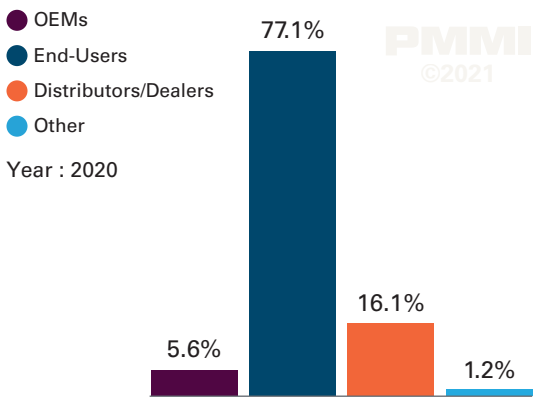
Roller Conveyors Shipments by Customer Type, 2020

Table 1.39 (Millions of Dollars)

	2020	Share in 2020
OEMs	$11.6	5.6%
End-Users	$160.7	77.1%
Distributors/Dealers (including agents)	$33.6	16.1%
Other	$2.5	1.2%
Grand Total	**$208.4**	

Data issued: June 2021
Source: Omdia

Figure 1.39



OTHER MACHINERY:
CONVEYING MACHINERY SHIPMENTS – TABLETOP CHAIN CONVEYORS SHIPMENTS

The value of tabletop chain conveyors shipments is estimated to have been worth $200 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $57.6 million.

The "other" end-user sector industry sector was the largest in 2020, accounting for 30.7% of total revenues. This was followed by the food sector category (25.7%). The personal care, toiletries & cosmetics sector was the smallest, accounting for 5.9% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 73.5% of revenues.

Tabletop Chain Conveyors Shipments, 2019 and 2020

Table 1.40 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$169.2	$200.0	1.9%	18.2%	$57.6

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

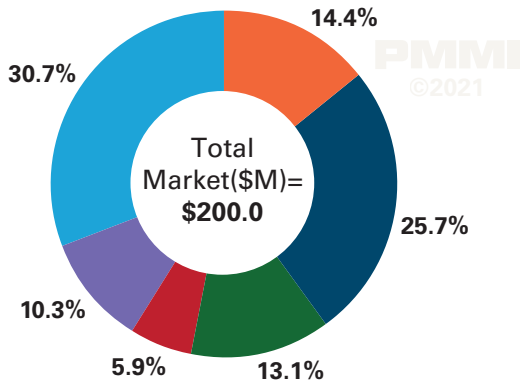
Tabletop Chain Conveyors Shipments by Industry Sector, 2020

Table 1.41 (Millions of Dollars)

	2020	Share in 2020
Beverages	$28.7	14.4%
Food	$51.5	25.7%
Household, Industrial & Agricultural Chemicals	$26.2	13.1%
Personal Care, Toiletries & Cosmetics	$11.8	5.9%
Pharmaceuticals	$20.5	10.3%
Other End-User Sectors	$61.4	30.7%
Grand Total	**$200.0**	

Data issued: June 2021
Source: Omdia

Figure 1.41



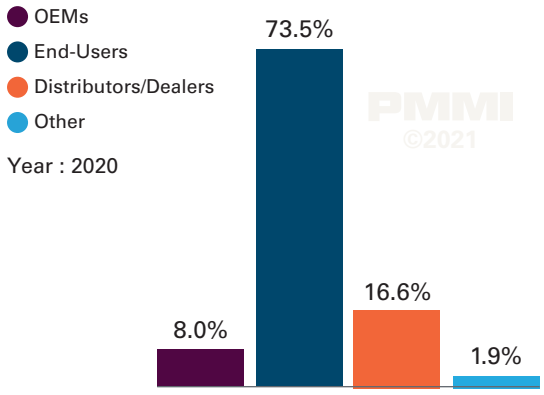
Tabletop Chain Conveyors Shipments by Customer Type, 2020

Table 1.42 (Millions of Dollars)

	2020	Share in 2020
OEMs	$16.0	8.0%
End-Users	$147.0	73.5%
Distributors/Dealers (including agents)	$33.2	16.6%
Other	$3.9	1.9%
Grand Total	**$200.0**	

Data issued: June 2021
Source: Omdia

Figure 1.42



OTHER MACHINERY: CONVEYING MACHINERY SHIPMENTS – BELT CONVEYORS SHIPMENTS

The value of belt conveyors shipments is estimated to have been worth $262.5 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $99.3 million.

The "other" end-user sector industry sector was the largest in 2020, accounting for 29.5% of total revenues. This was followed by the food sector category (26.4%). Pharmaceuticals sector was the smallest, accounting for 5.8% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 66.5% of revenues.

Belt Conveyors Shipments, 2019 and 2020

Table 1.43 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$232.9	$262.5	2.5%	12.7%	$99.3

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

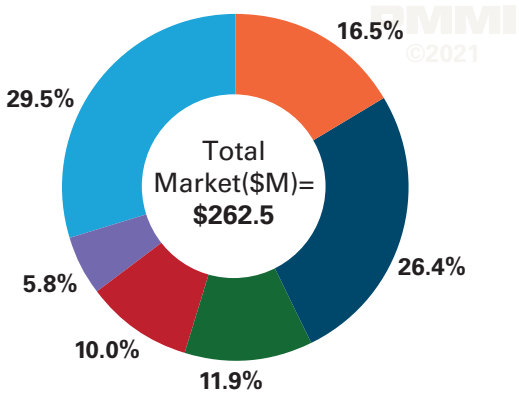
Belt Conveyors Shipments by Industry Sector, 2020

Table 1.44 (Millions of Dollars)

	2020	Share in 2020
Beverages	$43.3	16.5%
Food	$69.2	26.4%
Household, Industrial & Agricultural Chemicals	$31.2	11.9%
Personal Care, Toiletries & Cosmetics	$26.4	10.0%
Pharmaceuticals	$15.2	5.8%
Other End-User Sectors	$77.3	29.5%
Grand Total	**$262.5**	

Data issued: June 2021
Source: Omdia

Figure 1.44



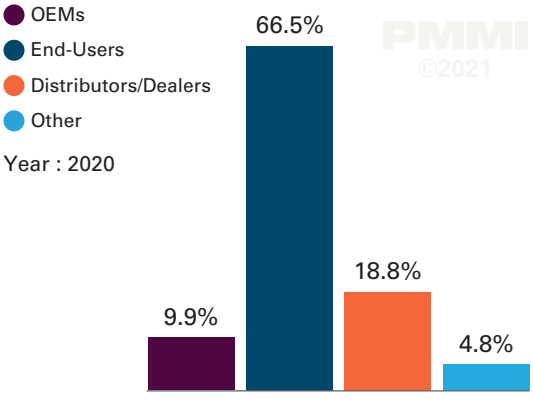
Belt Conveyors Shipments by Customer Type, 2020

Table 1.45 (Millions of Dollars)

	2020	Share in 2020
OEMs	$25.9	9.9%
End-Users	$174.6	66.5%
Distributors/Dealers (including agents)	$49.3	18.8%
Other	$12.7	4.8%
Grand Total	**$262.5**	

Data issued: June 2021
Source: Omdia

Figure 1.45



OTHER MACHINERY:
INSPECTING, DETECTING AND CHECKWEIGHING MACHINERY SHIPMENTS

The value of inspecting, detecting and checkweighing machinery shipments is estimated to have been worth $613.2 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $253.2 million.

The food industry sector was the largest in 2020, accounting for 64.7% of total revenues. This was followed by the "other" end user sectors category (13.2%). The household, industrial and agricultural chemicals sector was the smallest, accounting for less than 1% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 72.9% of revenues.

Inspecting, Detecting And Checkweighing Machinery Shipments, 2019 and 2020

Table 1.67 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$527.8	$613.2	5.9%	16.2%	$253.2

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

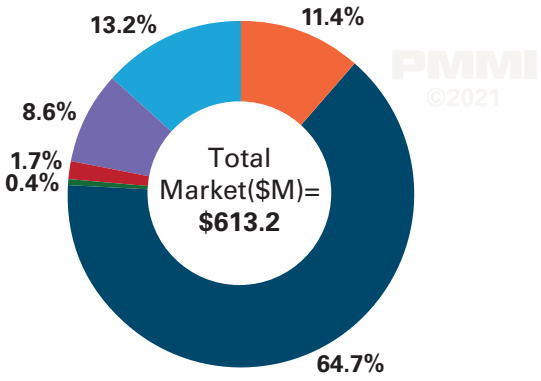
Inspecting, Detecting And Checkweighing Machinery Shipments by Industry Sector, 2020

Table 1.68 (Millions of Dollars)

	2020	Share in 2020
Beverages	$69.9	11.4%
Food	$396.9	64.7%
Household, Industrial & Agricultural Chemicals	$2.5	0.4%
Personal Care, Toiletries & Cosmetics	$10.1	1.7%
Pharmaceuticals	$52.7	8.6%
Other End-User Sectors	$80.9	13.2%
Grand Total	**$613.2**	

Data issued: June 2021
Source: Omdia

Figure 1.68



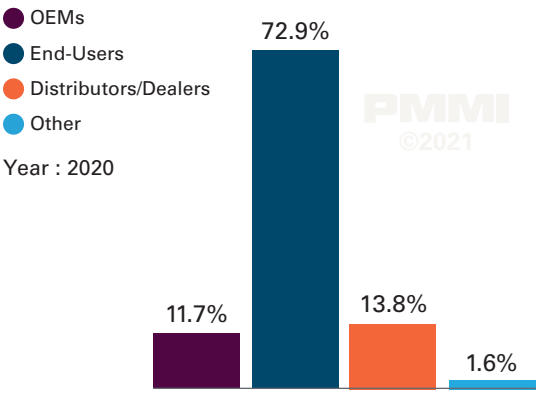
Inspecting, Detecting And Checkweighing Machinery Shipments by Customer Type, 2020

Table 1.69 (Millions of Dollars)

	2020	Share in 2020
OEMs	$71.8	11.7%
End-Users	$447.3	72.9%
Distributors/Dealers (including agents)	$84.6	13.8%
Other	$9.6	1.6%
Grand Total	**$613.2**	

Data issued: June 2021
Source: Omdia

Figure 1.69



OTHER MACHINERY: SPECIALTY PACKAGING MACHINERY SHIPMENTS

The value of specialty packaging machinery shipments is estimated to have been worth $384.9 million in 2020. The order backlog as of 31 December 2020 is estimated to have been worth $291.4 million.

The beverage industry sector was the largest in 2020, accounting for 38% of total revenues. This was followed by the food sector (36%). The personal care and toiletries sector was the smallest, accounting for 6% of revenues.

As with most machinery categories, the largest customer type was end users; accounting for 54% of revenues.

Specialty Packaging Machinery Shipments, 2019 and 2020

Table 1.85 (Millions of Dollars)

	2019	2020	Share in 2020	Annual Change	Backlog
Revenues ($M)	$322.4	$384.9	3.7%	19.4%	$291.4

2019 data as shown in the 2020 PMMI State of the Industry Study
Data issued: June 2021 • Source: Omdia

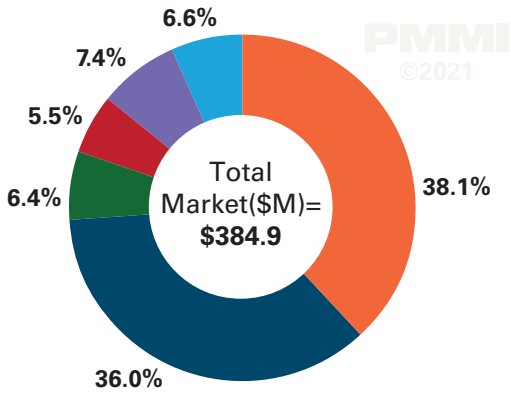
Specialty Packaging Machinery Shipments by Industry Sector, 2020

Table 1.86 (Millions of Dollars)

	2020	Share in 2020
Beverages	$146.8	38.1%
Food	$138.5	36.0%
Household, Industrial & Agricultural Chemicals	$24.8	6.4%
Personal Care, Toiletries & Cosmetics	$21.2	5.5%
Pharmaceuticals	$28.3	7.4%
Other End-User Sectors	$25.2	6.6%
Grand Total	**$384.9**	

Data issued: June 2021
Source: Omdia

Figure 1.86



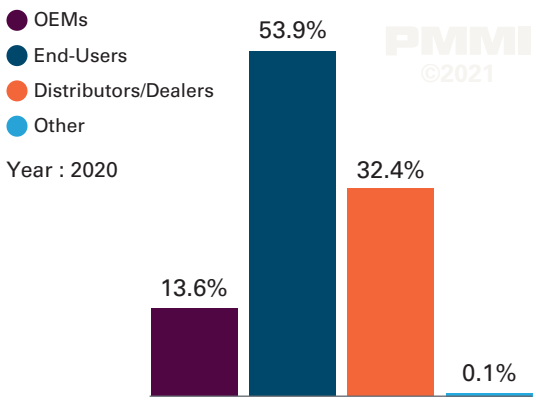
Specialty Packaging Machinery Shipments by Customer Type, 2020

Table 1.87 (Millions of Dollars)

	2020	Share in 2020
OEMs	$52.3	13.6%
End-Users	$207.4	53.9%
Distributors/Dealers (including agents)	$124.6	32.4%
Other	$0.5	0.1%
Grand Total	**$384.9**	

Data issued: June 2021
Source: Omdia

Figure 1.87



SECTION FOUR

ECONOMIC OUTLOOK

GDP GROWTH

The global economy has reached an important milestone in the second quarter of 2021, surpassing the pre-pandemic real GDP peak attained in the fourth quarter of 2019. The Asia-Pacific region was first to complete its recovery in late 2020, owing to a resilient mainland Chinese economy. North America's recovery has coincided with that of the world; US economists estimate that the US real GDP reached a new peak in May 2021. Africa and the Middle East will reach this juncture in the third quarter, and Europe and Latin America will complete their recoveries in the final quarter of 2021.

After a 3.5% contraction in 2020, global real GDP is projected to increase 6.0% in 2021, its strongest advance since 1973. Growth will continue at a robust 4.6% pace in 2022 before settling to 3.0% in 2023–25. The June forecast of world growth is revised up by 0.3 percentage point in 2021, reflecting brighter outlooks for the United States, Europe, Latin America, and mainland China.

GDP Growth in U.S.

US GDP growth rate (2021) increased to 6.0%.

2021	2022	2023-25
▲ 6.0%	▲ 4.6%	▼ 3.0%

As recovery from the COVID-19 recession is completed, the global economy is moving into the sweet spot of the current expansion. World real GDP growth is picking up from an annual rate of 1.5% quarter on quarter (q/q) in the first quarter to rates of 6.0–7.0% over the remainder of 2021. As vaccination rates increase and pandemic-related restrictions are lifted, consumer spending is surging.

This is most evident in the United States, where pent-up demand for travel and all services involving social interaction is stronger than anticipated. Western Europe is in the early stages of a growth spurt as economies reopen, labor market conditions improve, and household saving rates retreat from exceptionally high levels.

Business investment is also picking up in response to more robust sales prospects and favorable financing conditions. Depleted inventories will be rebuilt, supporting economic growth in the second half of 2021. Meanwhile, commodity exporting countries are benefiting from elevated prices and a strong resurgence in exports.

Global economic growth is set to slow in 2022 and 2023. The post-pandemic economic surge is expected to subside by mid-2022, as pent-up demand is satisfied and global real GDP growth settles at a 3% annual pace. The withdrawal of fiscal stimulus will become a drag on growth as governments rein in spending and contend with higher debt burdens. Government fiscal deficits widened from 3% of world GDP in 2019 to 10% in 2020 and are expected to narrow to 7% in 2021 and 4% in 2022.

Forecast Risks

COVID-19 virus flare-ups remain a risk to the economic outlook in places where vaccination rates are lagging. This includes many emerging and developing countries where vaccine campaigns are just beginning and will extend into 2022. Parts of Asia have experienced COVID-19 outbreaks this spring, prompting lockdowns that have affected consumer spending and exports. Thus, India, Taiwan, Malaysia, Vietnam, and Japan have experienced setbacks in recent months but should rebound in the summer quarter. India's daily infection rate has fallen 80% from its early May peak. Declining cases will enable Japan to lift states of emergency in all areas but Okinawa prefecture on 20 June.

Global supply chains are severely disrupted, and rebalancing will take time. The IHS Markit PMI™ global manufacturing survey found that supplier delivery times lengthened in May to the greatest extent in survey history, contributing to the steepest rise in input costs in over a decade and record inflation in selling prices. While some of the delays emanate from suppliers in Asia, manufacturers in Europe and North America are most affected by delivery delays. With consumer demand expected to grow at a rapid pace through 2021, transportation delays are likely to continue into 2022. Semiconductor shortages have also disrupted several industrial sectors, including automobiles and parts, household goods, and technology equipment. The shortages reflect sharp declines in exports of electronic components from mainland China and Taiwan.

Industrial commodity prices are beginning a correction, but downstream price pressures remain intense. Market forces are working, as high commodity prices are dampening demand and incentivizing production. The IHS Markit Materials Price Index (MPI) has fallen from early May to mid-June, and declines have been broadly based. Buyers are resisting high prices and mainland China has announced plans to sell state inventories of industrial metals. Despite the downturn, the MPI is up 25% year to date and nearly double its year-earlier level. Some of the increases will be passed downstream to finished goods prices in the months ahead.

Global consumer price inflation is projected to pick up from 2.1% in 2020 to 3.3% in 2021 before settling back to 2.7% in 2022 as supply conditions improve and commodity prices retreat. Forecast risks are on the upside and depend on the path of long-term inflation expectations, as well as monetary and fiscal policies.

As economies move toward full employment, transitory inflation pressures could give way to more persistent inflation pressures. In response to accelerating prices, currency depreciation, and capital flight, central banks in Brazil, Russia, Ukraine, and other emerging markets have already raised interest rates. In the United States, the eurozone, and other advanced economies where inflation expectations are well-anchored, monetary tightening can be delayed in the short term but not indefinitely.

Table A.2 GDP Forecasts - Americas% Annual Growth 2013 - 2025 Real GDP, Growth Rate, Year-on-Year

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Brazil	3.2%	0.5%	-3.5%	-3.5%	1.6%	1.7%	1.4%	-4.4%	5.0%	3.2%	1.9%	2.3%	2.6%
Canada	2.3%	2.9%	0.7%	1.0%	3.0%	2.4%	1.9%	-5.3%	6.5%	4.5%	2.1%	2.1%	2.3%
Latin America	3.6%	0.9%	-0.5%	-1.3%	2.1%	1.3%	1.0%	-6.3%	5.3%	3.5%	2.6%	2.6%	2.9%
Mexico	1.6%	2.9%	3.3%	2.4%	2.3%	2.2%	-0.2%	-8.5%	5.8%	2.8%	2.1%	2.0%	2.0%
United States	1.8%	2.5%	3.1%	1.7%	2.3%	3.0%	2.2%	-3.5%	7.4%	4.8%	1.7%	2.0%	2.2%
Americas	**2.1%**	**2.3%**	**2.4%**	**1.2%**	**2.3%**	**2.7%**	**1.9%**	**-4.3%**	**6.9%**	**4.5%**	**1.9%**	**2.1%**	**2.3%**

Data issued: June 2021
*Source: *GDP Data from IHS Markit Economics & Country Risk*


10
7.50
2.50
0.00
-2.50
015f
2016f
2009
2010
2011
2012

SECTION FIVE

APPENDIX

APPENDIX A

Scope & Methodology

SCOPE

This study provides a detailed view of the domestic market for packaging and converting machinery produced in the United States (US).

The goal of this report is to provide key insights and forecasts related to the strength and direction of the industry. Considerable emphasis is placed on providing the reader with detailed insight by machinery category through in-depth discussion and supporting data.

The specification of this study was developed in conjunction with the PMMI, The Association for Packaging and Processing Technologies. As a consequence, it focuses on issues that are fundamental to an in-depth understanding of the future development of this market.

The key objectives of the research, as defined at the outset, were to:

- Compile estimates of the size of the domestic market for US-produced packaging machinery by industry sector in 2020; expressed in US dollar revenues from each major packaging machinery category.
- Use credible economic indicators and a robust forecasting method to project market growth from 2021 to 2026, with clear justification.
- Identify key trends that may affect the market from 2021 to 2026.

BASIS OF THIS STUDY

Collected base years:
Calendar Year 2020

Forecast years:
2021 to 2026

Segmentations:
- Machinery categories
- Machinery Types
- Industry Sector
- Customer Type

Machinery Types

- Accumulating / collating machines
- Blister, skin / vacuum packaging machines
- Capping, overcapping, lidding machines
- Cartoning machines
- Case / tray sealing machines
- Case / tray, loading / unloading machines
- Case erecting / tray forming machines
- Case group / load and close / seal machines
- Cleaning, sterilizing, cooling and drying machines
- Closing, seaming and sealing machines
- Coding machines
- Conveying machines
- Dating, printing, marking, stamping and imprinting machines
- Feeding machines
- Filling and closing machines
- Filling machines - dry / powder /solid product
- Filling machines - liquid / gas /viscous product
- Form / fill / seal machines - horizontal
- Form / fill / seal machines - vertical
- Inspecting, detecting and checkweighing machines
- Labeling machines
- Orienting, unscrambling machines
- Pallet unitizing machines
- Palletizing - ancillary machines
- Palletizing / depalletizing machines
- Specialty packaging machines
- Wrapping / banding / bundling machines
- Converting machines - container / material manufacture

RESEARCH METHODOLOGY

The scope of this study was developed with PMMI. The research method used in packaging machinery reports relies heavily on supplier participation and feedback, including multiple feedback loops throughout the research process.

This report is based largely on primary data collection for quantitative and qualitative analysis. Quantitative data were collected via completed questionnaires from major suppliers to the market, while both face-to-face and telephone discussions on the market with manufacturers' personnel provided insight and identified qualitative trends for analysis.

Secondary research was carried out to extend product and company knowledge using company annual reports, business and financial press, manufacturers' brochures, data books and other technical literature

POINT OF MEASUREMENT FOR MARKET VALUE

Calendar year

The base year for this study is calendar year 2020. For comparison to previous calendar years this report presents data from the 2016 to 2019 PMMI State of the Industry Reports. Omdia collects revenue data based on the calendar year, rather than the fiscal year, so reporting across companies is consistent.

Distributor markup

Omdia excluded revenues generated through distributor markup because this study focuses on the supplier part of the value chain.

Rebranding

Market-size estimates were derived solely from branded sales for each company, which requires the exclusion of revenues sold to a third party that re-brands products under its own name to sell to the open market. Rebranding has been taken into consideration to avoid double-counting.

Merchant market

Only sales to the open or "merchant" market were analyzed as part of this study. Intra-company sales occur when divisions of large conglomerates sell internally to others in the same organization without an open bidding process. Such sales are often called the "captive market" and were excluded from estimates of market size in this report.

Exchange rates

Data for this report were collected in local currencies where possible, although most companies reported in US dollars and Canadian dollars. All price and revenue data for 2020 were converted to US dollars using the average exchange rates for the year. To be consistent, market data were analyzed and presented in US dollars. Forecasts are in constant dollars at the 2020 rates of exchange.

Project method

Revenues, unit shipments and average selling prices (ASPs) have been analyzed as part of this study to provide further insight on the status of the market and to highlight expected future development. The main forecast is in revenues and ASPs, with unit shipments derived from them.

The ASP of each product segment was generated for the base year 2020 based on data and interviews provided by manufacturers of packaging machinery. Factors that contribute to changes in ASP, such as price erosion and changes in the product mix, were assessed to calculate a profile of changing ASPs for the years 2021 to 2026. Product-level revenues were forecast along with the projected ASPs, and unit forecasts were then derived from them.

In an effort to simplify the forecasting process for subsequent market segmentation, the forecast model assumes that the profile of change in ASP for each major product category is constant across the various market segments.

Base year analysis

For the purpose of statistical analysis, calendar year 2020 was used as the base year. Omdia requested leading suppliers of packaging machinery to provide revenue and unit shipment data for 2020 for product sales by product type. Additional breakdowns of sales according to the market segmentations analyzed in this report were also provided for 2020. These data were compiled to calculate the approximate size of the market in 2020 and how revenues in the aggregate market were segmented. To identify any statistical discrepancies, both "top-down" and "bottom-up" analyses were used.

Forecast method

The forecast model used in this report, which for consistency is also used in other industrial automation reports, relies heavily on four main sources of information, described below. An insight into the current economic outlook in section four includes GDP and industrial production information.

1. Economic assumptions • Real GDP and Industrial Production are relevant and available economic indicators that are forecast by credible sources. Omdia Economics produces a Country Forecasting Tool from which this data is sourced. Real GDP and Industrial Production forecasts are also sourced from the Country Forecasting Tool for the all the data analyzed in this report.

2. Machinery production forecasts • Core statistics produced as part of the Omdia Machinery Production Market Tracker are integrated into this report's forecast method. They are used to help project the performance of the different machinery markets evaluated in this study. The most up-to-date machinery production data available are estimated along with historical estimates for each machinery category.

   Omdia believes it is not appropriate to derive machinery production growth directly from GDP. This is because industrial production is only one component of GDP and can behave differently. In contrast, machinery production is tied heavily to industrial production and the growth profiles tend to be very closely linked.

3. Capital expenditure changes • This study has been compiled using a combination of both primary and secondary research. The primary research has been carried out by analysts contacting key decision makers involved in capital expenditure projects. These consultations involved evaluating interviewees' perceptions of trends in capital expenditure, how this spending takes place, and its associated timing.

   The secondary research involved collating data from a variety of sources that present data on this topic, such as national statistics bodies, industry associations, regulators and financial institutions. This secondary research process provided the framework for the analysis, while the more detailed qualitative assessment was derived from the primary research.

4. Supplier interviews • Indications of market trends and performance are derived from interviews with marketing personnel at major manufacturers. These factors are used to weigh market growth for different product types in different discrete and process industries. For example, trends affecting different product types were evaluated and integrated into the forecast model.

PMMI MEMBER COMPANY RESPONDENTS

As part of the research for this report, Omdia requested PMMI members that supply packaging machinery to provide revenue and unit shipment data for 2020 for machinery sales by product type, industry sector and customer type. Data was compiled to estimate the size of the total and segmented markets in 2020.

In total, 194 PMMI members participated in the research for the 2021 PMMI State of the Industry Report. Table A.1 provides segmentation of the participant members by packaging machinery revenues in the US in 2020.

All revenue categories were reasonably well represented. However, there was a greater concentration of participants in the three largest categories with over 80% of the participants having generated more than $10 million from packaging machinery sales in 2020.

In the research for the 2020 report

194
PMMI member participated

There was a greater concentration of participants in the three largest categories with over

80%
of the participants having generated more than

$10 mn
from packaging machinery sales

State of the Industry - Packaging Machinery, 2020

Table A.1 - PMMI Member Respondents by Company Size
Number of Respondents

Company Size (by revenue category)	Number of respondents	Share of total (%)
Less than $2 million	3	2%
$2 million but less than $4 million	15	8%
$4 million but less than $6 million	7	4%
$6 million but less than $10 million	15	8%
$10 million but less than $20 million	26	13%
$20 million but less than $50 million	39	20%
$50 million or more	89	46%
Grand Total	194	100%

Data issued: June 2021 Source: Omdia

APPENDIX B

MACHINERY CATEGORY & SUBCATEGORY DEFINITIONS

MACHINERY CATEGORY DEFINITIONS

The scope of the report includes 31 different packaging machinery categories. The following machinery category definitions are used:

Accumulating / collating machines

A machine that accumulates and or collates objects (packages, products, etc.) on line or off line. This category includes the following:

Accumulator - collator robotic An accumulator that uses a robot in the process of accumulating.

Accumulator - continuous loop machine A series of conveyor chains that form a continuous loop to allow product to accumulate by forming concentric nested lanes of product during accumulation and discharging the product to the downstream machines either in single file, en-masse, or multiple, divided rows. Product that is not discharged is recirculated and resent to the discharge point.

Accumulator - conveyor A conveyor designed to permit accumulation of packages, objects, or carriers.

Accumulator - in-line A series of wide conveyors that are adjacent to, and on either side of, the product flow conveyor, with one side moving in the same direction as the product flow and the other side moving in the opposite direction.

A wide conveyor, that receives product at one end and discharges at the other, allowing the product to accumulate in transit.

Accumulator - off-line A wide conveyor placed perpendicular to the line that moves away from the line while loading, then reverses direction to put the product back onto the production line.

Accumulator - rotary machine A flat, round, rotating disc that can store and collect products between machines.

Accumulator - serpentine machine A series of conveyor runs that loop back and forth on each other to create a store of products in between two machines.

Accumulator – spiral/helical machine A series of conveyors that form an inclining and a declining spiral with a transfer device in between the two spirals for transferring product from the incline spiral to the decline spiral. This transfer device will position itself relative to the speed of the two spirals to form a continuous line of product through the unit.

Indexing / counting / collating conveyor / machine A machine used to collect and orient packages in specific patterns, usually in conjunction with bundling, multi-packing, or case packing, that also indexes, counts and collates products and packages.

Vacuum packaging machines

A machine used to heat-seal a plastic blister to coated cardboard or a machine that traps product inside of a plastic bag that is collapsed by vacuum and sealed.

Blister packaging machine A machine used to heat-seal a blister to coated cartonboard and blister to compatible packages.

Skin / vacuum packaging machine A machine that traps product inside of a plastic bag that is collapsed by vacuum and then sealed. Also includes wrapping machines that seal products placed on perforated and coated cartonboard blanks with a web of thermoplastic film.

Capping, overcapping, lidding machines (uses a closure)

A machine that applies a closure (cap, overcap, lid, membrane, etc.) to a container.

Aerosol valve closing machine A closing machine that places an aerosol valve into the mouth of a rigid container before seaming the valve to the container.

Crown capping machine A closing machine that places a pre-formed metal cap over the mouth of a rigid container before crimping the edges of the cap to secure it to the container.

Overcapping machine A machine that places a secondary cap or lid designed to protect the primary closure of fitment of a container or to provide aesthetic enhancement.

Plugging, corking machine A machine wherein casks, kegs or bottles are filled and/or closed by pushing a plug or cork into the mouth of a rigid container and/or the machine applies cork wiring to prevent the cork from being pushed out by pressure in the container.

Press-on lidding machine A closing machine that pushes a lid, usually metal or plastic, onto a rigid container.

Roll-on capping machine A closing machine that places a deformable capsule over the mouth of a rigid container before rolling the capsule to form a thread and secure the capsule to the container.

Screw capping machine A closing machine that applies a threaded cap or lid, usually to a rigid container.

Specialty closure applicator machine (dispensers, pumps, fitments, etc.) A closing machine that places a dispensing pump into the mouth of a rigid container before attaching the pump to the container.

Cartoning machines

A machine that performs one or more of the following functions to a package made of paperboard: opening, loading, and/or closing.

Carton blank / skillet erecting / forming machine A packaging machine that erects pre-glued cartonboard skillets and secures them by engaging pre-cut tabs and slots, applying adhesive or applying heat to pre-coated board. Also, a packaging machine that forms cartonboard blanks into cartons and secures them by engaging pre-cut tabs and slots, applying adhesive or applying heat to pre-coated board.

Carton end flap closing machine A packaging machine that closes cartons and secures them by engaging pre-cut tabs and slots, applying adhesive or applying heat to pre-coated board.

Carton horizontal end load form / fill / seal machine A cartoning machine that erects a folded and side seam-sealed carton and places it on a horizontal transport mechanism so that the carton can be filled with product horizontally through an end flap of the carton before being closed.

Carton three flap carton closing machine A packaging machine that closes three flap cartons and secures them with adhesive or by the application of heat to pre-coated board.

Carton top load carton form / fill / close / seal machine A cartoning machine in which a carton blank is partly formed into an open-top carton before being loaded vertically with product. After loading, the carton is fully formed and closed within the machine.

Carton tray erect/load/seal machine A cartoning machine in which a carton tray blank is partly formed before being loaded horizontally with product. After loading, the carton tray is fully formed and sealed within the machine.

Carton vertical form / fill / seal machine A cartoning machine that erects a folded and side seam-sealed carton and places it on a horizontal transport mechanism so that the carton can be filled with product vertically through the carton top flap before being closed. A vertical form fill-and-seal machine that uses a heavy paper laminate that is formed, filled with product (usually a liquid) and sealed to produce a pack resembling a carton.

Carton wrap-around cartoner / sleeving / mandrel form / fill / seal machine A cartoning machine that wraps a paperboard blank around a product, or group of fill / seal machine products, securing it by engaging pre-cut tabs and slots or by the application of adhesive. Also includes a cartoning machine that wraps a cartonboard blank around a product, usually with the aid of a mandrel, before closing the carton with adhesive or by tucking.

A cartoning machine that forms cartons either from magazine-fed or reel-fed carton blanks, around one or a number or mandrels, before filling the cartons with product and closing them in the machine.

A cartoning machine that forms a bag made from a reel of flexible material on a mandrel. A carton blank is formed around the bag to produce a bag-in-box package. This package is then filled with product before first the bag and then the carton are closed.

Case / tray sealing machines (limited to corrugated)

A machine that closes a container or tray made from corrugated paperboard.

Case gluing machine A packaging machine that closes cases, usually made from corrugated board, and seals them with adhesive.

Case stapling machine A packaging machine that closes cases, usually made from corrugated board, and seals them with staples.

Case taping machine A packaging machine that closes cases, usually made from corrugated board, and seals them with self-adhesive or pregummed tape.

Wrap-around lidding machine A packaging machine that closes group packages, usually deep wall trays, by folding a corrugated board blank around the open top of the pack and securing it.

Case / tray, loading / unloading machines

A machine that loads or unloads a case made from corrugated material or a tray.

Case liner bag inserting / uncuffing / closing machine A machine that inserts a liner bag (usually plastic) into a corrugated case.

Case unloading machine A machine that opens and or unloads a corrugated case.

Drop packing machine A packaging machine that assembles groups of products and loads them into group packages by gravity.

Gantry loading / unloading machine A machine that loads or unloads a case or tray using a gantry-type mechanism (e.g. a lifting mechanism fitted in a trolley for horizontal movement).

Horizontal case loading machine A packaging machine that assembles groups of packages and loads them horizontally into group packages, usually corrugated board cases.

Place packing machine A packaging machine that grips groups of products and either places them vertically into or removes them from group packages.

Robot place loading / unloading machine A machine that loads or unloads a case or tray by means of a robot. A robot is an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes which may be fixed in place or mobile for use in industrial automation applications.

Vertical case loading machine A packaging machine that groups packages together and loads them vertically through the top of side-seamed cases that are closed within the machine.

Case erecting / tray forming machines

A machine that erects or forms a corrugated case or tray from a flat blank.

Bliss box forming machine A machine that forms various types of bliss boxes from flat corrugated material.

Case erecting machine A packaging machine that erects side-seamed cases, usually made from corrugated board.

Partition inserting machine A packaging machine that assembles and places pre-cut divisions into a group package, usually a corrugated board case.

Tray forming erecting machine A packaging machine that forms trays, usually from pre-cut corrugated board blanks.

Case group / load and close / seal machine

A machine that loads and closes and/or seals a container made from corrugated material.

Bottom load casepacking machine A packaging machine that groups packages together and loads them vertically through the bottom of side-seamed cases that are closed within the machine.

Case / tray multipacking machine A machine that groups and/or loads multiple units of product and loads them into a case or tray.

Horizontal case packing machine (end load / side load) A packaging machine that groups packages together and loads them horizontally into side-seamed cases that are closed within the machine.

Vertical case packing machine A packaging machine that groups packages together and loads them vertically into side-seamed cases or trays that may be closed within the machine.

Wrap-around case packing machine A packaging machine that groups packages together and wraps a pre-cut case blank around them.

Wrap-around sleeving machine A packaging machine that groups packages together and wraps a precut sleeve blank around them.

Wrap-around tray packing machine A packaging machine that groups packages together and wraps a pre-cut tray blank around them.

Cleaning, sterilizing, cooling and drying machines

A machine that cleans, sterilizes and cools containers using air, gas, vacuum or ultrasonic means.

Air / gas / vacuum cleaning machine A packaging machine that cleans the inside and/or outside of rigid containers by injecting a gas, usually air, into inverted containers, or by vacuum.

Sterilizing machine - batch or continuous A packaging machine that sterilizes empty containers before they are filled. A packaging machine that sterilizes packaged products by heating and then cooling them continuously under controlled conditions either in a continuous or batch mode.

Sterilizing - any process that effectively kills or eliminates transmissible agents (such as fungi, bacteria, viruses and prions) from a surface, equipment, foods, medications, or biological culture medium. Sterilization can be achieved through application of heat, chemicals, irradiation, or filtration.

Ultrasonic cleaning machine A machine that cleans a container using ultrasonic waves.

Warming, curing, cooling, and drying machine A packaging machine that reduces the temperature of packages and/or removes surface moisture. Also, a packaging machine that warms empty glass containers before they are hot filled.

Washing / rinsing / cleaning machine (bottle / crate / part) A packaging machine that cleans the inside and outside of rigid containers, usually with water and detergent. Also, a packaging machine that cleans the inside of a rigid container by injecting a liquid, usually water, into the inverted container.

Closing, seaming and sealing machines (bags, cartons or corrugated boards)

A machine that closes, seams and seals a container using a closing device (clip, sewing, staples, twist ties, tape strapping, etc.), adhesive, folding/tucking, crimping or sealing (heat, sonic, ultrasonic, radio frequency, etc.).

Can seaming machine (uses the can's end to seal the can) A machine that places a pre-formed lid onto the mouth of a can body before mechanically rolling and interlocking five layers of metal together - three from the can lid and two from the can body - compressing them tightly in two seaming stages to form a hermetical seal.

Clip / sewing / staple / twist-tie machine

Clip - A closing machine that loses flexible packages (netting, base and plastic casing materials) with metal clips.

Sewing - a closing machine that closes packages, usually paper sacks, by sewing.

Staple - a closing machine that closes packages, usually corrugated cases, with metal staples.

Twist tie - a closing machine that closes packages, usually bags, by twisting a wire closure around the neck of the package.

Crimp / roller closing machine A closing machine that closes a package, bag or collapsible tube or can by crimping or roll forming.

Film / foil sealing machine A packaging machine that applies a reel fed film, foil or plastic cover to a rigid container, which is usually plastic.

Folding / tucking machine A closing machine that closes a package, usually a carton, by engaging pre-cut tabs and slots. A closing machine that closes and/or seals a package, usually a bag or collapsible tube, by folding.

Glue application / sealing machine A sealing machine that seals packages, usually bags, cartons or corrugated board cases, with an adhesive.

Heat sealing (conduction) machine A sealing machine that seals a package, usually plastic, by heat transferred by conduction.

Impulse / induction sealing machine A sealing machine that seals a foil laminate lid to a container in an

electromagnetic field.

Sonic / ultrasonic / radio frequency (RF) sealing machine A sealing machine that seals material using sonic, ultrasonic or RF energy.

Strapping machine A sealing machine that seals packages with a metal or plastic strap.

Tape sealing machine A sealing machine that seals packages, usually corrugated board cases, with pressure sensitive tape or gummed tape.

Weld sealing machine A sealing machine that seals a package, usually metal, by welding.

Coding, dating, printing, marking, stamping and imprinting machines (not on label)

A machine that prints or scans optical readable codes (information) or decoration on a surface by ink, laser or contact.

Bar coding machine A machine that prints or scans (reads) a type of optically readable code.

Braille coding / application machine A machine that creates and or applies braille coding.

Contact coding machine A machine that places information on a surface by physical contact.

Emboss coding machine A machine attachment that marks a package by embossing or debossing with raised type.

Ink-jet coding machine A machine attachment that marks a package by jetting ink (wet or dry) in a predetermined pattern.

Laser coding machine A machine attachment that marks a package with a laser.

Product identification, decorating machine A machine that transfers information or decoration onto a surface through contact.

Thermal transfer coding machine A machine attachment that marks a package by transferring dry ink, carried on a reel of film, with a heated dye.

Converting machines - container / material manufacture

A machine that makes a packaging container (rigid or flexible) from glass, metal, paper or plastic.

Bag / pouch making machine A machine that makes a bag (a preformed, flexible container generally enclosed on all but one side). Bag making machines, roll fed, for the production of the following bag styles: S.O.S. square bottom bags; flat and square (satchel) bags; heat seal pinch bottom bags; multiwall bags; and handle bags with twisted, flat, or die-cut handles.

Blow molding machine A machine that makes bottles and packages from plastic by expanding tubular material in a hollow mold.

Box making machine Machinery that prints, scores, cuts, slots and forms fiberboard and paperboard into boxes.

Can making machine A machine that makes a container, usually from metal, generally having a capacity of less than 40 liters (10 gallons). Machines for trimming and die-necking two-piece beverage cans after body making. A machine that makes and or applies an end to a can. A machine that makes a can by winding paper or paperboard in overlapping layers until a suitable body thickness is built up.

Cup making machine

Paper - A machine that makes a rigid container constructed almost completely from lightweight paperboard fiber stock.

Plastic - a machine that makes a rigid container using plastic material.

Extruding machine A machine with a screw device rotating inside of a strong steel barrel that melts and ejects plastic material.

Injection molding machine A machine that makes plastic shapes by extruding plastic into a dye.

Label printing machine A printing machine that prints rolls of labels.

Paperboard molding machine A molding machine for paperboard.

Thermoforming machine A machine that make a rigid container from a plastic web plastic material by using heat and dies to form a shape then cut the shape from the web.

Conveying machines

A machine that conveys or moves containers or product (items or bulk) using mechanical (belts, buckets, chain, etc.) or pneumatic/vacuum means.

Air cushion / driven conveyor A fixture that uses pressurized air to move material or product from one place to another.

Apron / cable / drag chain / slat conveyor A type of conveyor having one or more endless chains that transports bulk materials through a trough. A type of conveyor in which the product is supported by moving endless cable(s) operating between guides. A conveyor in which a series of apron pans form the moving bed.

Belt conveyor An endless fabric, rubber, plastic, leather or metal belt operating over suitable drive, tail-end and bend terminals and over belt idlers or a slider bed for handling bulk material, packages, or objects placed directly upon the belt.

Bucket conveyor Any type of conveyor in which the material is carried in a series of buckets.

Elevating / lowering conveyor A conveyor used to discharge material at a higher or lower point than that at which it was received.

Flat top / mat top chain conveyor Any type of conveyor in which one or more chains act as the conveying element.

Lane divider / merge / transfer / infeed conveyor / mechanism A conveyor section where two or more product flows meet and merge or where a conveyor/mechanism single product flow is divided into two or more flows.

Magnetic conveyor A belt conveyor operating over a slider bed containing permanent magnets for handling ferrous metal parts.

Monorail (trolley) conveyor A series of trolleys supported from or within an overhead track and connected by an endless propelling means such as a chain, cable or other linkage with loads usually suspended from trolleys.

Pneumatic conveyor An arrangement of tubes or ducts that bulk material or objects are conveyed in a pressure and/or vacuum system.

Pucking / depucking conveyor A conveying system that uses a fixture to convey unstable or awkwardly shaped packages.

Roller conveyor A series of rollers supported in a frame wherein objects are advanced manually or by gravity or power.

Screw conveyor A conveyor screw revolving in a suitably shaped stationary trough or casing that may be fitted with hangers, through ends or other auxiliary accessories.

Spiral conveyor A conveyor that follows a helical path, wherein the input is at a different elevation than its output.

Steel belt conveyor A belt conveyor using a steel band belt as the conveying medium.

Vacuum conveyor A conveyor that moves product by means of pressure lower than that of atmospheric (vacuum).

Vibratory horizontal motion conveyor A machine that transports material using a horizontal oscillating or vibrating motion.

Wire mesh conveyor A belt conveyor using a flexible belt composed of a series of formed wires laterally connected, or of longitudinally articulated wires laterally connected for operation over straight-face pulleys.

Feeding machines

A machine that feeds (dispenses, places) packages, product or items.

Bag/sack/pouch feeding/presenting machine A packaging machine that uses pre-made bags/sacks, or a reel of tubular film, to form the base of a sack by heat sealing. The machine may separate the sack from the reel and open it ready for filling. Also, a packaging machine that removes a pre-made bag from a magazine and opens it ready for filling.

Coupon / booklet feeding / placing machine (outserting) A packaging machine or attachment that dispenses and or places a leaflet, card or coupon from a stack, magazine or bulk supply.

Package accessory (handle, hook, hanger) feeding / application machine A packaging machine attachment that applies a tear tape, pre-wrapped straw, handle, opening key, knife, fork, spoon, etc. to a package.

Pouch feeding machine A machine that feeds pouches from a strip or fan fold bulk supply.

Protective material feeding machine (e.g. cotton, desiccants, paper, etc.) Equipment that dispenses protective packaging material into a container for the purpose of securing and protecting the contents of the container.

Rigid container / product feeding machine A packaging machine that feeds rigid or semi-rigid containers, usually canisters, cups, tubs or trays, from a stack or magazine.

Robotic feeding machine Robot - an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes, which may be fixed in place or mobile for use in industrial automation applications.

Sorting / feeding machine A machine that sorts (based on a parameter) and/or feeds product or packages.

Vibratory feeding machine A machine that feeds material by vibration induced by mechanical or electrical means.

Filling and closing machines

A machine that performs the functions of filling and closing a packaging container (bags, bottles, cans, cups, trays, tubs, kegs, tubes, vials, etc.).

Ampoule / vial filling and closing machine A packaging machine in which glass ampoules or vials are first filled with a liquid and then fusion sealed.

Bag open / fill / seal machine A packaging machine that opens, fills and seals a bag.

Blister filling and sealing machine A packaging machine in that a pre-formed plastic blister is taken from a magazine, filled with product and then sealed to a backing card.

Bottle / jar filling and capping machine A packaging machine in which bottles are first filled and then capped.

A packaging machine in which cans are first filled and then seamed.

Cartridge filling and sealing machine A machine that feeds a semi rigid cartridge and then fills and seals the cartridge.

Cup / tray / tub filling and sealing machine A packaging machine in which a plastic cup, tray or tub is taken from a magazine, filled and then closed with a heat sealed foil and/or a press-on lid.

Film tube filling and sealing machine A packaging machine that forms a tube from film, fills the tube and then closes it by folding, crimping or a heat seal.

Keg / cask filling and sealing machine A packaging machine that fills and seals kegs and/or casks.

Sack / pouch open / filling and closing / sealing machine

Bag - a packaging machine in which a premade bag is taken from a magazine, opened, filled with product and then sealed.

Sack - a packaging machine in which a pre-made sack is taken from a magazine before being opened, filled with product and then closed.

Tube filling and sealing machine A packaging machine in which collapsible tubes are taken from a magazine, filled and then folded, crimped or heat sealed.

Filling machines – dry / powder / solid product

A filling machine that measures a solid or powder product by means of volume, weight, mass or time (irrespective of the container).

Auger filling machine A filling machine that measures out a product, usually a powder or granular, using an auger that rotates for a predetermined number of revolutions.

Count filling machine Filling machines that measure out solids according to a predetermined count.

Gross weighing machine A filling machine that measures out a predetermined mass of product, which may be liquid, powder, gas or solids, directly into the package, while it rests on a weighing instrument that controls the filling operation.

Net weighing machine A filling machine that measures out a predetermined mass of product, usually free-flowing solids, before dispensing it as a fill.

Selective combination weighing machine A net weighing machine with multiple weighing units that computes an appropriate combination of loads to achieve the predetermined mass and discharges them together as a fill.

Vibratory filling machine A machine that fills product by means of a vibratory feed mechanism.

Volumetric filling machine A filling machine that measures out a product, usually free-flowing solids or powder, in a cup of predetermined volume.

Filling machines - liquid / gas / viscous product

A filling machine that measures a liquid, gas or viscous product by means of volume, weight, mass or time (irrespective of the container).

Aerosol filling machine A machine that fills product enclosed under pressure dispersed in a gas.

Displacement filling machine A filling machine that measures out product, usually liquid, by displacing a predetermined volume of product with a loose fitting piston.

Flowmeter filling machine A filling machine that measures out product, usually liquid, using a flowmeter.

Gas and vacuum combo filling machine A filling machine that fills a package using a combination of vacuum and flushing the package with a gas other than air.

Gas flush filling machine A filling machine that fills a package that has been flushed with a gas other than air.

Gravity filling machine A filling machine that fills product, usually liquid or powder, to a predetermined level in a container by gravity.

Net weight filling machine A filling machine that measures out a predetermined mass of product before dispensing it as a fill.

Pressure filling machine A filling machine that fills a product, usually liquid, to a predetermined level in a rigid container, with product under pressure.

Rotating chamber filling machine A filling machine that measures out a product, usually a liquid, paste or gas, using a metering pump that operates for a predetermined number of cycles.

Stuffing machine (natural or manmade casing) A machine that fills a cavity with a mixture of product.

Timed flow filling machine Filling machines that measure out a product, usually a liquid or powder, by controlling the product flow duration to a predetermined value.

Vacuum filling machine A filling machine that fills a product, usually a liquid or powder, to a predetermined level in a rigid container by applying a vacuum to the container.

Volumetric piston filling machine A filling machine that measures out a product, usually a liquid, viscous material, paste or gas, using a reciprocating piston of predetermined volume.

Form / fill / seal machines - horizontal

A machine that forms, fills and seals a bag or pouch from a web of material moving in a horizontal direction.

Blow-mold fill and seal machine Packaging machines in which plastic granules are melted, extruded, and blow molded to form a container, which is then filled with product and sealed within the machine.

Cold form / fill / seal machine A form, fill and seal machine in which a web of deformable material is formed.

Edge sealing machine A horizontal form, fill and seal machine in which product is placed on a horizontal web.

Flow wrapping machine A horizontal form, fill and seal machine with film reel mounted above the operating level; the product is loaded horizontally and a longitudinal seal is formed below the pack.

Form / fill / seal machines for bags A horizontal form, fill and seal machine that produces a pillow bag or stand-up pouch.

Form / fill / seal machine for stand-up pouches A horizontal form, fill and seal machine in which stand-up pouches are formed, sealed on two or three sides, filled vertically with product and sealed on the remaining side while the film web is moved horizontally with the pack being moved vertically.

Form / fill / seal machine for pouches with fitments A horizontal form, fill and seal machine in which pouches with fitments are formed, sealed on 2 or 3 sides, filled vertically with product and sealed on the remaining side while the film web is moved horizontally with the pack vertical.

Sachet form/ fill / seal machine A horizontal form, fill and seal machine in that packs are formed, sealed on two or three sides, filled vertically with product and sealed on the remaining side while the film web is moved horizontally with the pack being moved vertically.

Thermoform / fill / seal machine A form, fill and seal machine in which a web of thermoformable material is heated and cooled and formed with pressure and/or vacuum before being filled vertically with product, sealed with a top film or magazine-fed lid and finally cut to produce individual packs. Machines can produce one or more lanes of packs and can form, fill and seal machine in which a web of thermoformable material is heated and cooled to formed with pressure and/or vacuum before being filled vertically with product, sealed with a top film or magazine-fed lid and finally cut to produce individual packs. Machines can produce one or more lanes of packs and can form, fill and seal machine in which a web of thermoformable material is heated and formed with pressure and/or vacuum before being filled vertically with product, sealed with a top film or magazine-fed lid and finally cut to produce individual packs. Machines can produce one or more lanes of packs and may incorporate equipment to evacuate packages before they are sealed.

Form / fill / seal machines - vertical

A machine that forms, fills and seals a bag or pouch from a web of material moving in a vertical direction.

Form / fill / seal machine for bags Packaging machines that form a bag from a reel of lay-flat, tubular, and flexible packaging film. The bag is then filled with product and sealed within the machine.

Form / fill / seal machine with fitment attachment A vertical form, fill and seal machine that uses one or multiple webs of film that are formed vertically, filled with product and sealed to produce a 3- or 4-sided sealed sachet. Machines can have one or two reels of film and can produce one or more lanes of packs. Also, includes packaging machines that form packs from a reel of flexible material, on one or a number of mandrels, before filling the packs with product and sealing their tops.

Stick / film tube form / fill / seal machine (single / multiple lane) A vertical form, fill and seal machine that produces individually sealed sticks or film tubes.

Strip packing machine A vertical sachet form, fill and seal machine that produces strips of individually sealed packs joined together in predetermined lengths.

Inspecting, detecting and checkweighing machines

A machine that checks compliance to a parameter (specification) of a product or container by means of scanning, weighing, etc.

Aerosol testing machine An inspection machine that checks filled aerosol cans for leaks.

Bar-code verification machine A machine which scans and verifies the information contained in a bar code.

Can / cap / case inspecting machine An inspection machine that tests a case for acceptable properties. An inspection machine that inspects filled and closed rigid containers for the presence of a cap and rejects containers without caps. An inspection machine that checks cans against a predetermined set of characteristics.

Checkweigher machine A measuring instrument that measures the mass of a package or product, usually as it travels on a conveyor, records the mass of the item and rejects those that fall outside of preset values.

Coatings/thickness testing machine An inspection machine that measures / tests the thickness of material or coatings.

Empty bottle inspection machine A packaging machine that inspects empty bottles for certain attributes, e.g. size, wall thickness, and cleanliness, and rejects bottles that fall outside of pre-set values.

Fill height inspecting machine A packaging machine that detects the level of fill in a container and rejects containers that falls outside of pre-set values.

Foreign matter detecting machine An inspection machine that detects the presence of foreign matter in a product that then may remove them (e.g. vision systems, metal detectors, x-rays, etc.).

Label inspecting machine An inspection machine that detects labels on packages and checks that they comply with pre-set requirements, e.g. orientation, print quality, and alignment.

Leak detecting machine An inspection machine that tests package leakage.

Metal detection / separation machine An inspection machine that detects the presence of metallic matter in a product that then may remove them.

Open flap detecting machine An inspection machine that detects the presence of an open flap on a carton or case and rejects it.

Optical inspecting machine An inspection machine that uses vision systems to detect the presence of conditions not meeting a predetermined specification.

Radio frequency identification (RFID) reading machine A machine that reads the information contained on an RFID tag.

Scanning machine An inspection machine that uses light waves to examine the characteristics of a product or container.

Seal checking machine An inspection machine that tests the integrity of package seals and rejects faulty packages.

Torque/tightness testing machine An inspection machine that tests caps, lids, etc. for closing integrity using torque or other mechanical means.

Vision inspecting machine An inspection machine that uses visible light waves to examine the characteristics of a product or container.

X-ray inspecting machine An inspection machine that uses x-ray waves to examine the characteristics of a product or container.

Labeling machines (product identification, decorating)

A machine that creates, imparts information to and/or applies a label to a package or product.

Dual head printing (over/under, tandem) labeling machine

Electronic article surveillance (EAS) – source tagging machine A machine that feeds and applies EAS source tags.

Foiling machine A packaging machine that applies a decorative foil to the neck of a closed rigid container.

Heat seal labeling machine A labeling machine that applies labels coated with a heat sealable material.

Hot melt glue labeling machine A labeling machine that applies labels, usually to a rigid container, using an adhesive that is solid at room temperature.

Labeling machines A machine that applies a label.

Pre-gummed label applying machine A labeling machine that applies pre-gummed labels to packages.

Pressure-sensitive labeling machine A labeling machine that applies pre-glued labels that are supplied on a reel of release paper or film.

Print and apply labeling machine A labeling machine on that a label is first printed and then applied to a package.

RFID encoding/apply machine Machines that apply or encode RFID tags.

RFID encoding / printing / apply machine Machines that encode RFID tags, prints a label containing human or machine readable code and applies the label.

Shrink labeling / sleeving machine A packaging machine that places a tube of plain or printed thermoplastic material over the container, then heats the material to shrink to conform the shape of the container.

Stretch labeling / sleeving machine A packaging machine that places a tube of plain or printed thermoplastic by stretching material over the container, then using tension the material is shrunk to conform to the shape of the container.

Tag applying machine A packaging machine that applies a tag, usually to a rigid container, either by placing it over the neck of the container or by fixing it to the container with glue.

Weigh price labeling machine A machine that weighs a product and prints and produces a label based on the weighing information.

Wet glue labeling machine A labeling machine that applies labels, usually to a rigid container, using an adhesive that is liquid at room temperature.

Orienting, unscrambling machines

A machine that orients or unscrambles product or containers from supply means or bulk.

Component / product orienting, unscrambling machine A packaging machine that accepts a bulk supply of packaging components, e.g. caps, and dispenses them in a predetermined orientation.

Container orienting, unscrambling machine A packaging machine that accepts a bulk supply of randomly oriented containers, usually plastic bottles, and dispenses the containers in a predetermined orientation.

Container de-nesting machine A packaging machine that dispenses trays, usually plastic or fiberboard, from a stack.

Container stacking machine A packaging machine that stacks trays that are usually filled.

Crate stacking / unstacking machine A packaging machine that stacks or unstacks crates that may be full or empty.

Tray / crate handling machines A packaging machine that orients, unstacks and handles trays or crates.

Pallet unitizing machines

A machine that secures (unitizes) containers or product on a pallet by means of adhesive, film, banding, etc. This includes the following machinery types: adhesive pallet stabilizing machines, pallet hooding machines, pallet shrink-wrapping machines, pallet strapping machines, and pallet stretch wrapping machines.

Palletizing - ancillary machines

A machine that dispenses, places or orients pallets, pads or slip sheets used in the palletizing operation. This includes the following machinery types: pallet dispensing machines, pallet elevator / stacking machines, pallet inverting machines, pallet layer forming machines, slip sheet dispensing / removal machines and top sheet dispensing machines.

Palletizing / depalletizing machines

A machine that places or removes product or containers into/from the layers of a pallet load.

Bag palletizing machine A packaging machine that handles bags or sacks comprising a series of conveying mechanisms that assembles products in a predetermined pattern to form layers and sequentially deposits the layers on a pallet to build a unit load.

Bulk palletizer and / depallatizer for containers A packaging machine that assembles a loading unit, usually comprising rigid containers, that are gripped and pushed on one layer at a time. A machine that forms and/or places layers of product / packages on a pallet by means of a lifting device attached to a device moving in the horizontal plane.

Case palletizing machine A packaging machine that forms a number of different loading units simultaneously. Group packages are formed into layers and transferred to the appropriate pallet one layer at a time. A packaging machine that forms a loading unit, usually comprising group packages, that are fed to the machine at low level. A packaging machine that forms a loading unit, usually comprising rigid containers or group packages, that are formed into layers and then lifted, a layer at a time, and placed on the pallet. A packaging machine that forms a loading unit, usually comprising group packages, that are fed to the machine at a high level.

Liftoff depalletizing machine A packaging machine that dismantles a loading unit, usually comprising rigid containers or group packages, that are lifted off one layer at a time.

Robotic palletizing / depallitizing machine A packaging machine that dismantles a loading unit, usually comprising group packages, that are lifted off one at a time by means of a robot. A machine that forms a loading unit, usually comprising group packages, that are picked up, oriented and placed on the pallet one at a time using a robot. Robot - an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes which may be fixed in place or mobile for use in industrial automation applications.

Sweep off depalletizing machine A packaging machine that dismantles a loading unit, usually comprising rigid containers, that are gripped and pushed off a layer at a time. A packaging machine that disassembles a loading unit, where the containers are pushed off (swept) a layer at a time.

Specialty packaging machines

This category refers to a range of machines types not covered in the other categories included in the list of definitions above. This includes the following machinery types:

Aseptic packaging machine A machine that places a commercially sterile product into a commercially sterile container.

Fitment assembly / insertion machine A machine that assembles and/or inserts a device into or onto a container to provide a special function.

Opening / closing device applying machine A machine that applies an opening or closing device to a package.

Tamper evident seals and band-applying machine A machine that produces and/or applies a band or seal that indicates if package contents have been tampered with or altered.

Also included are:
Clamshell handling machines, compressing machines, controlled atmosphere packaging (CAP) machines, foam in place machines, leaflet, label, booklet, outsert folding machines, modified atmosphere packaging machines, product / package recovery machines, tamper evident seals / bands applying machines / steam tunnels, twist wrapping machines and zipper application machines.

Wrapping / banding / bundling machines

A machine that wraps, bands or bundles products or containers using film or paper from a roll and the associated heat tunnels, etc. used to shrink the material.

Banding machine A wrapping machine that wraps a band of material around a product or group of products and secures it with adhesive or by the application of heat.

Foil and band wrapping machine A wrapping machine that wraps a product in aluminum foil before applying a paper band to complete the package.

Fold / tuck wrapping machine (film or paper) A wrapping machine that wraps a product in a deformable material, e.g. aluminum foil or paper, in a series of folding operations.

L-sealing machine A wrapping machine that uses thermoplastic film folded in half along its length. Products or groups of products are placed between the two halves of film before the film is sealed around the product with an L-shaped sealing bar to produce a fully enclosed pack, sealed on three sides.

Over wrapping machine A wrapping machine that wraps a product or group of products in flexible packaging material with a series of folding, heat sealing or gluing operations.

Pleat wrapping machine A wrapping machine that gathers and folds flexible material around a product and seals it at one point by applying a label.

Roll wrapping machine A wrapping machine that wraps a cylindrical product or group of products, in a series of folding, heat sealing or gluing operations, to form a roll-shaped pack.

Shrink bundling machine A machine that groups products and wraps the bundle with shrink film.

Shrink tunnel / oven machine A machine that shrinks thermoplastic film around a product or group of products as they pass through a heated tunnel or chamber. The heating medium may be hot air, radiant heat or steam.

Shrink wrapping machine A machine that shrinks thermoplastic film around a product or group of products as it is moved over the surface of the product.

Sleeve wrapping machine A wrapping machine that wraps a band of thermoplastic material loosely around a product or group of products before the pack is passed through a shrink tunnel to form a shrink-wrap pack. The band may be formed from one or two reels of film.

Spiral wrapping machine A wrapping machine that wraps a web of thermoplastic tightly around a product or group of products, in a series of turns, while the product is conveyed through the machine.

Stretch banding machine A wrapping machine that wraps a band of thermoplastic film tightly around a product or group of products.

Stretch wrapping machine A wrapping machine that pulls a web of stretch film around a product.

APPENDIX C

LIST OF TABLES

APPENDIX D

COPYRIGHT NOTICE AND DISCLAIMER

The Omdia research, data and information referenced herein (the "Omdia Materials") are the copyrighted property of Informa Tech and its subsidiaries or affiliates (together "Informa Tech") or its third party data providers and represent data, research, opinions, or viewpoints published by Informa Tech, and are not representations of fact.

The Omdia Materials reflect information and opinions from the original publication date and not from the date of this document. The information and opinions expressed in the Omdia Materials are subject to change without notice and Informa Tech does not have any duty or responsibility to update the Omdia Materials or this publication as a result.

Omdia Materials are delivered on an "as-is" and "as-available" basis. No representation or warranty, express or implied, is made as to the fairness, accuracy, completeness, or correctness of the information, opinions, and conclusions contained in Omdia Materials.

To the maximum extent permitted by law, Informa Tech and its affiliates, officers, directors, employees, agents, and third party data providers disclaim any liability (including, without limitation, any liability arising from fault or negligence) as to the accuracy or completeness or use of the Omdia Materials. Informa Tech will not, under any circumstance whatsoever, be liable for any trading, investment, commercial, or other decisions based on or made in reliance of the Omdia Materials.

PMMI Business Intelligence

PMMI HEADQUARTERS
12930 Worldgate Dr., Suite 200
Herndon, Virginia 20170
T: (571) 612-3200
F: (703) 243-8556
E: pmmi@pmmi.org
www.pmmi.org

PMMI LATIN AMERICA
Homero 418 Piso 7
Col. Miguel Chapultepec
Miguel Hidalgo, D.F. 11570 Mexico
T: + (52 55) 5545 4254
F: + (52 55) 5545 4302
E: latina@pmmi.org
www.pmmi.org.mx/es

LEARN MORE!

PMMI's Business Intelligence Reports

Visit **pmmi.org** or contact **Paula Feldman**, Senior Director Business Intelligence, at **571-612-3194** or **pfeldman@pmmi.org**.

PMMI's most recent reports include:

Our Latest Report

Guidance in an Uncertain Economy

Economic Impact of COVID-19

Trends and Drivers Impacting the Pet Food Industry

Trends and Advances in Food Packaging and Processing

Cannabis Market

Aftermarket Opportunities For OEMs

Flexible Packaging Market Assessment

Vision 2025

Robotics