Keynote Address
17th Annual CARE Conference
Factors Affecting Plastics Industry

- Domestic Economic Conditions
- Technological Innovation
- Global Economic Conditions
- Regulatory Environment
- Demographics

Sustainability
With chemical recycling, plastic can be transformed back into its raw materials and reused in new applications like carpet, packaging & more.
Weaker global economic growth...

Gross Domestic Product (GDP) Forecast
Source: IMF

2019 2020
Moderate global economic activity…

<table>
<thead>
<tr>
<th>World Economy</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross domestic product, constant prices, % change</td>
<td>3.6</td>
<td>3.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Investment, % of GDP</td>
<td>26.2</td>
<td>26.3</td>
<td>26.3</td>
</tr>
<tr>
<td>Inflation, end of period consumer prices, % change</td>
<td>3.7</td>
<td>3.6</td>
<td>3.5</td>
</tr>
<tr>
<td>Trade volume of goods and services, % change</td>
<td>3.8</td>
<td>3.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Commodity Price Index, Fuel and Non-Fuel Price, 2005=100</td>
<td>128.4</td>
<td>118.8</td>
<td>119.3</td>
</tr>
<tr>
<td>Crude Oil (petroleum), simple average of Brent, WTI, and Dubai Fateh, US$/barrel</td>
<td>68.3</td>
<td>59.2</td>
<td>59.0</td>
</tr>
<tr>
<td>Natural Gas, Henry Hub, US$/MMBtu</td>
<td>3.2</td>
<td>2.7</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: IMF
U.S. economy still at full capacity…with moderate growth projections
Long-run U.S. Unemployment Rate

Unemployment Rate

- Official Rate
- U6 Rate
- Manufacturing
U.S. Regulatory Environment


- Manufacturing
- Finance and Insurance
- Transportation and Warehousing
- Admin & Support & Waste Mgmt & Remediation Services
- Professional, Scientific, and Technical Services
- Information
- Agriculture, Forestry, Fishing and Hunting
- Retail Trade
- Utilities
- Educational Services
- Health Care and Social Assistance
- Public Administration
- Arts, Entertainment, and Recreation
- Mining, Quarrying, and Oil and Gas Extraction
- Wholesale Trade

CFR count of the number of restrictions—binding constraints marked by words that create an obligation to comply, such as “shall” or “must” (thousands)

Manufacturing continues to evolve…
U.S. Manufacturing Output and Employment

Manufacturing Output and Employment
Source: BLS and Federal Reserve

Manufacturing Employees (Left) — Plastics Products (Right) — Manufacturing (Right)
Artificial Intelligence (AI) in Manufacturing

- Quality Checks
- Maintenance
- Faster, more reliable design
- Reduced environmental impact
- Harnessing useful data
- Supply chain communication
- Waste reduction
- Improved customer service
- Post-production support
Plastics Producer Price Index

Producer Price Index by Industry: Material Recyclers: Recyclable Plastics, Index June 1996=100, Monthly, Not Seasonally Adjusted
https://plasticsindustry.org/data/industry-data

- Recyclable Plastics
- 12-Month Moving Average
Oil and Gas Prices Forecasts

West Texas Intermediate (WTI) crude oil price and NYMEX confidence intervals
dollars per barrel

Henry Hub natural gas price and NYMEX confidence intervals
dollars per million Btu

Note: Confidence interval derived from options market information for the five trading days ending Apr 4, 2019. Intervals not calculated for months with sparse trading in near-the-money options contracts.

Source: Short-Term Energy Outlook, April 2019, and CME Group
U.S. Industrial Production

Industrial Production Indices
(Source: Federal Reserve Bank)
Recession: Four Monthly Coincident Indicators

[Trend
Industrial Production
Non-farm Payrolls
Retail Sales
Real Personal Income]
Balance Sheet Recession?

Consumer and Mortgage Debt – Percent of Disposable Income
Source: Federal Reserve

Commercial and Industrial Loan Growth
Source: Federal Reserve
U.S. Recession Probabilities and Plastics Shipments

U.S. Recession Probabilities
(Piger and Chauvet, 2008)

U.S. Recession Probabilities and
Plastics Shipments (% Change Y/Y)
<table>
<thead>
<tr>
<th>Category</th>
<th>2017</th>
<th>2018</th>
<th>Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal consumption expenditures (PCE)</td>
<td>12,558.7</td>
<td>12,890.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Goods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durable goods</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicles and parts</td>
<td>1,577.9</td>
<td>1,667.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Furnishings and durable household equipment</td>
<td>360.4</td>
<td>382.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Recreational goods and vehicles</td>
<td>476.2</td>
<td>517.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Other durable goods</td>
<td>239.9</td>
<td>259.6</td>
<td>8.2</td>
</tr>
<tr>
<td>Nondurable goods</td>
<td>2,822.0</td>
<td>2,901.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Food and beverages purchased for off-premises consumption</td>
<td>938.9</td>
<td>968.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Clothing and footwear</td>
<td>382.9</td>
<td>397.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Gasoline and other energy goods</td>
<td>446.5</td>
<td>444.0</td>
<td>(0.6)</td>
</tr>
<tr>
<td>Other nondurable goods</td>
<td>1,045.1</td>
<td>1,078.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household consumption expenditures (for services)</td>
<td>7,842.2</td>
<td>7,992.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Housing and utilities</td>
<td>2,129.9</td>
<td>2,160.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Health care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation services</td>
<td>417.6</td>
<td>424.5</td>
<td>1.7</td>
</tr>
<tr>
<td>Recreation services</td>
<td>489.1</td>
<td>492.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Food services and accommodations</td>
<td>795.3</td>
<td>816.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Financial services and insurance</td>
<td>848.4</td>
<td>856.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Other services</td>
<td>1,027.0</td>
<td>1,053.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>
Factors affecting demand for goods and services

- Disposable income
- Wealth
- Exchange rate
- Availability of consumer credit
- Interest rate on consumer credit
- New housing demand
- Population growth
U.S. Household Disposable Income and Net Worth

Real Disposable Personal Income

$Billions vs. %

Quarterly, Y/Y

Household Net Worth and Household’s Equity in Real Estate

$Billions

2012 Dollars  Quarterly, Y/Y

Owner’s Equity in Real Estate  Net Worth
Home Remodeling Segments in the U.S.

Products & Services Segmentation:
- Outside additions: 27.9%
- Systems and equipment: 17.6%
- Room additions and other interior alterations: 17.0%
- Other: 12.8%
- Kitchen remodeling: 11.0%
- Disaster repairs: 5.0%
- Bathroom remodeling: 8.7%

Major Market Segmentation:
- Single-family homes (detached): 65.1%
- Apartment buildings: 15.8%
- Other: 7.9%
- Single-family homes (attached): 11.2%
Commercial Remodeling Segments in the U.S.

**Products & Services Segmentation**
- Interior additions and alterations: 22.8%
- Systems and equipment: 23.5%
- Exterior additions and alterations: 29.8%
- Disaster repair: 6.7%
- Other remodeling services: 17.2%
- Other remodeling services: 3.4%

**Major Market Segmentation**
- Office buildings: 34.1%
- Lodging: 13.0%
- Retail buildings: 26.0%
- Warehouses and storage: 13.3%
- Nonresidential farm structures: 3.4%
- Amusement and recreational buildings: 6.8%
- Other: 3.4%
Plastics in Building and Construction

Properties and Benefits

- Durability in extreme environments
- Light weight
- Faster construction times
- Structures can often be repaired in site
- Flexible in terms of color, shape and texture
- Ability to be made fire-resistant
- High strength-to-weight and stiffness-to-weight ratios
- Low thermal conductivity
- Corrosion resistance
- Long lifespans
Plastics and the Housing Market

New Single-Family Home Sales – Quarterly
Source: US Census Bureau

Housing Starts and Industrial Production: Plastics Products
Source: PLASTICS© Analysis of BLS Data
### Fannie Mae Housing Forecast (April 2019)

<table>
<thead>
<tr>
<th>Growth Rate (Y/Y)</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing starts (%)</td>
<td>2.6</td>
<td>2.1</td>
<td>5.4</td>
</tr>
<tr>
<td>New single-family home sales (%)</td>
<td>1.0</td>
<td>2.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Total existing home sales (%)</td>
<td>-2.7</td>
<td>0.3</td>
<td>2.3</td>
</tr>
<tr>
<td>30-year fixed mortgage rate (%)</td>
<td>4.5</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Median new home price ($1,000)</td>
<td>326</td>
<td>336</td>
<td>348</td>
</tr>
<tr>
<td>Median total existing ($1,000)</td>
<td>259</td>
<td>268</td>
<td>278</td>
</tr>
</tbody>
</table>
Mortgage rates fell in recent months…
Home Building & Commercial Building Construction
Revenue Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>Home ($Billions)</th>
<th>Commercial ($Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>84.1</td>
<td>237.9</td>
</tr>
<tr>
<td>2020</td>
<td>85.6</td>
<td>242.3</td>
</tr>
<tr>
<td>2021</td>
<td>87.5</td>
<td>248.3</td>
</tr>
<tr>
<td>2022</td>
<td>88.3</td>
<td>253.0</td>
</tr>
<tr>
<td>2023</td>
<td>89.9</td>
<td>257.9</td>
</tr>
<tr>
<td>2024</td>
<td>91.3</td>
<td>262.8</td>
</tr>
</tbody>
</table>
Carpet Mills in the U.S.

**Product Segmentation**
- Roll carpets & rugs: 65.6%
- Woven carpets & rugs: 4.3%
- Modular carpet & rug tile: 7.5%
- Other: 4.0%
- Washable scatter rugs, bathmats & sets: 4.4%
- Automobile & aircraft carpet & rugs: 8.2%
- Revenue from finishing: 6.0%

**Major Market Segmentation**
- Residential Replacement: 43.8%
- Office and corporate commercial construction: 32.9%
- New residential construction: 6.6%
- Exports: 8.8%
- Nonoffice commercial construction: 7.9%
- New residential construction: 6.6%
- Residential Replacement: 43.8%
Carpet Mills: Demand Drivers

- Private spending on home improvements
- Housing starts
- Disposable income
- Trade weighted U.S. dollar index
- Corporate profit
- Price of synthetic fiber
Carpet Mills in the U.S.: Revenue and Demand

Revenue and Domestic Demand Projections ($ Billions)

Source: IBISWorld
Flooring Stores and Installers in the U.S.: Revenue

Revenue Projections – All Flooring Materials ($ Billions)

Source: IBISWorld
Plastics and the Automotive Market

Auto and Light Truck Sales and Assemblies
Source: BEA and Federal Reserve

Industrial Production Plastics Manufacturing and Auto Sales
Source: PLASTICS© Analysis of BEA and Federal Reserve Data

\[ R^2 = 0.8301 \]
Plastics in motion in today’s trends in transportation

The four, interrelated trends in the transportation sector are:

- Electric
- Autonomous
- Connected
- Shared
Automobile Manufacturing Revenue Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue ($Billions)</th>
<th>Demand ($Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>107.5</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>99.3</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>95.8</td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>96.1</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>94.2</td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td>92.1</td>
<td></td>
</tr>
</tbody>
</table>
# 2018 World Motor Vehicle Production

<table>
<thead>
<tr>
<th>Country</th>
<th>Auto</th>
<th>Commercial Vehicles</th>
<th>Total</th>
<th>% Change 2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>70,466,344</td>
<td>21,072,296</td>
<td>91,538,640</td>
<td>-6.29</td>
</tr>
<tr>
<td>China</td>
<td>23,709,782</td>
<td>1,995,776</td>
<td>25,705,558</td>
<td>-4.16</td>
</tr>
<tr>
<td>USA</td>
<td>2,795,971</td>
<td>8,190,254</td>
<td>10,986,225</td>
<td>1.11</td>
</tr>
<tr>
<td>Japan</td>
<td>8,358,220</td>
<td>843,071</td>
<td>9,201,291</td>
<td>0.39</td>
</tr>
<tr>
<td>Germany</td>
<td>5,120,409</td>
<td>-</td>
<td>5,120,409</td>
<td>-9.3</td>
</tr>
<tr>
<td>India</td>
<td>4,064,774</td>
<td>663,193</td>
<td>4,727,967</td>
<td>7.98</td>
</tr>
<tr>
<td>South Korea</td>
<td>3,661,730</td>
<td>367,104</td>
<td>4,028,834</td>
<td>-2.09</td>
</tr>
<tr>
<td>Mexico</td>
<td>1,575,808</td>
<td>2,332,331</td>
<td>3,908,139</td>
<td>0.14</td>
</tr>
<tr>
<td>Spain</td>
<td>2,267,396</td>
<td>496,671</td>
<td>2,764,067</td>
<td>-1.01</td>
</tr>
<tr>
<td>Brazil</td>
<td>2,386,758</td>
<td>358,981</td>
<td>2,745,739</td>
<td>5.23</td>
</tr>
<tr>
<td>France</td>
<td>1,763,000</td>
<td>506,000</td>
<td>2,269,000</td>
<td>1.98</td>
</tr>
</tbody>
</table>

Source: International Organization of Motor Vehicle Manufacturers
U.S. dollar holding steady…

Trade Weighted U.S. Dollar Index: Major Currencies (Daily)
Source: Federal Reserve Bank
US Plastics Trade

US Plastics Industry Trade (2018 - Preliminary)
Resins, Products, Machineries, Molds
Source: PLASTICS© Analysis of USITC Data
US Plastics Trade Breakdown in 2018

Exports - $ Billions
- Resins: 17.59
- Products: 26.54
- Machineries: 3.41
- Molds: 0.62

Imports - $ Billions
- Resins: 17.59
- Products: 38.06
- Machineries: 3.41
- Molds: 2.29
U.S. Plastics Trade with USMCA

U.S. Plastics Trade with Mexico
(Resins, Products, Machinery, Molds)

$ Billions

Balance
Export
Import

16.83
11.51
5.31
China’s Dependence on International Trade

**China: Number of people living < $1.90/day**

*World Bank*

**Chinas Exports of Goods and Service**

*World Bank*
Brexit Effects?

- Trade is 62% of UK’s economy
- UK’s GDP: 1.2 ~ 1.6% next four years
- Plastics (HTS 39) : ranked 7th largest UK import in 2018
- No-deal Brexit:
  - Plastics industry output: 10.0% ~ 11.0% lower
  - £340M cost of exports and £540M cost of imports
- Under a free trade agreement:
  - Plastics industry output: 5.0% ~ 6.0% lower
- UK - low growth market for U.S. plastics exports

Source: www.plasticsindustry.org/data/industry-data
2019 - 2020 Production Volume Forecast (Y/Y Growth)

- Plastics Material and Resin: 2019 - 2.0%, 2020 - 1.8%
- Plastics Products: 2019 - 1.4%, 2020 - 1.6%
- Plastics Machinery: 2019 - -1.3%, 2020 - 2.0%
- Plastics Molds: 2019 - 0.9%, 2020 - 0.6%
Summary

• Account for weaker global economic conditions to affect business activity

• Plan for demand to stay positive

• Anticipate consumer preferences

• Listen to clients and their markets

• Communicate your sustainability story

• Think innovation, innovation, innovation!