ChemQuest Group

Coatings Trends & Technologies

# Fundamentals to Ensure Sustainable Growth: Strategic Insights for Mid-Decade Business Planning. Are you Ready for 2025?

Coatings Trends & Technologies

September 2021

Presented By:

The ChemQuest Group, Inc.

# MACRO ENVIRONMENT

# Macro Environment - U.S. and Global Growth Outlook

**U.S. real GDP declined 3.5% in 2020 after 14 years in a row of growth under 3% (last time it was >3% was in 2005 at 3.5%)**

- **Q2 2021 GDP preliminary reading lower than expected at 6.5% (SAAR) with large increases in personal consumption but with lower-than-expected private and public investment**
- **Global GDP forecast has been moving up and is currently 5.6% in 2020 (World Bank latest forecast)**
  - U.S forecast for 2021 is expected to see GDP growth of 6.8% in 2021
  - Europe forecast to grow 4.2% in 2021 after a decline of 6.6% in 2020 and compared to 1.3% growth in 2019
  - China was the only major economy to grow in 2020 helped by increased trade surplus of goods and is forecast to grow 8.5%
  - Emerging markets have also been hard it (India -8% for 2020) and are expected to grow >6% in 2021

**Covid-19 vaccination rate has reached 51.5% of the population in the U.S. but is seeing another surge in infections**

- **Robustness of the economic recovery is encouraging**
  - Optimism that the crisis is abating continues but obstacles remain; including a reluctance of many to resume normal activities including international travel, cruising, and returning to schools and the office full-time
  - Recent economic data continues to be strong, however increased cases of the Covid-19 Delta variant have added some uncertainty to normalization timeframe as some restrictions have recently been imposed again in many countries

**Central Banks and fiscal stimulus have stabilized the financial markets and the economy during the crisis**

- U.S. Federal Reserve intervention including asset purchases and other programs go beyond what was pledged in 2008/9
- Additional infrastructure stimulus appears to be heading for passage in the fall with a bipartisan effort currently ongoing in the Senate
- Inflation concerns continue but the Federal Reserve's stance is that it is transitory

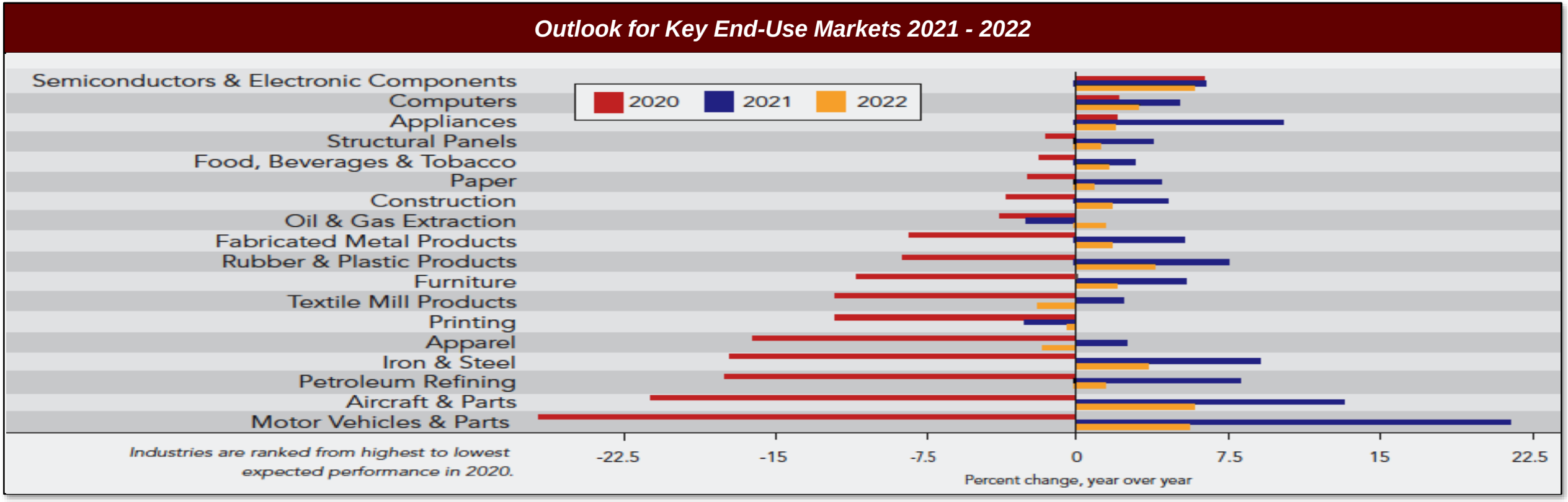
**Sales of goods outpacing service sector helping coatings producers**

- **"V"** shaped recovery for many durable goods as homeowner's spent on improvements during the increased time at home in 2020
- M&A activity has resumed after a pause during the spring of 2020

**2021 Outlook for raw materials**

- TiO2 price increases appear to be durable in 2021
- Other inputs including solvents, additives and resins likely to be headwind to coatings margins (2-3% on gross margin for 2021)
- Resins including VAM and Epoxy have seen dramatic price increases in 2021, up over 100%

# "V-shaped" Rapid Recovery



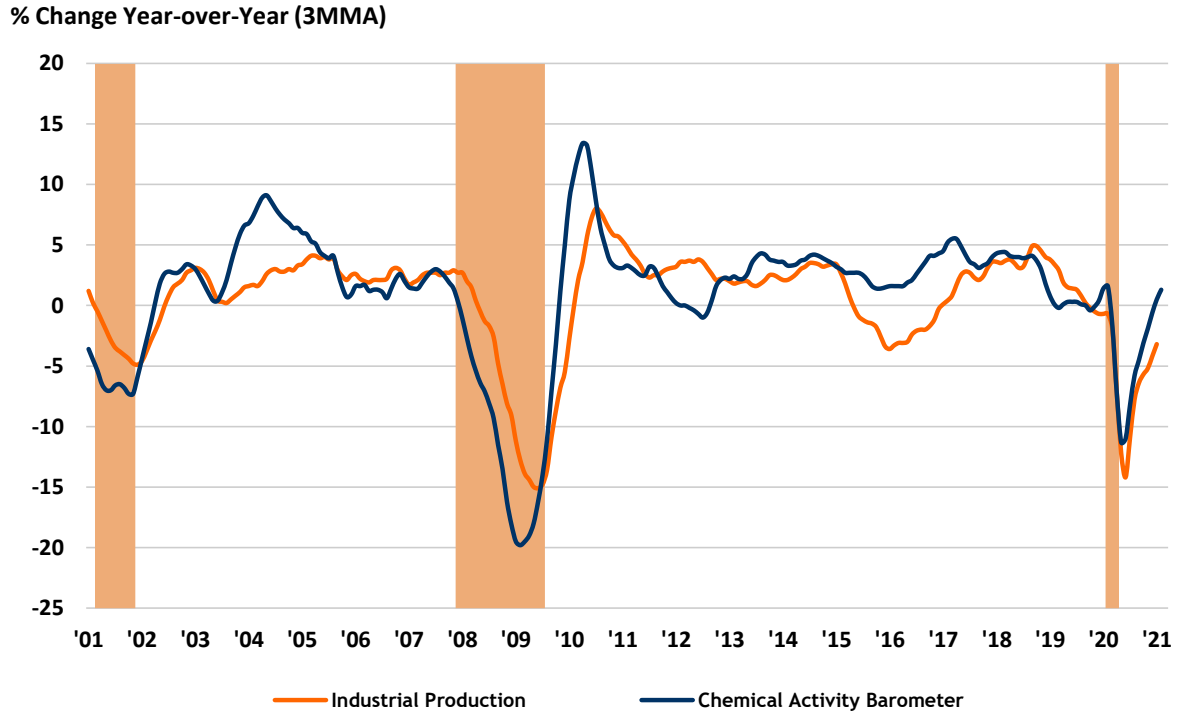

- While the downturn was rapid and deep, with 2020 Q2 GDP off by nearly a third (annualized basis), the recovery that likely began at the end of that quarter has been swift
- As factories reopened toward the end of the second quarter and inventories were drawn down, demand firmed across many economic segments
- Industrial production fell by 6.9% in 2020, with declines in nearly every industry sector. With the recovery in place, however, industrial production will continue to strengthen and should increase by 3.7% in both 2021 and 2022
- Growth expectations are positive for all industries in 2021 except oil and gas; motor vehicles, aerospace, appliances, iron and steel, petroleum refining, and plastic and rubber products should show the largest gains

*Source: American Chemistry Council.*

# Continued Strong Recovery in 2021

- Light vehicles are an important market for chemicals, representing over $3,170 in chemicals per vehicle. Sales were very strong during 2015–2019, averaging almost 17 million units each year. However, the U.S. light vehicle industry experienced sizeable lockdowns and, as a result, sales should total only 14.7 million in 2020.
  - A V-shaped recovery in this industry is occurring and sales should rise to 16.4 million in 2021. An eventual return to normal job and income levels as well as some continuing pent-up demand will support this rebound. The outlook is for sales to improve and remain at elevated levels over the next several years.
- Housing also consumes a lot of chemicals; 2020 showed a gain (despite COVID-19) to 1.34 million units as many households move from urban areas to suburban, ex-urban and rural areas.
  - Low mortgage rates also provided some much-needed stimulus. Expected growth in household formation — the leading determinant of housing demand —coupled with job and income gains in the long-term will support continuing, albeit more modest progress through 2025.
  - However, shortages of labor and available lots will constrain the pace of growth.
  - Housing starts are set to edge higher to 1.38 million in 2021 and 1.36 million in 2022. This is a market that could surprise to the upside.

***ACC Chemical Activity Barometer***



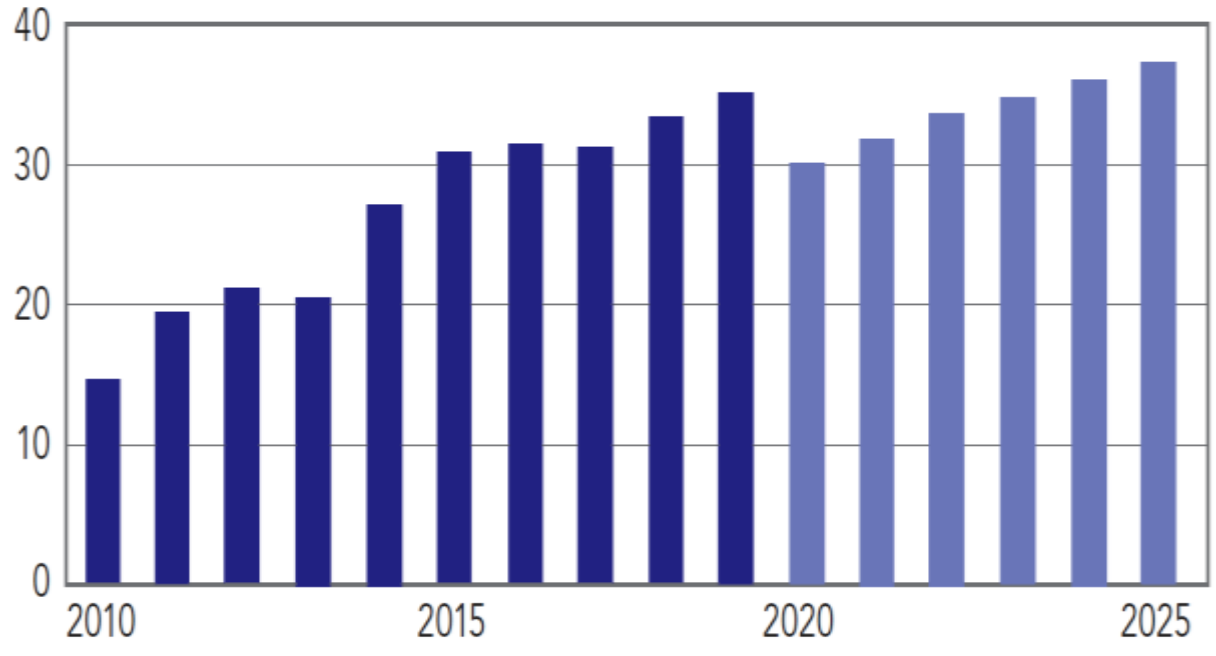

The Chemical Activity Barometer — an ACC-developed composite leading index of broader industrial activity — rose for the eleventh straight month in January. While key indicators are mixed, they remain largely positive and point to continued recovery in the U.S. economy in 2021

*Source: American Chemistry Council, ChemQuest*

# Investments in U.S. production plants will continue to increase

- Chemical industry capital spending likely fell by 14% in 2020 where capacity utilization fell to 78% and will experience only a modest 4.8% gain in 2021. Growth will remain moderate in subsequent years but could pick up afterward if the business environment proves supportive.
- By 2025, U.S. capital spending by the chemical industry should approach $37.3 billion, nearly 3X the level of spending at the start of the last cycle in 2010. Investment for bulk petrochemical and organic intermediates, along with that for plastic resins, will dominate.
- The new capacity started up recently and slated to come online in the years ahead puts the U.S. in a top competitive position for the foreseeable future.
- More than half of the investments announced since 2010 have been completed or currently are under construction. As the global economy expands and key-end use markets strengthen, we expect growth in basic chemicals as well most other chemical segments through 2025.
- Significant risks to this outlook include, most prominently, the containment of COVID-19. While several vaccines are progressing quickly, meaningful vaccine distribution may not occur until well into 2021.
- Despite the recovery currently underway, the momentum of the world economy can't gain traction until the health crisis abates.

***Chemical Industry Capital Spending***

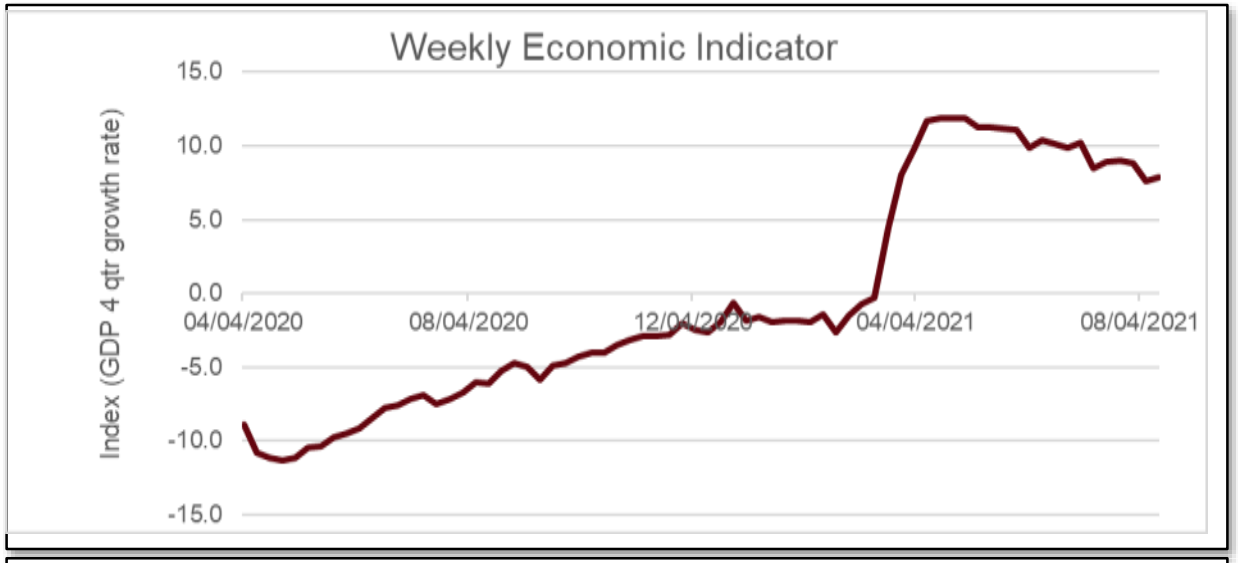


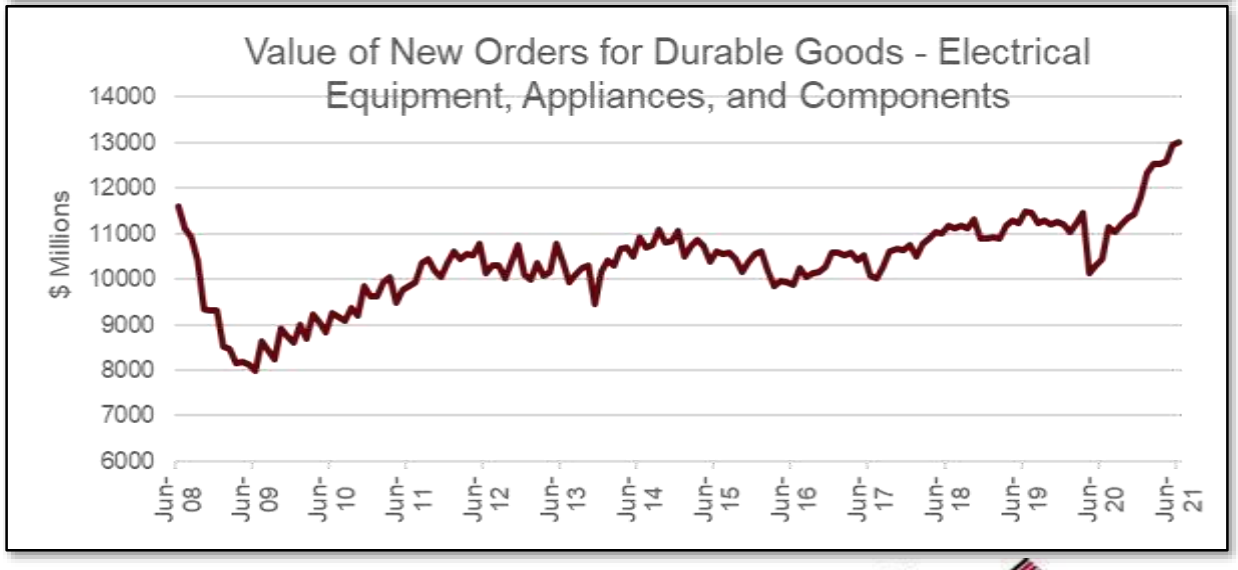

- As the COVID-19 recession accelerated, many companies delayed or extended projects. In addition, heightened uncertainty led to cancellation of some projects.
- Capacity utilization dropped to 78.4% in 2020 as demand fell at the same time new capacity came online. A slower pace of capacity growth and stronger demand will push operating rates up through 2025.

*Source: American Chemistry Council, ChemQuest*

# Economic Outlook

- **New York Federal Reserve recently developed a 4 quarter GDP weekly economic index based on high frequency data that currently stands at 7.84% run rate as of August 4th**
- **Auto / light truck and aerospace production**
  - Supply-chain interruptions continue; particularly **microchips**; having a material impact on auto/truck assemblies
  - Demand destruction with the collapse in air travel may take years to recover, however auto and light truck demand has been robust
- **Crude processing, Agricultural Equipment as well as Oil/Gas sectors decline in 2020 appear poised to do much better in 2021 and 2022**
- **Manufacturers' new orders quickly recovered and continue to be strong**
- **Consumer spending remains strong despite employment uncertainty, but helped by multiple round of stimulus**
- **State and local governments avert crisis**
  - Federal support and better than expected tax revenue




*Source: New York Fed, U.S. Census Bureau, Bureau of Economic Analysis*

# Recovery Contributing to Supply Chain Interruptions - How did we get here?

Rapid "V-Shaped" Recovery

Shipping Delays – Ocean Containers, Truck & Rail

Inventory Adjustments – Covid Demand Destruction

Texas Winter Storm URI

# Delays and Capacity Constraints are New Normal in Container Shipping
# Ocean Carrier Shipping Times Surge in Supply-Chain Crunch


- The strains on global container shipping are continuing with **shippers and carriers faced with ongoing delays, congestion, and capacity shortages**
- The number of containers seeing delays or missing their booking, known as the **rollover rate, exceeding 50%** at many ports
- Only about **40% of container ships globally were on time** arriving at ports
- Shipping delays have tied up inventories in some cases for weeks at a time as **vessels wait to reach berths** while offloaded containers sit for long periods at packed freight terminals.
- When **ships are finally unloaded**, the lack of **gate appointments on the docks for trucking companies to load** goods and transfer them to other parts of the country **creates even more delays** moving goods from the seaports to the interior of the country.
- Even when trucking companies are able to obtain gate appointments, and goods are finally ready to be loaded for land transport, there are **insufficient trucks and drivers** to handle the volume of goods.
- 62 vessels destined for the Port of Los Angeles, are at anchor at San Pedro Bay. **"We will still have vessels at anchor through midsummer causing a logjam"** stated Port of LA Executive Director Gene Seroka
- Maersk noted that container freight space will remain in **short supply through Q4 2021** as the global supply chains continue to be stressed by shortages of everything including wooden pallets, tin cans, metal drums, cardboard and freight containers

# Truck and Rail Shipments Hampered by Supply/Demand and Driver Availability

## Constraints in Trucking and Railcar Shipments

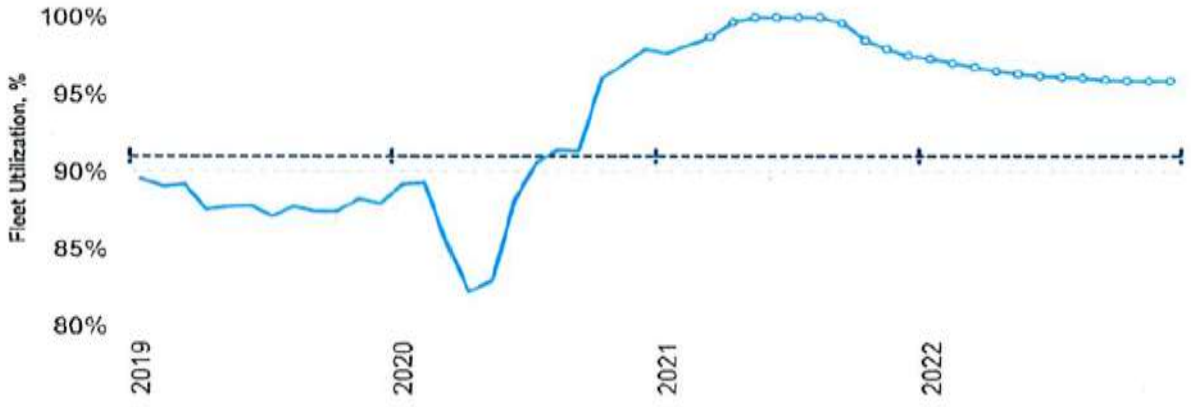
**Truck Shipments**

- Freight costs for trucking is expected to remain elevated as demand outpaces supply
- **Demand soared in 2021** due to lean inventories and pent-up demand during economic recovery
- **Driver shortage, increasing driver wages, increasing fuel costs and high insurance** rates represent costs that will continue to be passed on to the end-customer
- Historical **trucking costs at $3.50/mile is now $7 -$15/mile** depending on availability
- Tight driver capacity in the near-term extends the period of 100% active utilization through Q3
- Active utilization should begin easing modestly as fleets restore their pipeline of new drivers and raise pay
- However, expected **utilization will remain above 96% through 2022**
- Truckload rates in 2021 are forecast at 13.8% higher y/y, little changed from the prior outlook.
- **All truckload segments are forecast to see total rates up between 13% and 14%**

**Railcar Shipments**

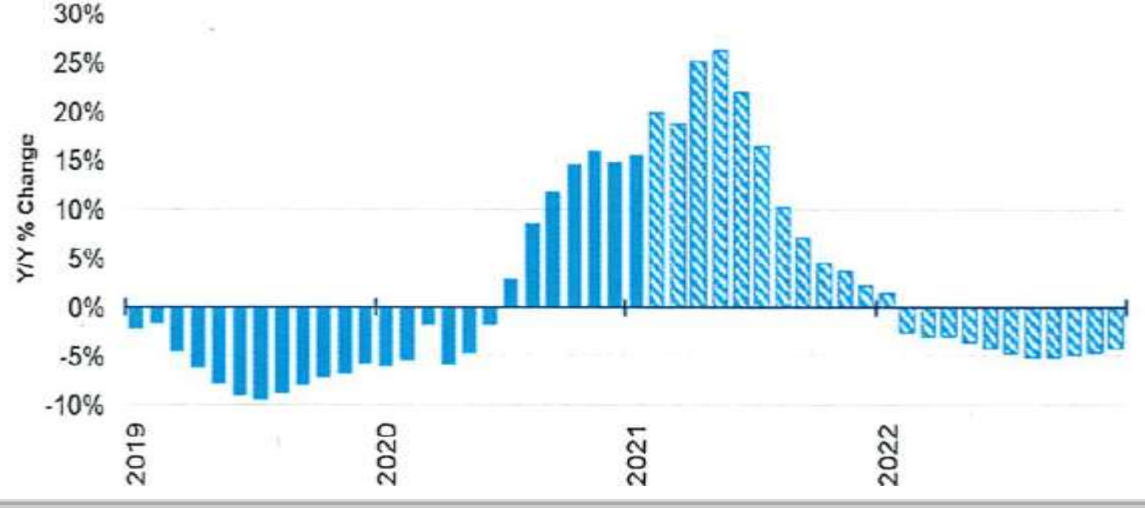
- U.S. railcar supply/demand remains tight as **railcar traffic rose 17.2% year on year** for the week ended 10 April.–Shipments rebounded for a second week after falling for six straight weeks amid fall-out from February's US Gulf Coast polar storm that hit chemical production and logistics in Texas, Louisiana and other states.
- For all of North America, weekly chemical railcar traffic rose 13.5% year on year, with Canada and Mexico also recording increases, according to the latest data by the American Association of Railroads (AAR) on Wednesday.
- In the US, **chemical railcar loadings represent about 20% of chemical transportation** by tonnage, with trucks, barges and pipelines carrying the rest, while Canadian producers rely on rail to ship more than 70% of their products, with some exclusively using rail.

### Truck Utilization Outlook



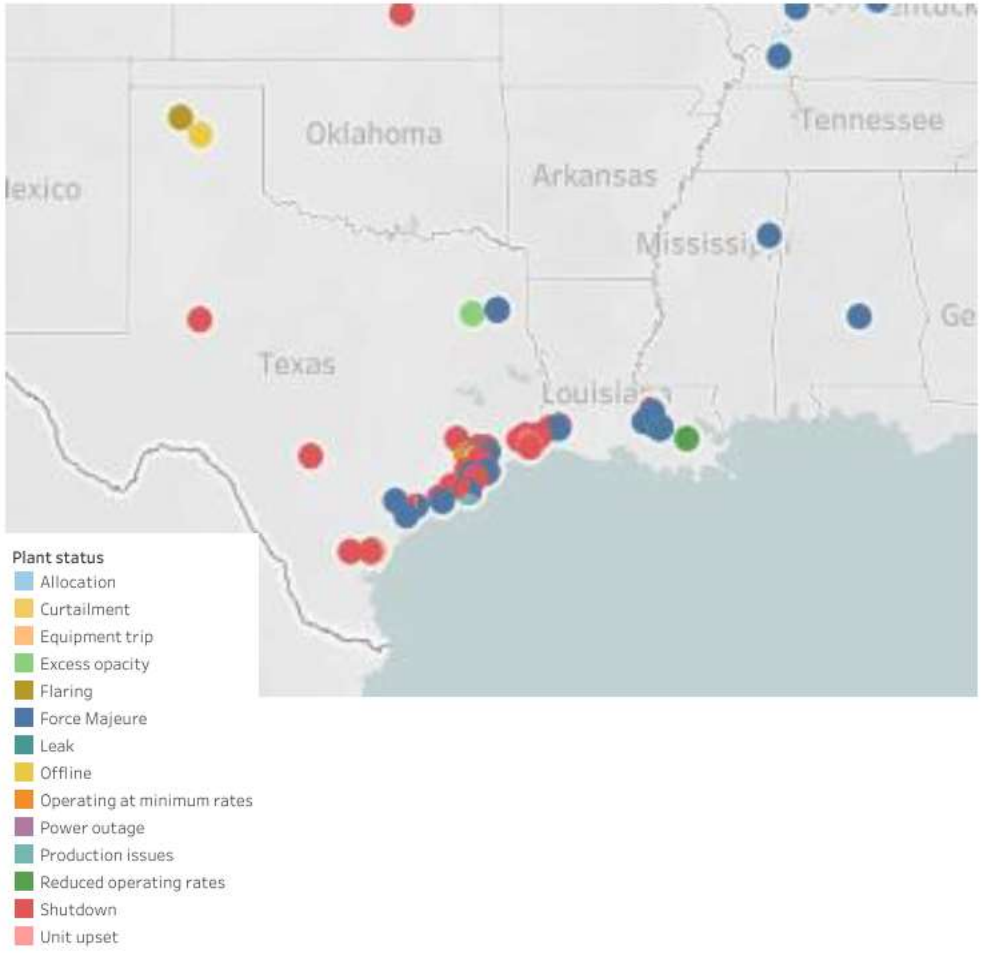

*Dashed Line = 10-year Average, data is seasonally adjusted*

### Truck Rates Outlook




Source: ChemQuest, FTIR Transportation Intelligence

# Winter Storm URI Catastrophically Affected Chemical Operations in TX and LA



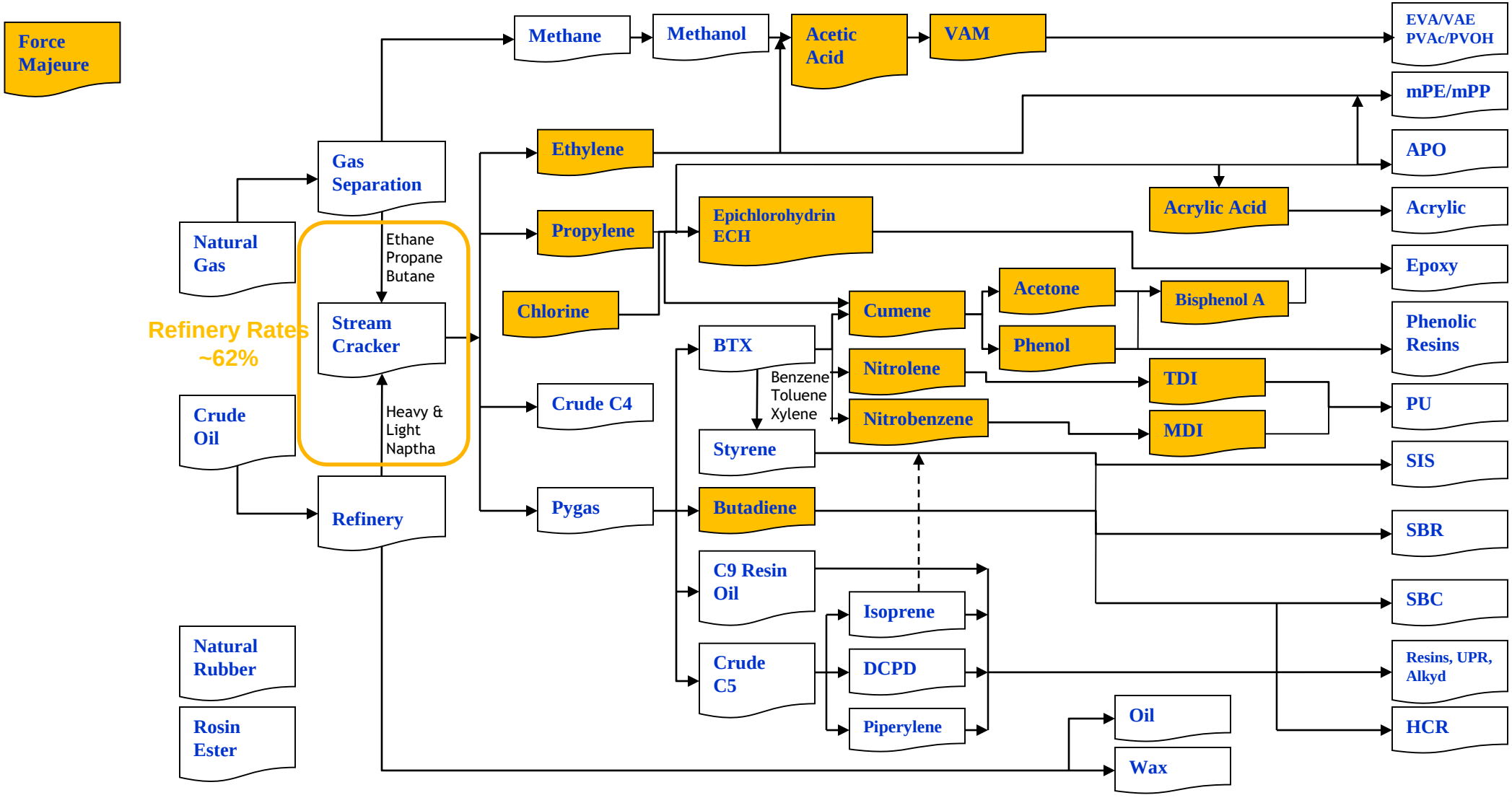

Source: Arkema

# Major Petrochemical Centers that Shut or Cut Rates as a Result of Winter Storm URI

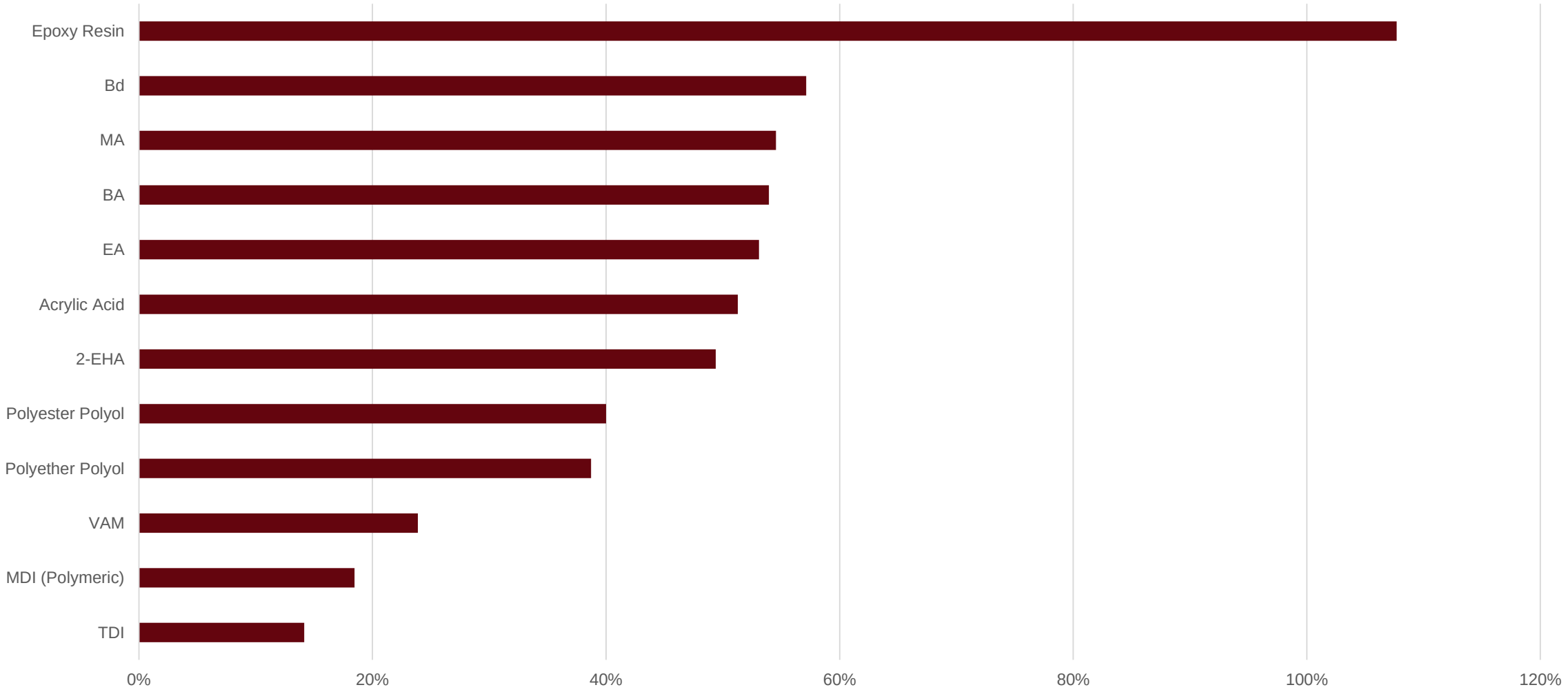

***In February of 2021, much of the U.S. was hit by a winter storm and sub-zero temperatures, causing widespread power outages in Texas and other parts of the South, bringing freight movement across the country to a near stand-still, and causing multiple petrochemical manufacturers to declare force majeure. This caused unprecedented disruption to the supply of many key intermediates essential to U.S. adhesive manufacturing. It has been estimated that about 61% of U.S. ethylene capacity and 59% of US propylene capacity is currently shut down, further aggravating an already tight market and driving price increases.***

Source: ASC, Chemceed, OPIS

# Key Raw Material Feedstocks

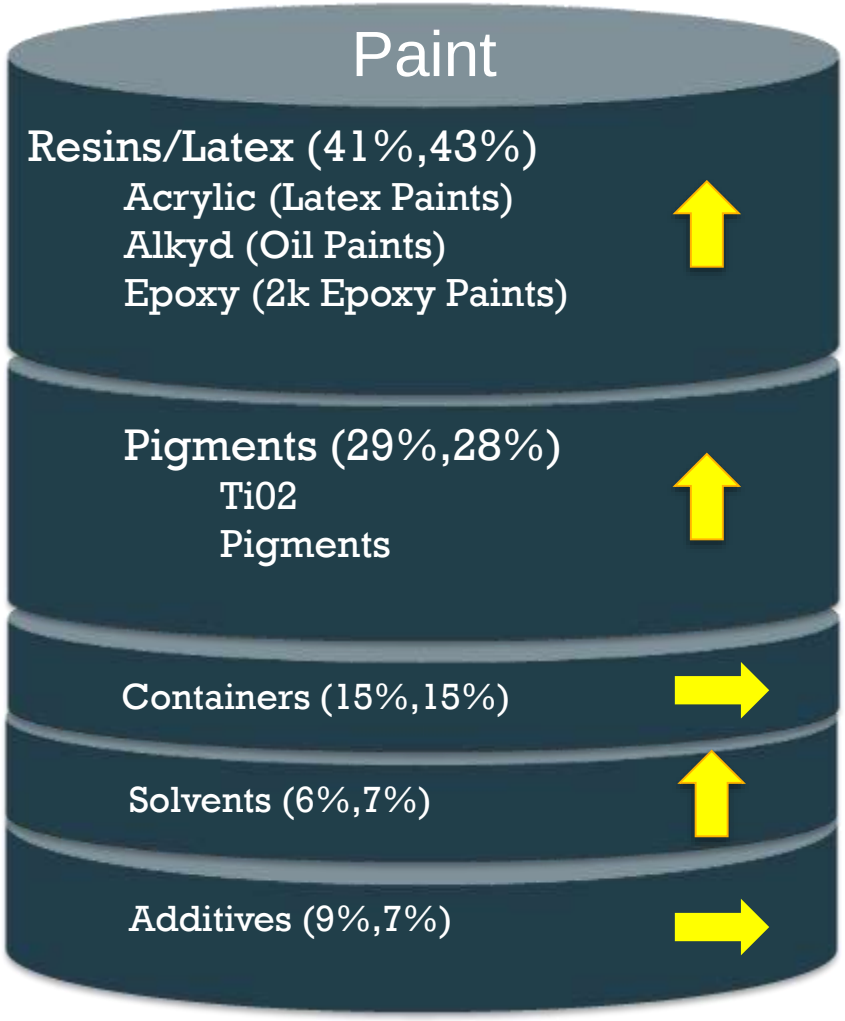


# Resin Prices Increase Appreciably Dec-June 2021




*Source: The ChemQuest Group, Inc., ICIS*

# Raw Material Input for a Typical Unit of Coatings: Percent of Cost in (2020, 2021f)



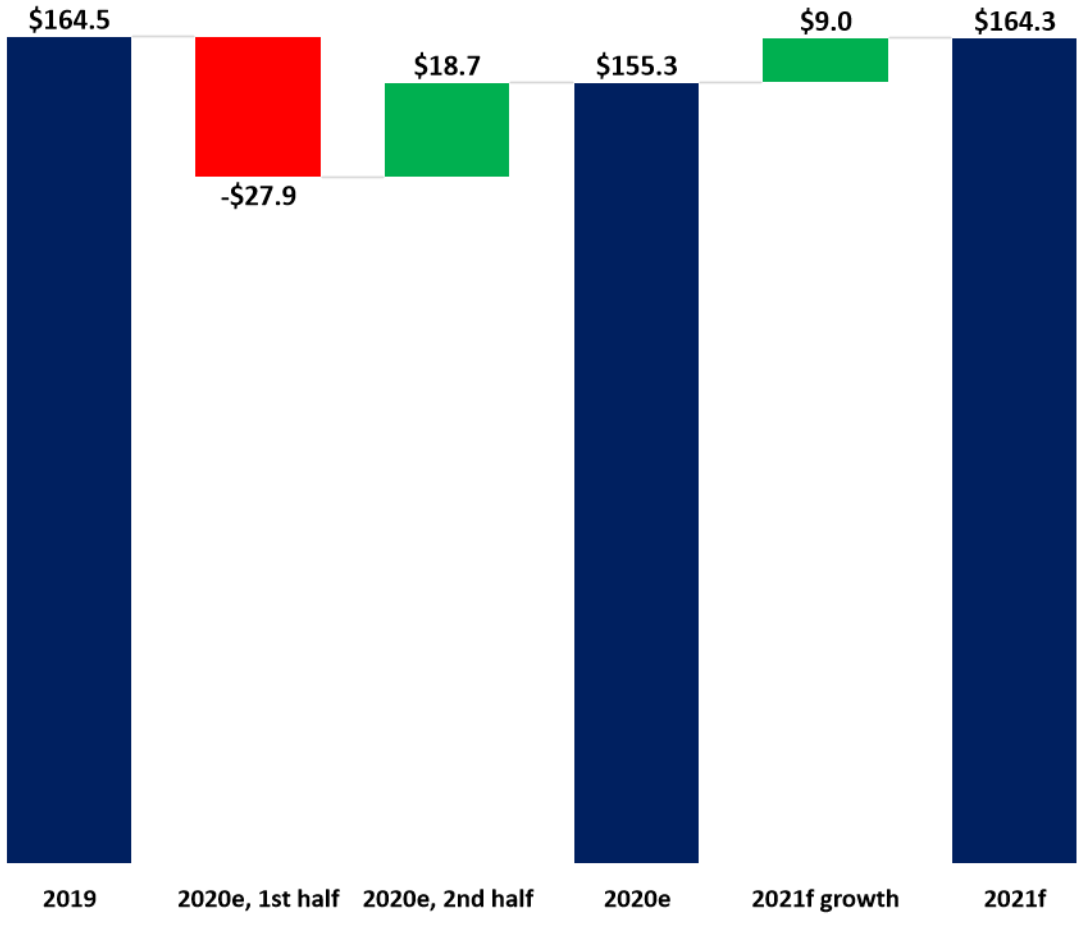

Total raw material input costs expected to increase **7-14%** overall, with resins and solvents leading the increases

*Source: Sherwin-Williams, The ChemQuest Group, Inc.*

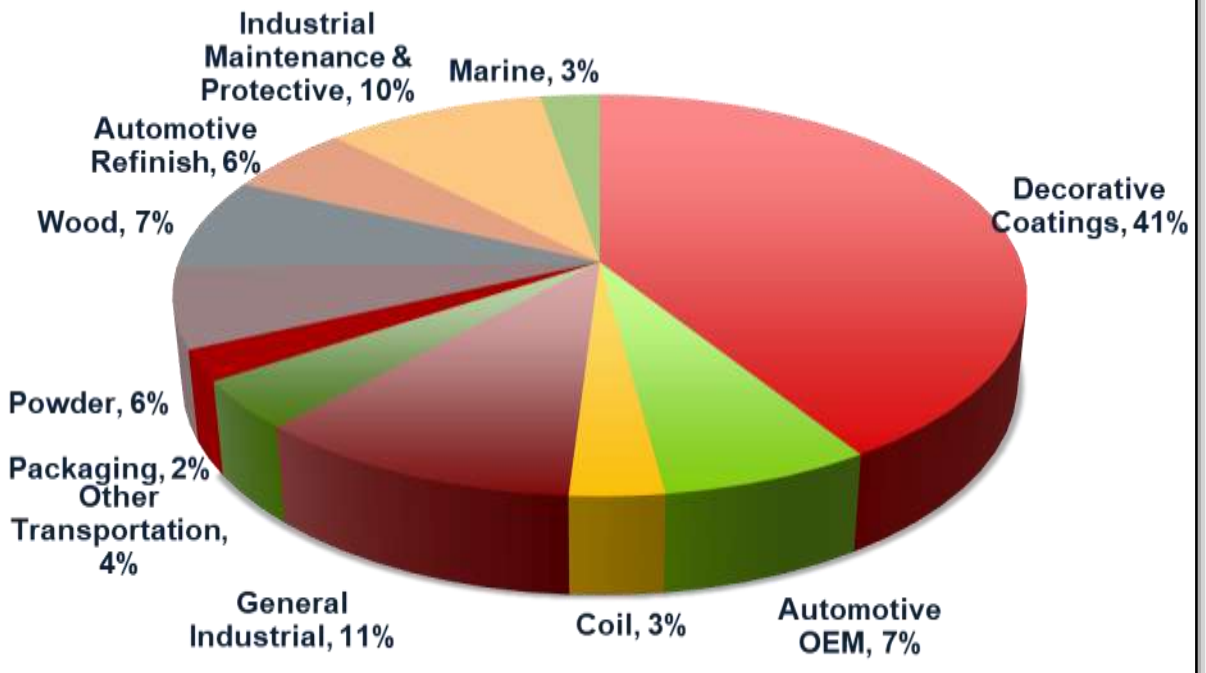
# COATINGS INDUSTRY

# Global Coatings Industry Dropped to $155 BN USD in 2020

## *Value Recovering by the end of 2021*



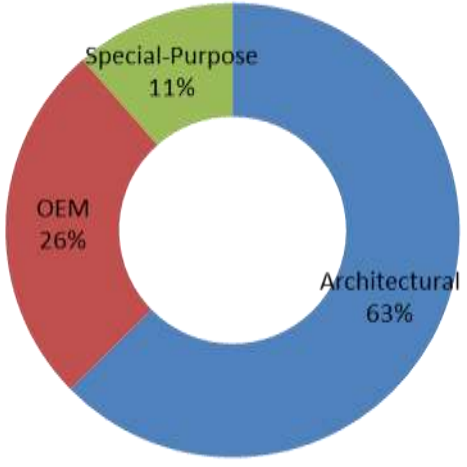

## *End Market Breakdown*



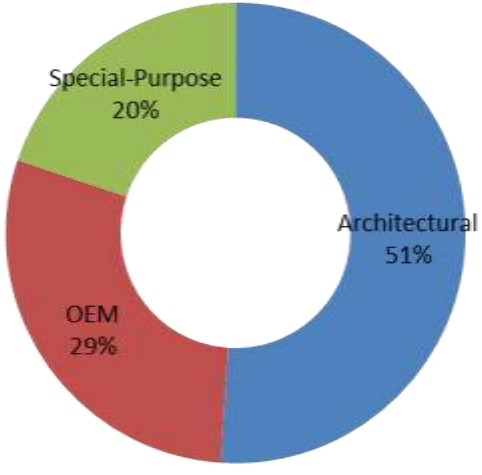

*Source: The ChemQuest Group, Inc., IPPIC*

# U.S. Coatings Demand in 2020 – $25.2B and 1.33B Gallons

## Market Segment Share

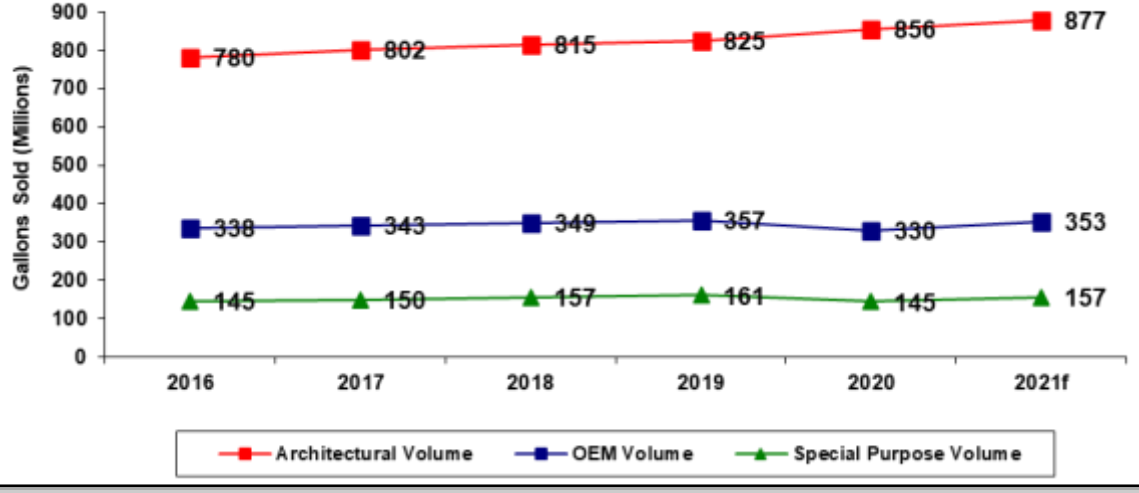


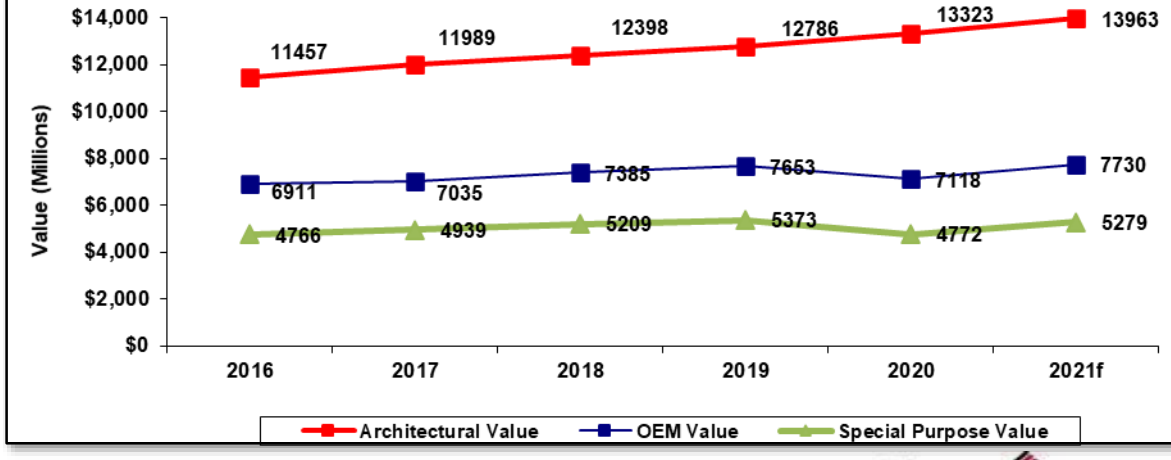

**Volume**




**Value**

## Market Segment Performance Trend



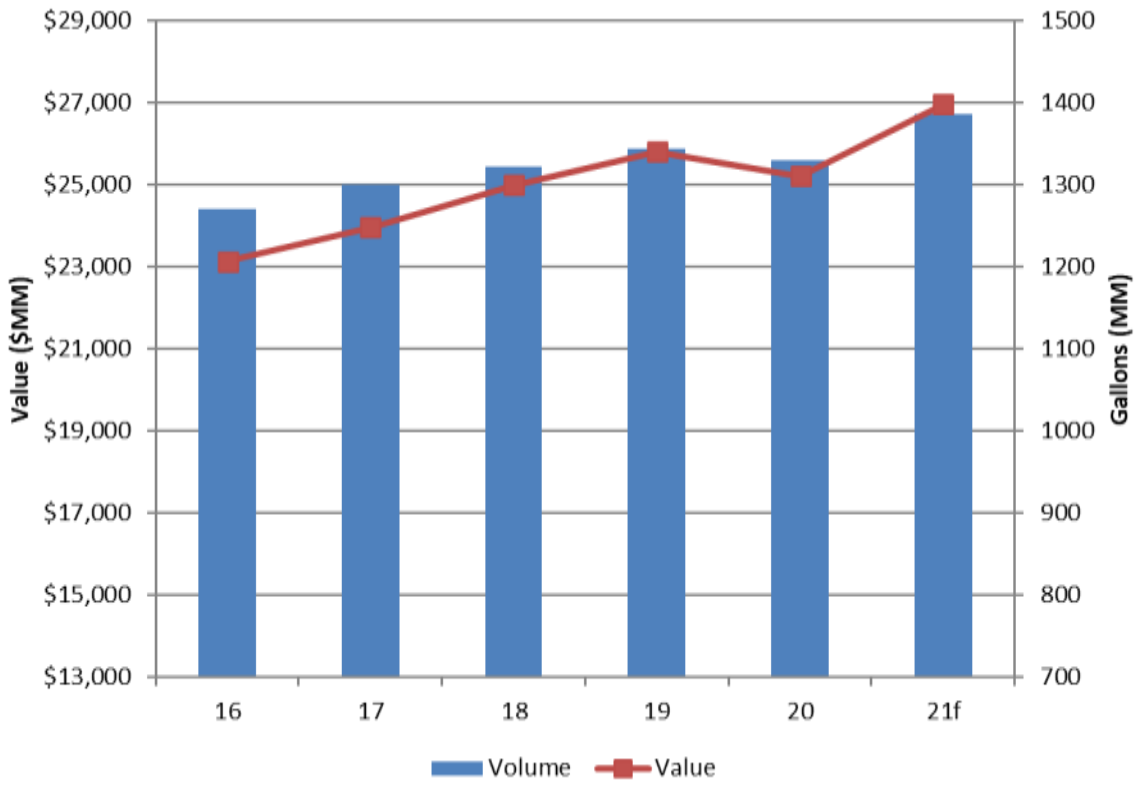




*Source: U.S. Census Bureau, The ChemQuest Group, Inc.*

# 2020 & 2021f – Rebound but how much?

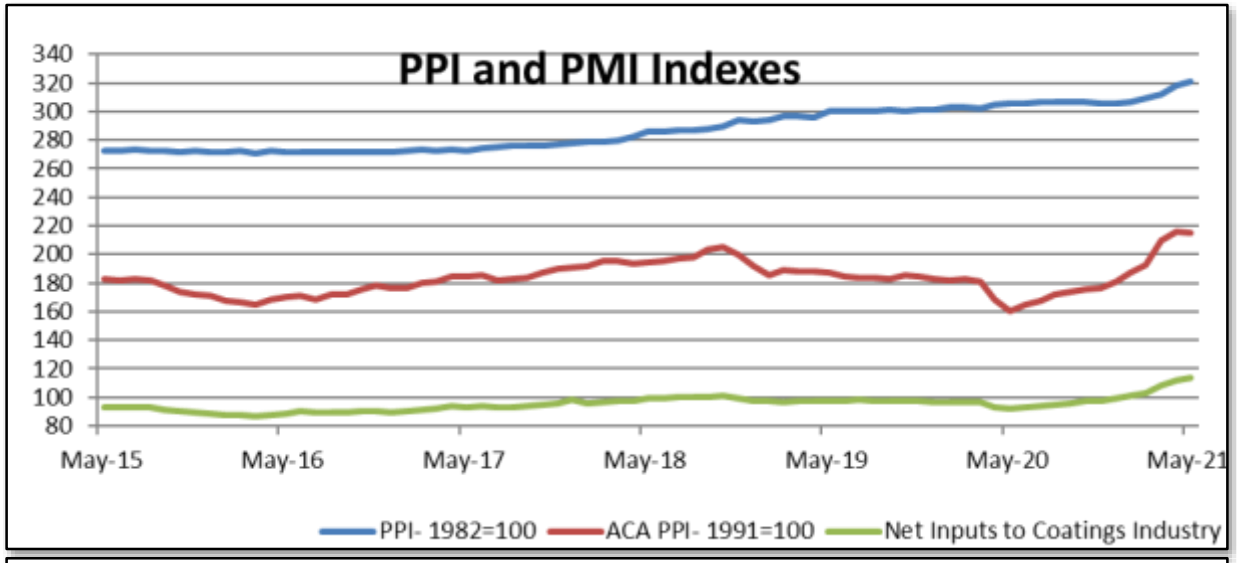
- **Industry declined 1.1% yr./yr. in 2020 in volume terms, while industry value declined 2.3% yr/yr, much better than initially forecast as architectural coatings increases offset declines in OEM and specialty coatings**
- **ChemQuest forecasts an increase across all 3 major market segments in 2021, 4.2% in volume and 7.0% in value**
- **Gross margins appear steady to slightly declining with raw material input costs trending 7 to 14 percent higher (lower end for global multinationals) in 2021 offset somewhat by price increases**
- **U.S. based coatings firms are likely to benefit from Fed's efforts to keep interest rates low for a long time**
  - **Net positive for home purchases and net negative for the dollar reversing the forex pressure they have seen the last couple of years**

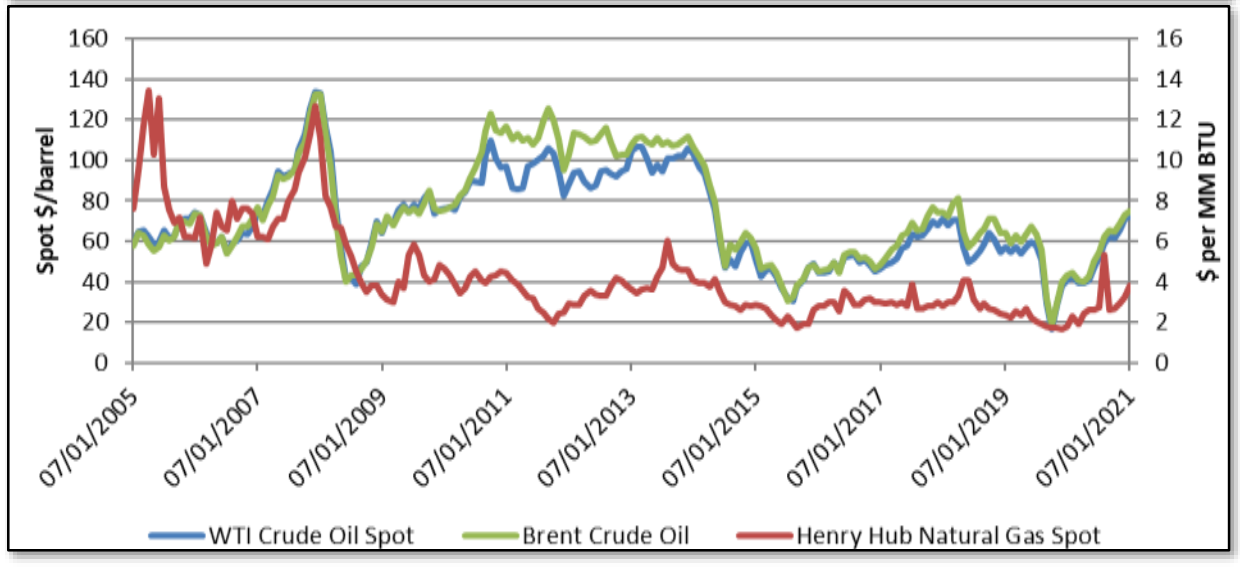
***2021f = $27B and 1.39B gals***

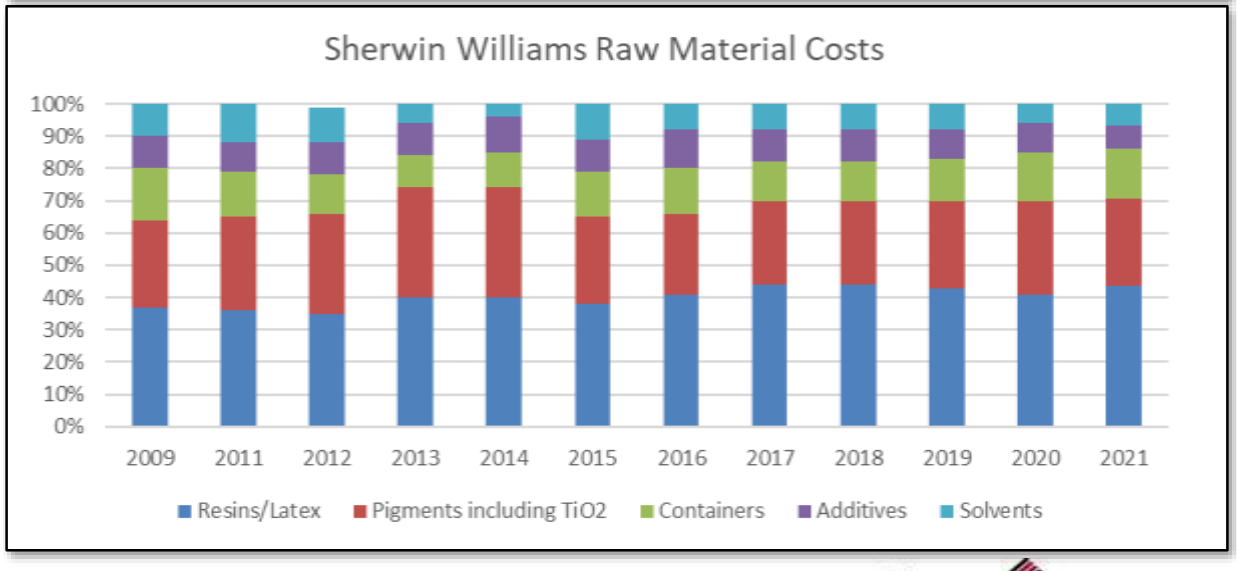


# U.S. Coatings Market

- **Industry is facing increased raw material costs. Our analysis shows that for each $10 increase in Brent crude results in a 3% increase in overall costs to coatings producers**
- **Industry participants expect to see raw material input costs increase of ~9% on average for 2021:** Margin declines due to increased raws should be offset due to cost control and supply chain optimization efforts
- **Participants continue to be disciplined in pricing:** The industry should be able to offset much of the increasing input costs through price increases in 2021



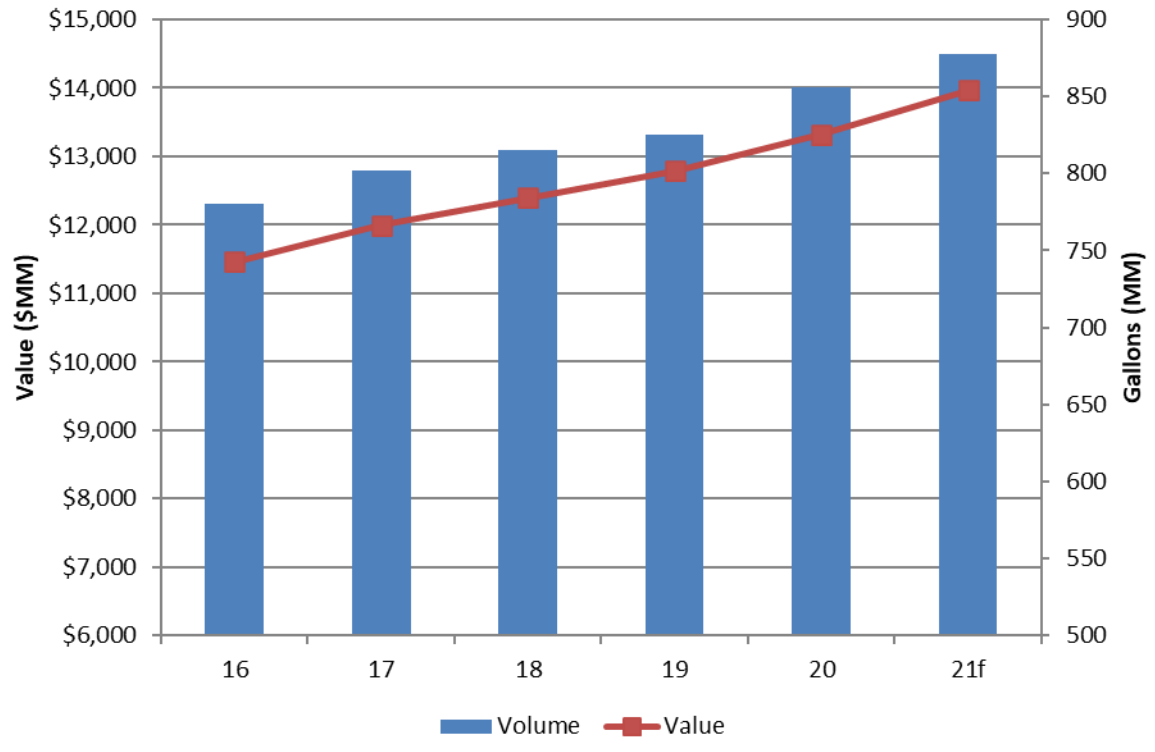




*Source: ACA and U.S. Census Bureau, The ChemQuest Group, Inc.*

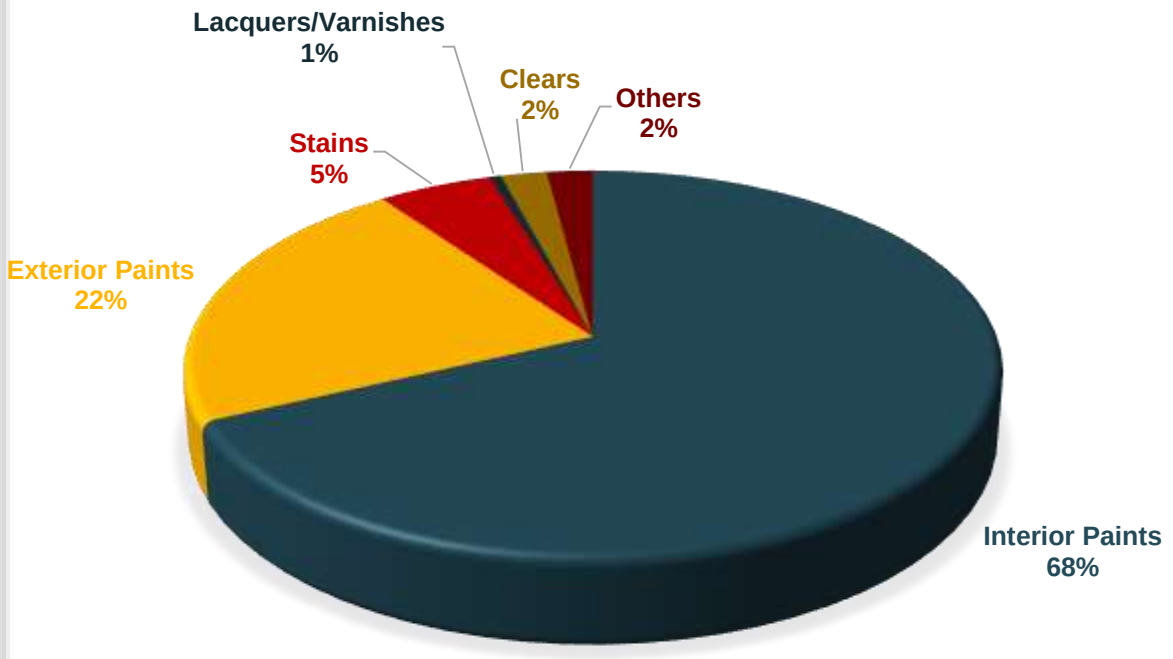
# ARCHITECTURAL COATINGS

# Architectural Coatings – Growth Trends and End-market Segments

## *Historical Volume & Value Trends*




## *End Market Segment Share*

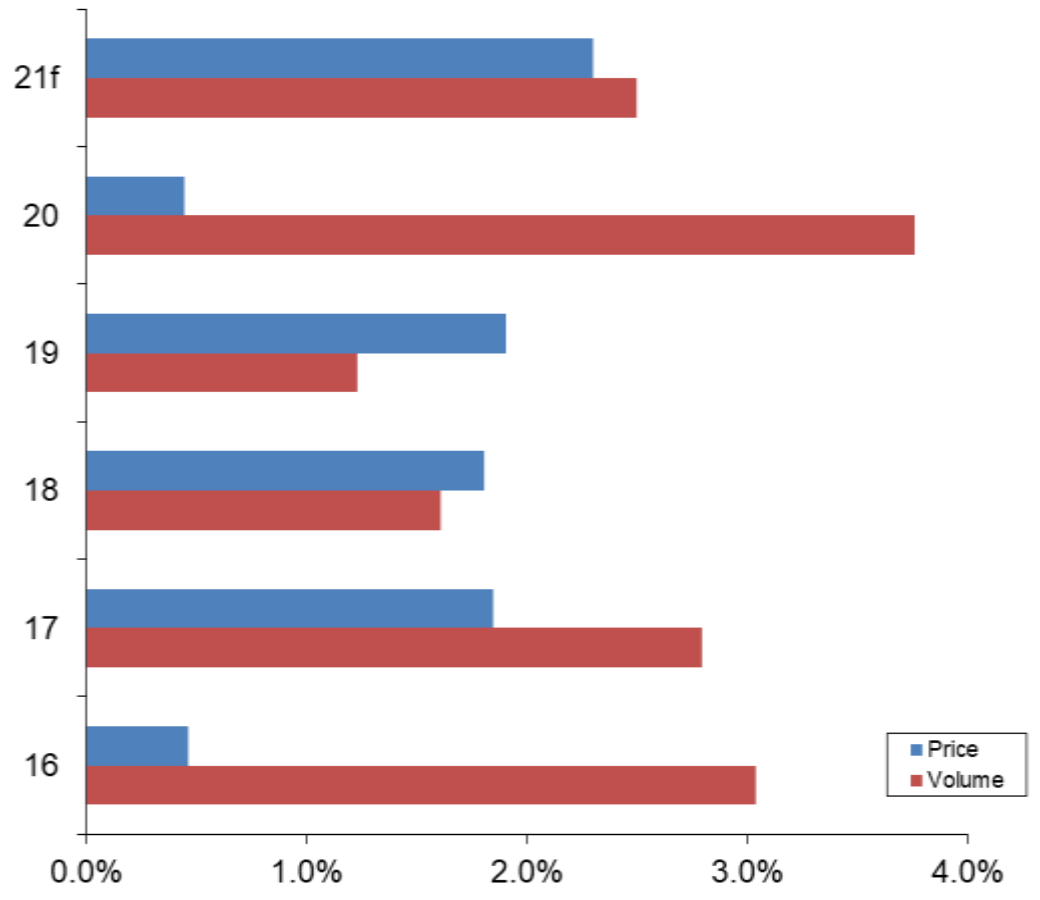



*Source: U.S. Census Bureau, The ChemQuest Group, Inc.*

# Architectural Coatings – 2020 and Outlook for 2021

- **Volume and value up; 3.8% and 4.2% respectively after strong second half;**
  - **Forecast to be to be up 2.5% and 4.8% in 2021**
- **Continued low inventory and turnover of existing housing**
- **New and existing home sales unexpectedly increased in 2020**
  - 815 thousand new home sales and 5.66 million existing home sales in 2020
- **Household formation growth a positive**
  - Covid-19 and work / schooling from home shifted new household formation away from urban areas to the suburbs
- **Housing price appreciation accelerates**
  - Latest Case-Shiller indicated a >14% increase in single family home prices over the last 12 months

***2020 = $13.3B and 856MM gals***



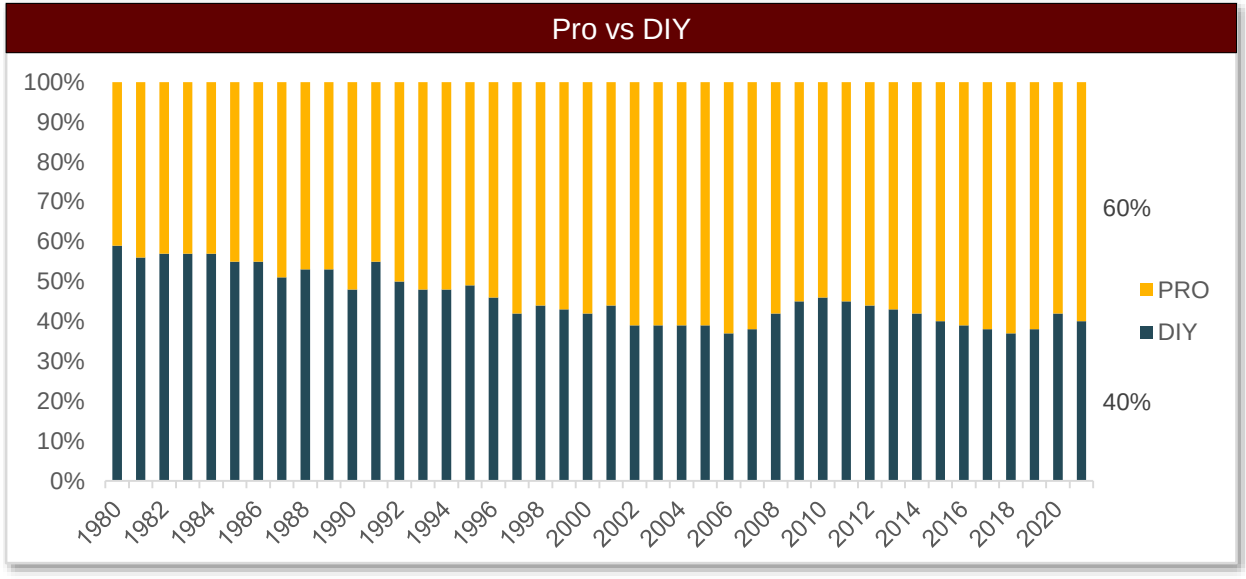

*Source: U.S. Census Bureau, The ChemQuest Group, Inc.*

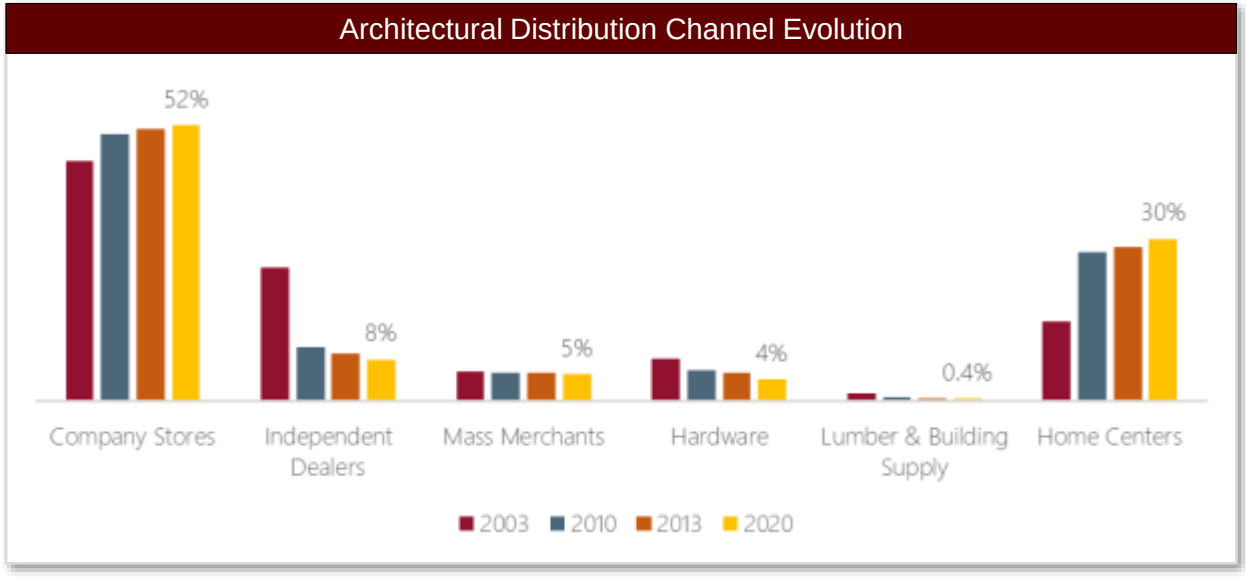
# Current Industry Trends & Drivers

- **Real Estate and construction uneven in 2020**
  - Low interest rates, lack of inventory of existing homes for sale, and strong bounce in homebuilder sentiment, and flight to suburbs have supported residential construction
  - Non-residential underperforming with Covid-19 accelerating trend away from brick-and-mortar stores and increasing supply of existing space

- **Remodel and Refinish strong in 2020**
  - The Joint Center for Housing Studies anticipated a slowdown in the pace of homeowner spending, but it did not occur
  - Homeowners have spent on improvements while spending more time at home (basement refinishing, home offices, etc.)

- **Shift continues to contractor applied paints temporarily reversed in first half of 2020 toward DIY**
  - The percentage of pro applied paint had been growing since 2012 compared to DIY until this year
  - The trend towards DIY is likely temporary and will likely revert to the long-term trend in 2021
  - While the U.S. pro-applied paint market is highly fragmented, the U.S. mass merchandise channel is highly concentrated




Source: Dodge Data and Analytics, Harvard Joint Studies

# Architectural Coatings – Key Trends

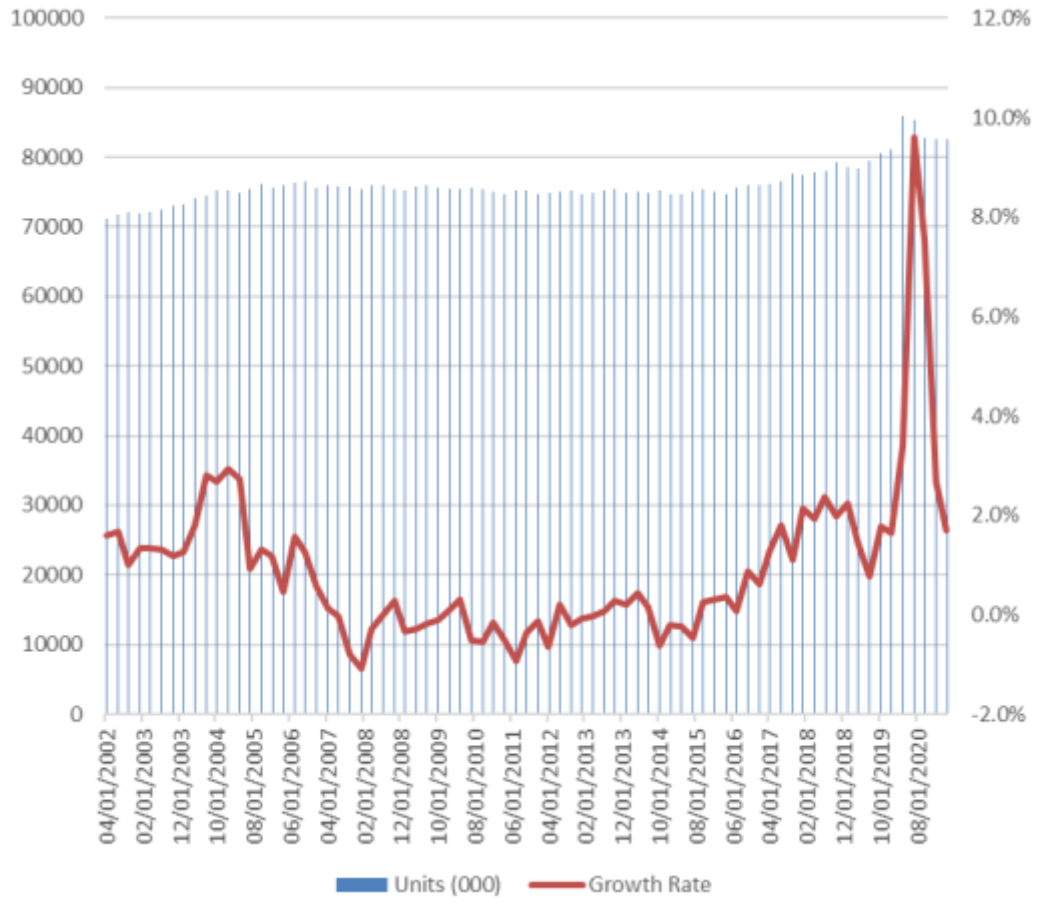
| Trend | Implications/Opportunities |
|---|---|
| **Color and styling** | Because architectural coatings market revolves around color trends, color-based research is constant |
| **DIY:PRO mix** | In 2019, 62% share of painting was PRO. However, this dropped in 2020 as people undertook DIY painting projects. Longer-term PRO is expected to recapture share as the Covid-19 crisis abates and many DIY projects may eventually get repainted by a PRO. |
| **Coatings turning from decorative to functional** | • Conductivity through paint technology for lighting and dynamic effects<br>• Sensors transform walls into giant touchpads<br>• Odor absorbing/Radon blocking, anti-microbial, antiviral<br>• De-polluting coatings, destroys “organic” dirt sticking onto surfaces – keep buildings cleaner<br>• De-Nox – Nitrogen oxides / particulates contribute to “smog” |
| **Convenience/Value add/Energy efficient** | Targeting DIY users to save time or number of steps in surface preparation and painting (e.g., primerless coatings)<br>• Lower building energy needs ”solar & heat reflective” - solar glass coatings, ultra cool building & roof coatings<br>• Improve customer comfort levels |
| **Greener coatings (waterborne dominates)** | Offer more functionality (odor control, bacteria resistance), more robust attributes (color, opacity, and brightness), and satisfy stricter regulations<br>Sustainability goals are research drivers.<br>Greater demand for eco-premium products |
| **New formulas reducing $TiO_2$ usage** | Continuing to seek ways to reduce reliance on this raw material |

*Source: The ChemQuest Group, Inc.*

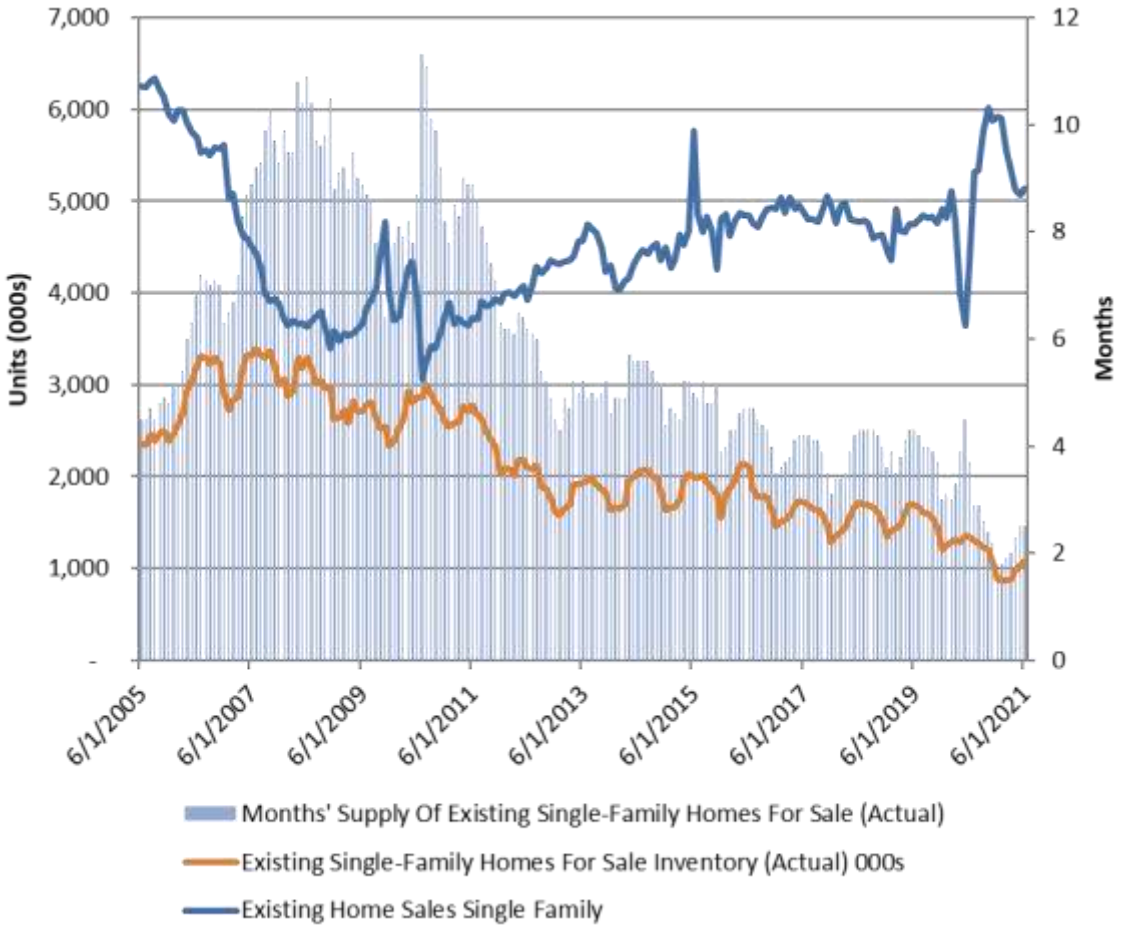
# RESIDENTIAL – SINGLE & MULTIFAMILY

# Supply Shortfall vs. Household Formation – Inventory Below Norms

***Owner-Occupied Housing and Growth Rates***

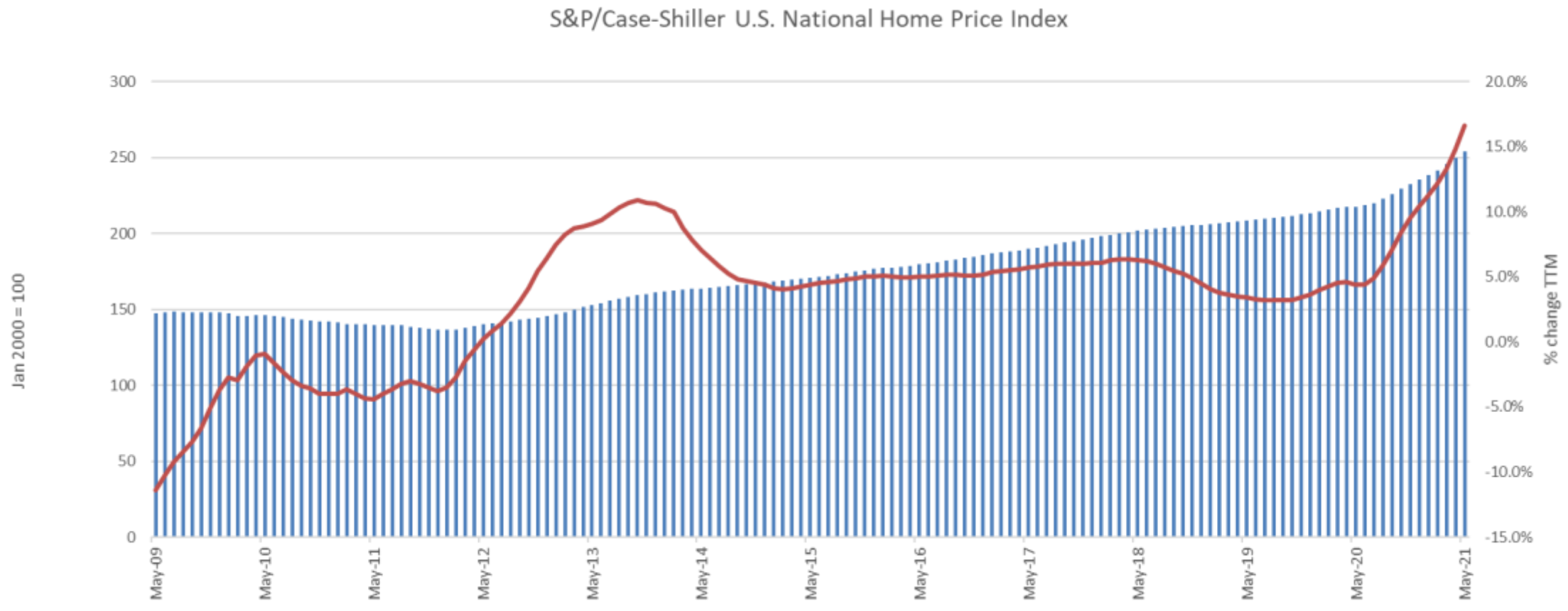



***Existing Home Sales and Inventory***



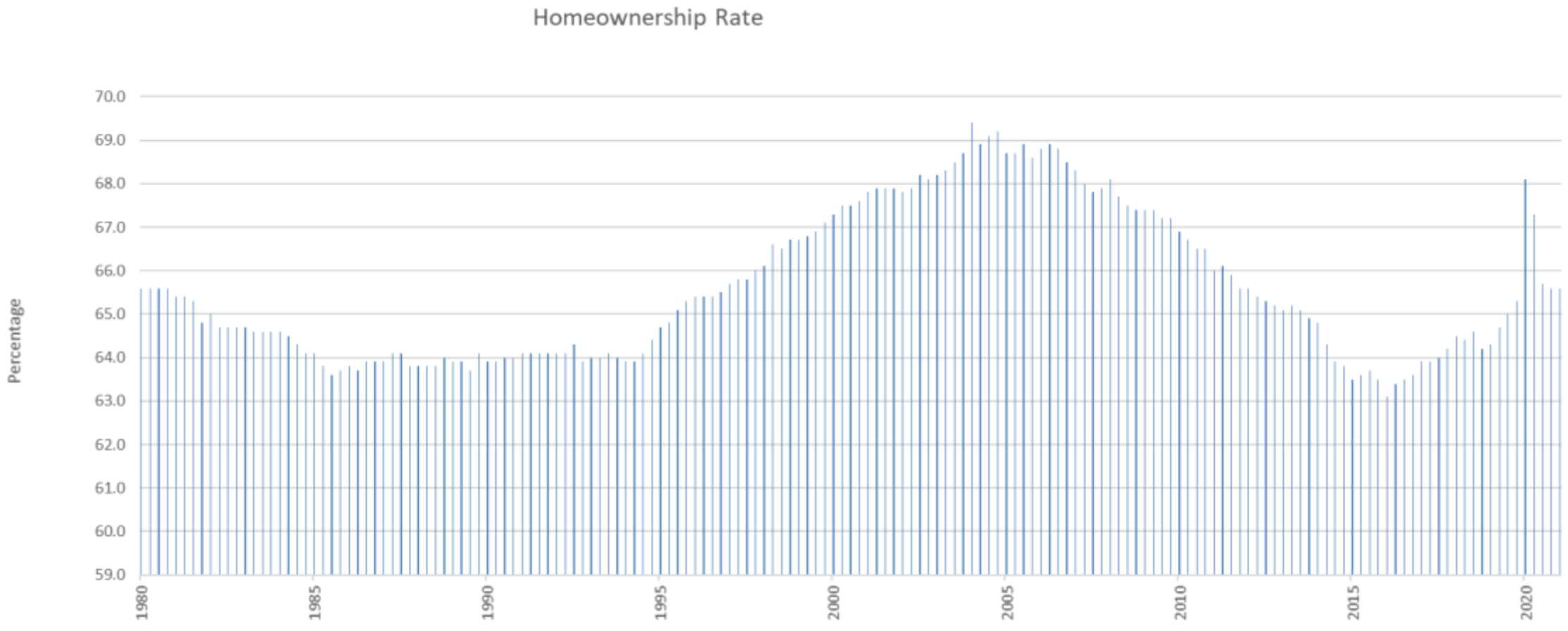

*Source: U.S. Census, Federal Reserve*

# Housing Affordability



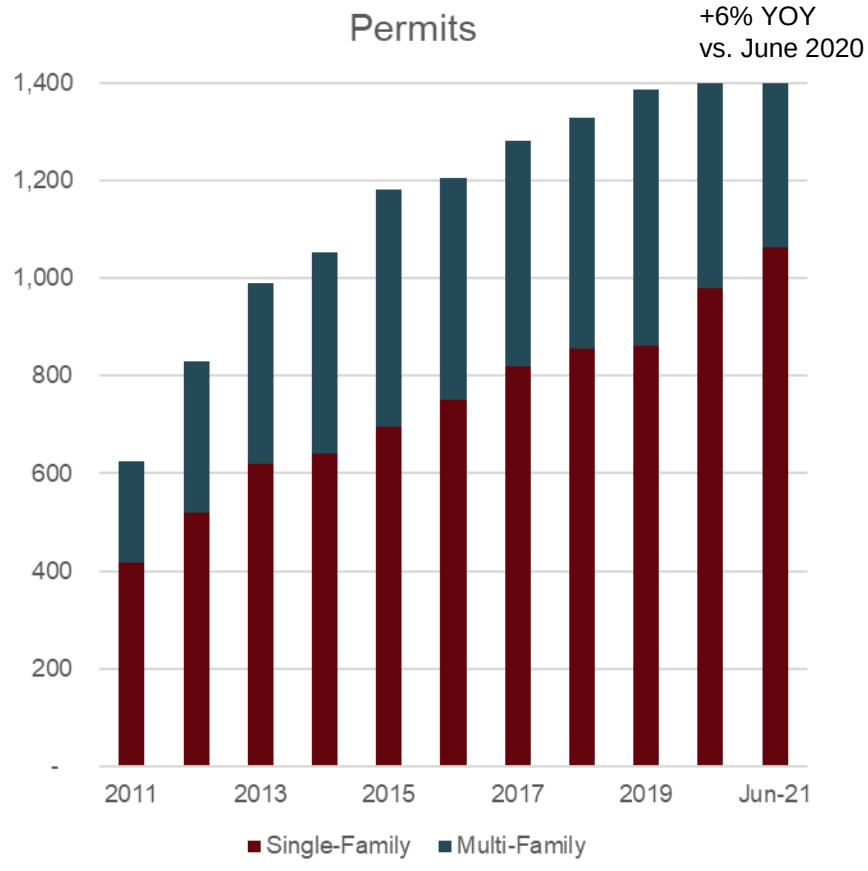

Source: U.S. Census Bureau, National Association of Realtors

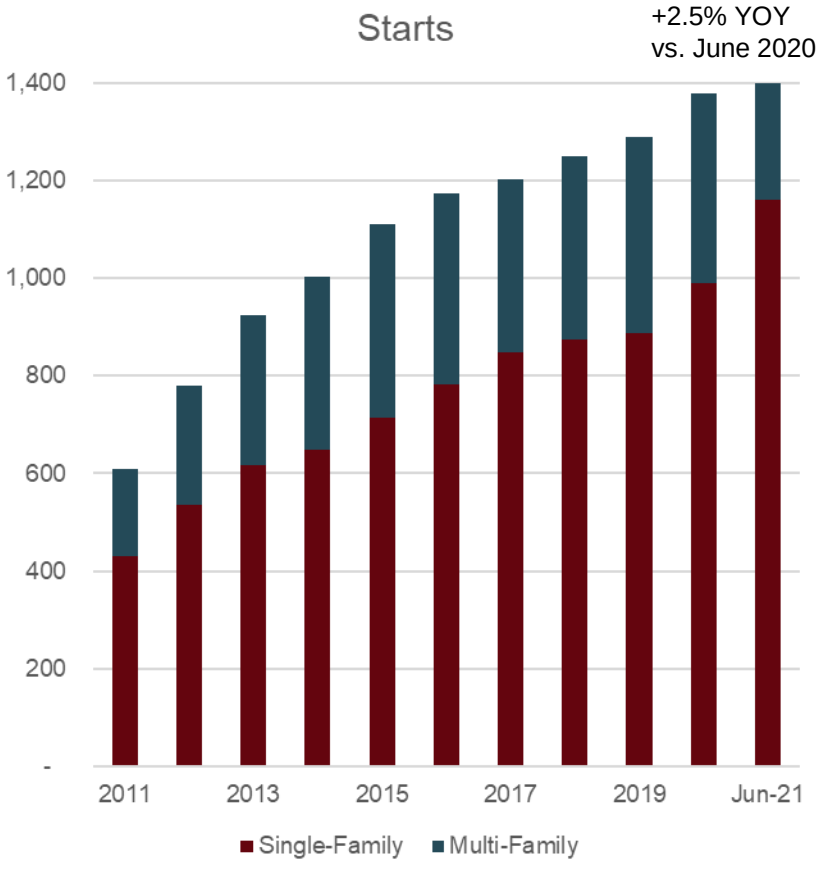
# Homeownership has recently increased from its all-time low in 2016

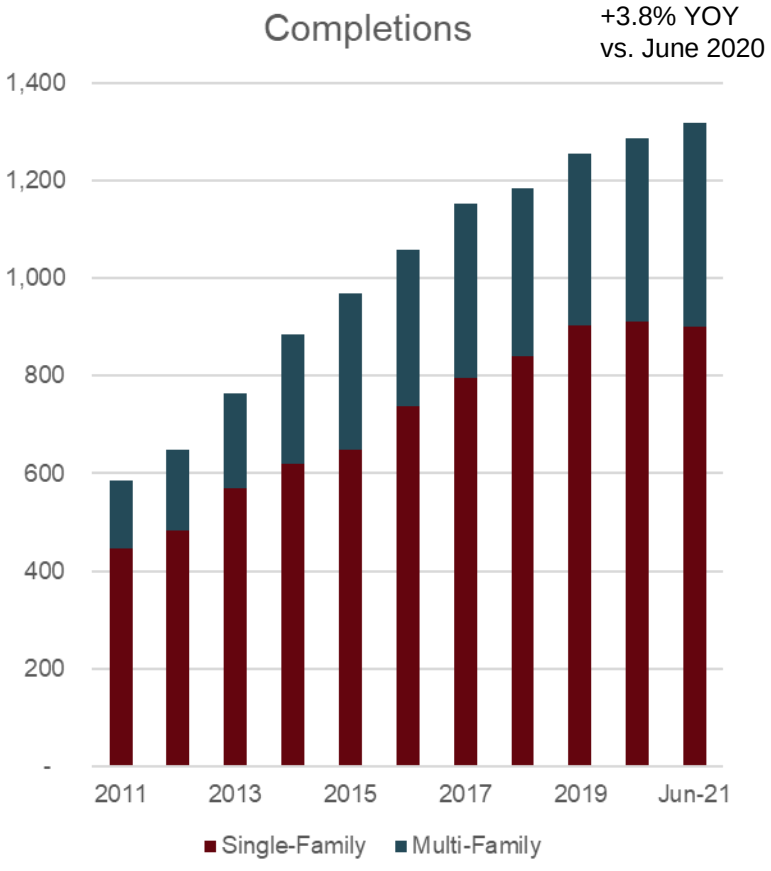



*Source: U.S. Census*

# Permits, starts, and completions plateauing as builder activity slowed down mid-year as their input costs have risen



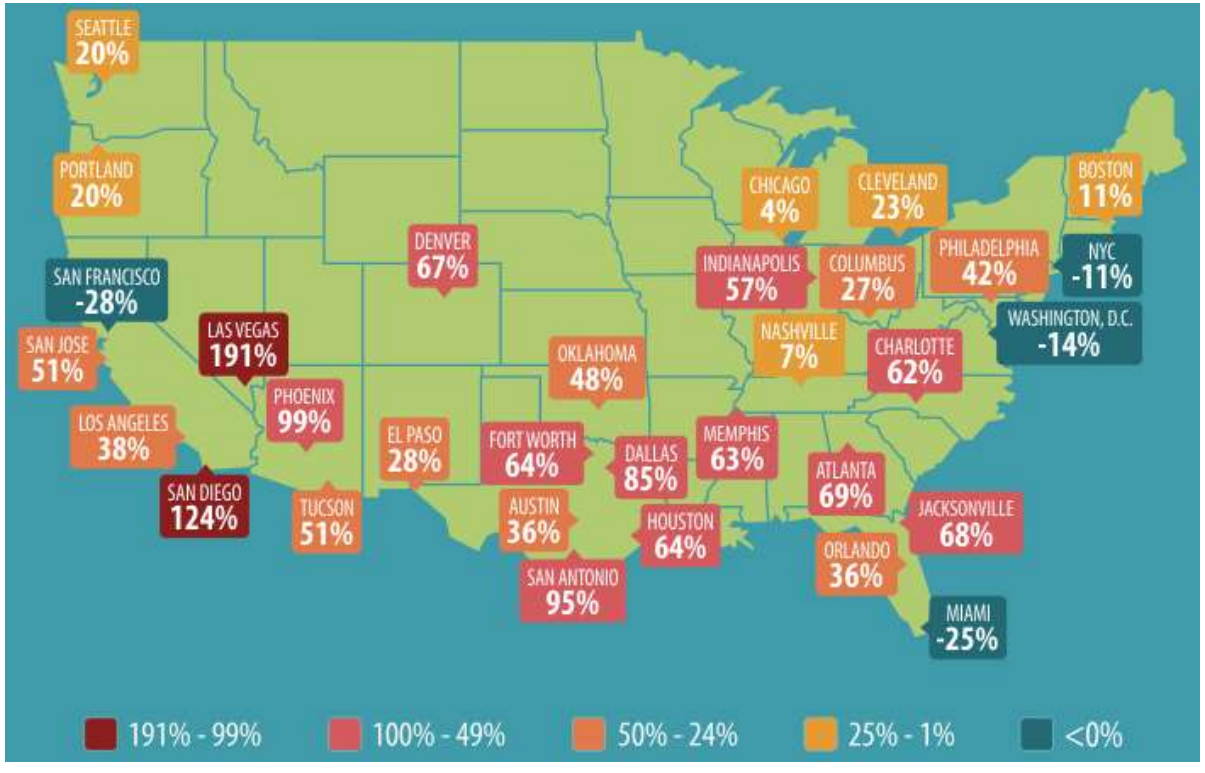



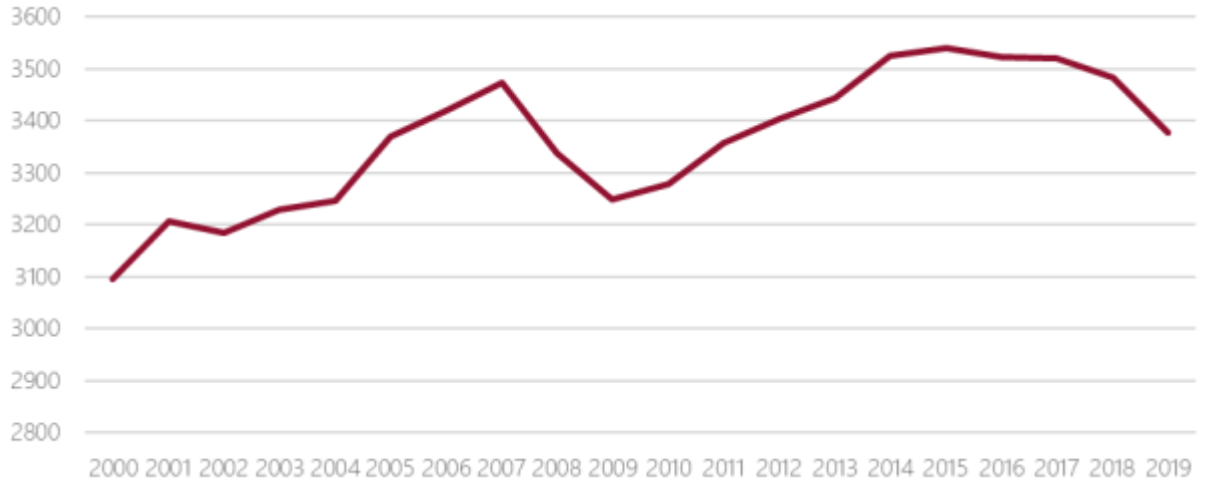

*Source: U.S. Census Bureau*

# Residential and non-residential construction square footage increased since 2019 which bolstered overall market

## 74% Larger Home Builds on Average




## Combined Nonresidential & Residential Median Square Footage 2000 to 2019

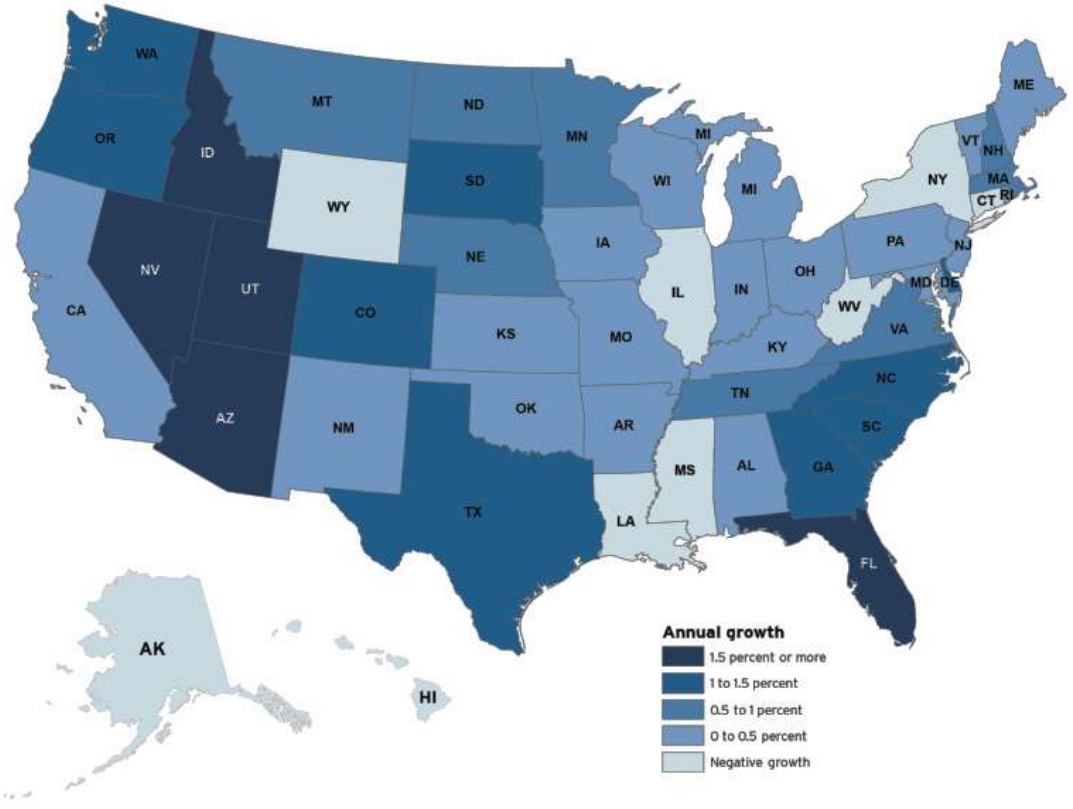


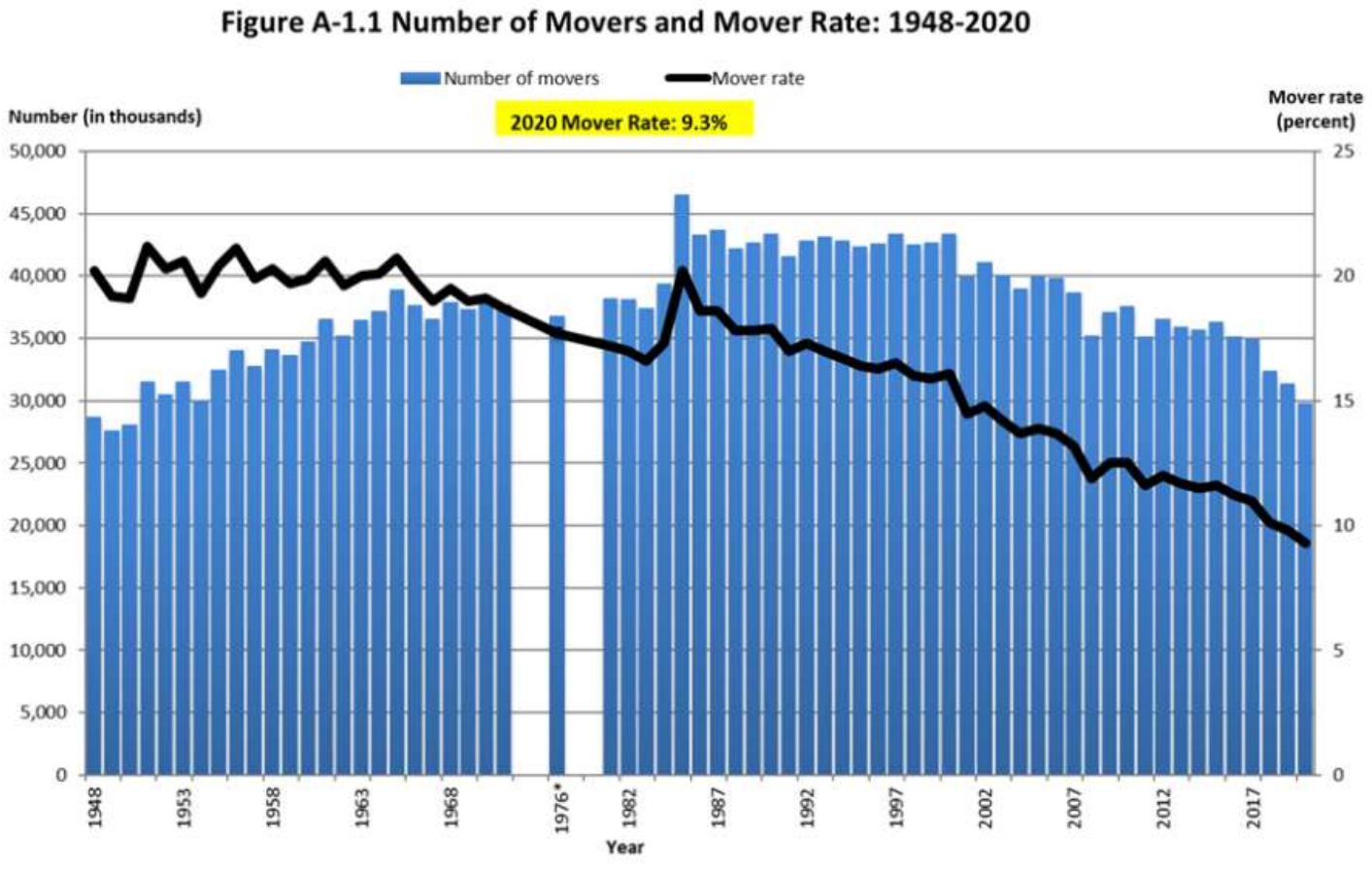

## Contractor-Built SF Home Average Size


| | | |
|---|---|---|
| **1950 983 ft²** | **1970 1500 ft²** | **2020 2600 ft²** |

Source: Dodge Data & Analytics U.S. Building Stock Data, Harvard Joint Housing, EIA, U.S. Census

# Declining Annual Rate of Mobility by Region



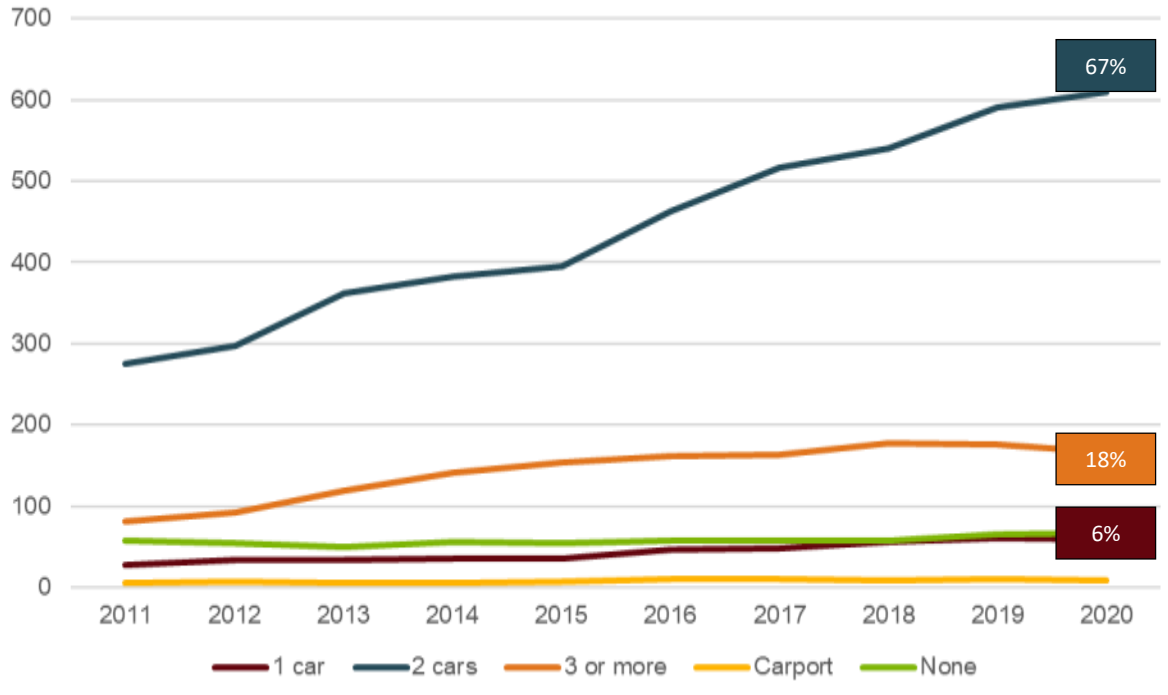

Notes: The CPS sample design was generally updated in years ending in "5" based on previous decennial censuses. Data for the following years are: 2011 (2000 controls), 2010 (2000 controls), 2001 (SCHIP, 2000 controls), 1993 (1990 controls). For more information on confidentiality protection, sampling error, nonsampling error, and definitions, see https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html.

* The migration question was asked differently between 1971 and 1980. Only 1971 and 1976 have a 1-year estimate comparable to all other years.

Source: U.S. Census Bureau, Brooking Institution

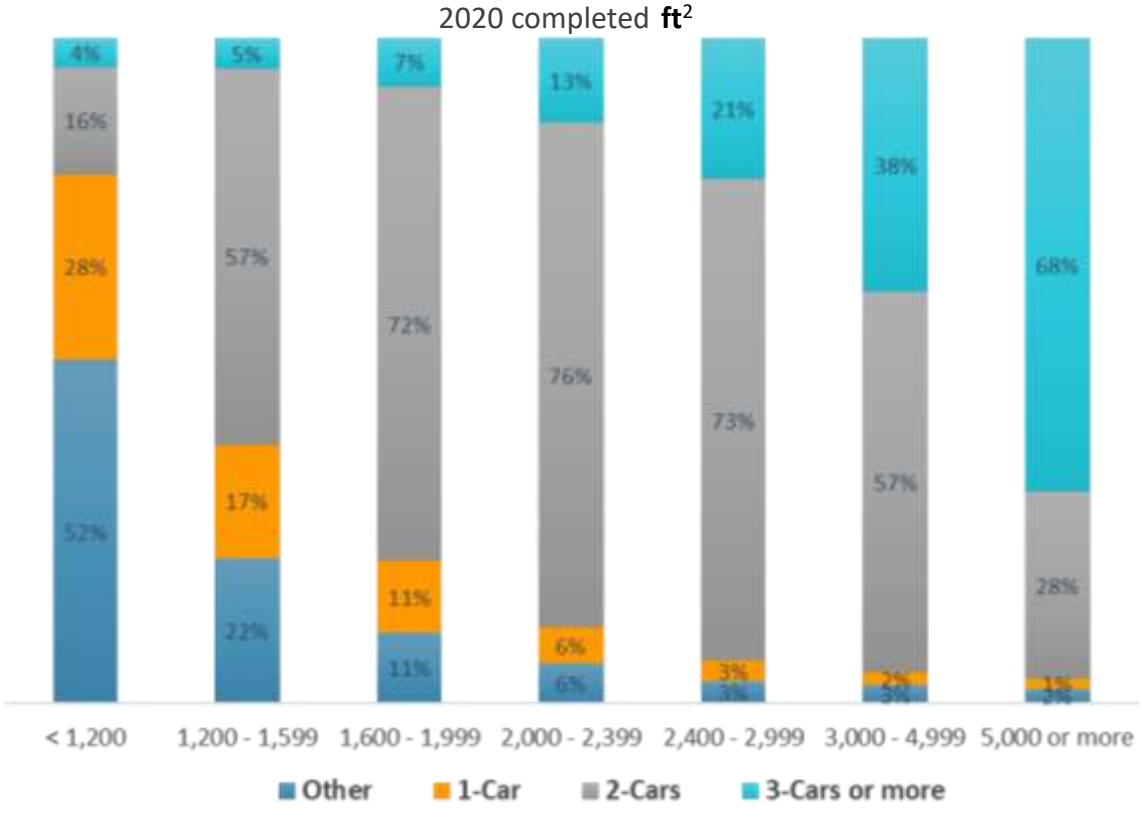
# Buyers prefer two-car garages; whether for vehicles or storage, attached garages remain an essential part of the American home

## Garages in New Homes (# of houses in thousands)




## Parking Options per Home Size

*As the house size increases, 2-car garages become the largest share of parking options.*



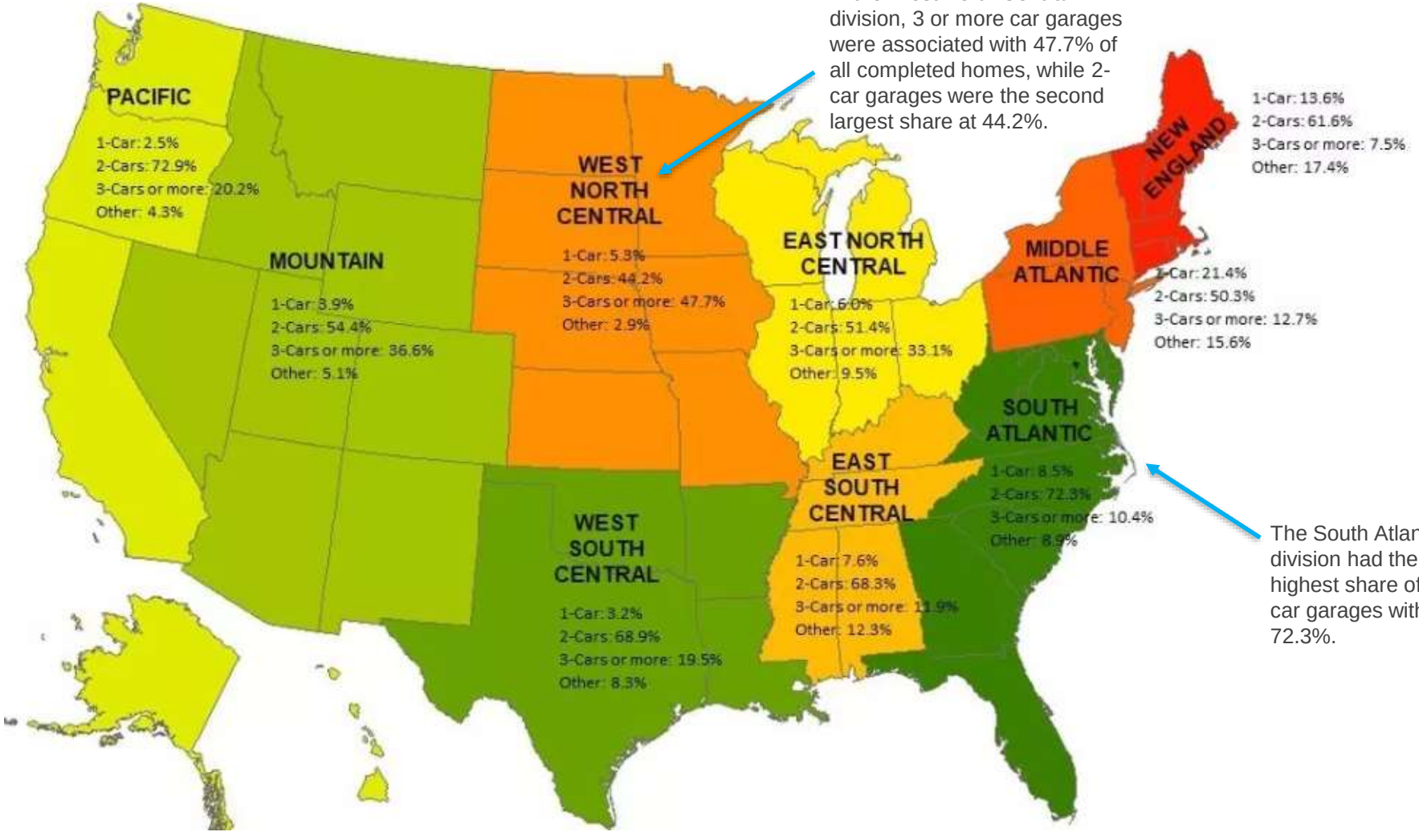

***For new single-family completions in 2020, ~67% of homes offered a two-car garage. Another ~18% of homes possessed a garage large enough to hold three or more cars. Just ~6% of newly-built homes had a one-car garage, and only 1% possessed a carport.***

***The smaller the size of the house, the larger the share of 1-car or other parking facilities. The percentage of completed homes with a 1-car garage is at 27.9% for homes smaller than 1,200 square feet, the highest share in its category.***

*Source: U.S. Census, NAHB*

# Except for West North Central division, the 2-car garage was the largest share of the completed homes in all other divisions

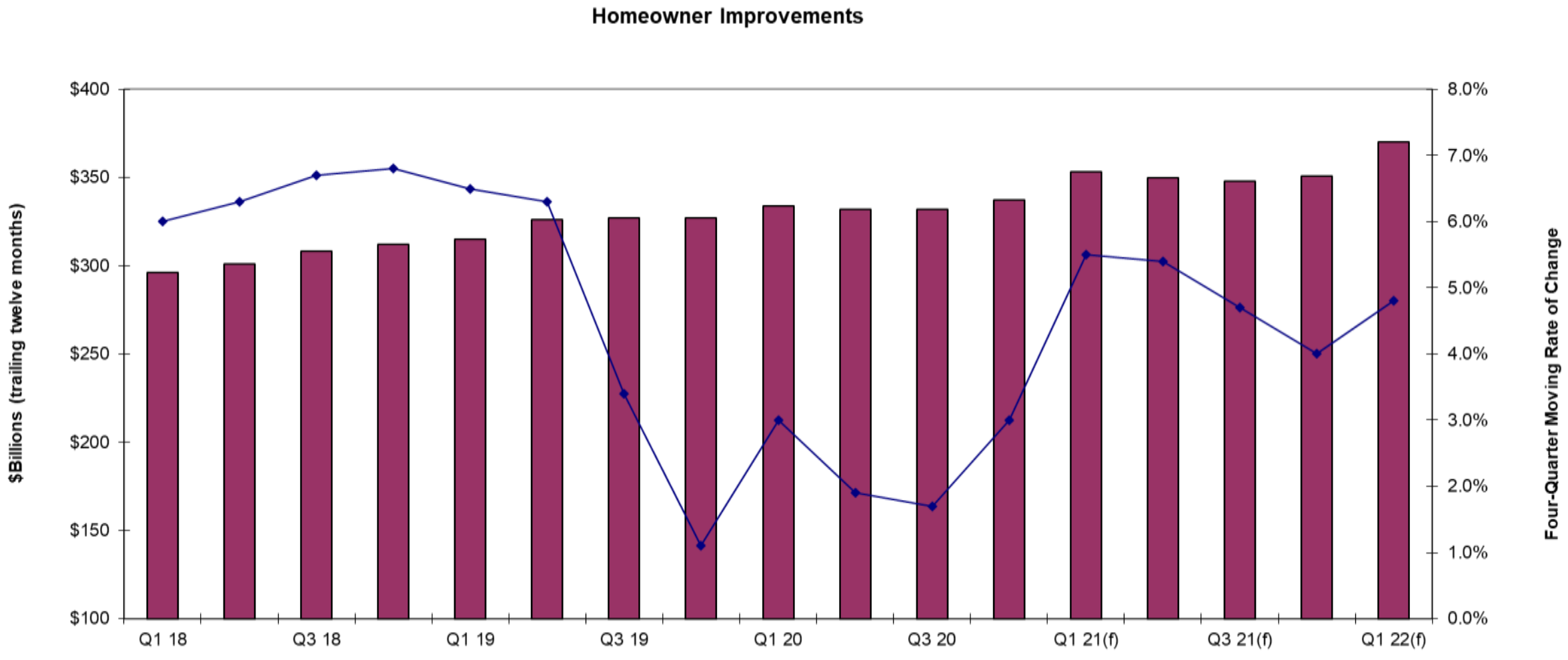
In the West North Central division, 3 or more car garages were associated with 47.7% of all completed homes, while 2-car garages were the second largest share at 44.2%.




The South Atlantic division had the highest share of 2-car garages with 72.3%.

*Source: NAHB*

# Remodeling Outlook – Current strength expected to continue in 2022

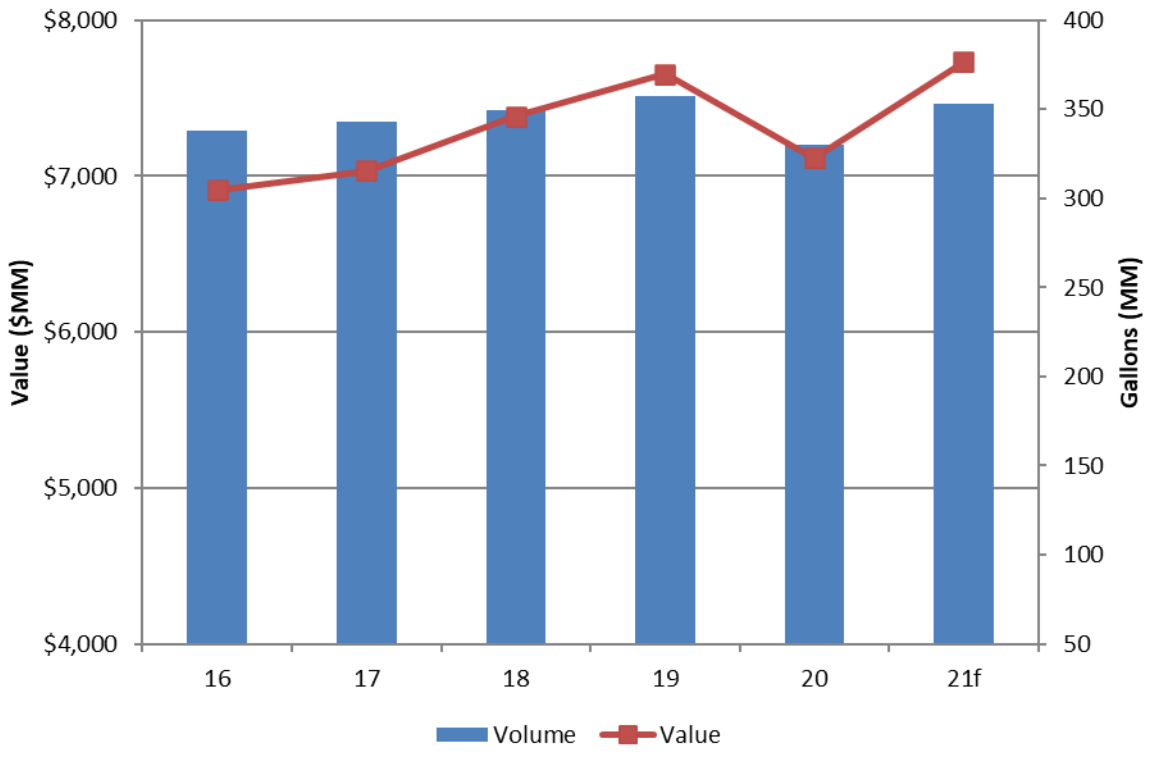



*Source: Harvard Joint Center for Housing Studies*

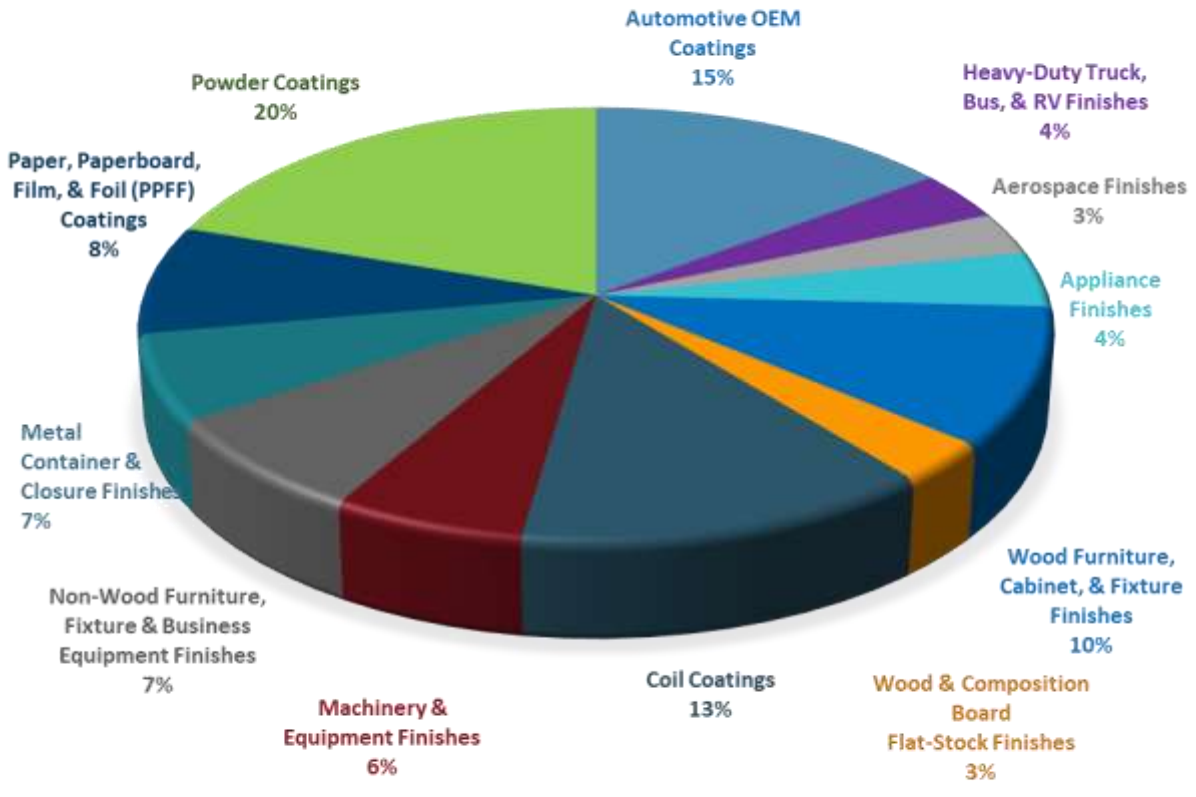
# OEM COATINGS

# Industrial OEM Coatings – Growth Trends and End-market Segments

## *Historical Volume & Value Trends*




## *End Market Segment Share*

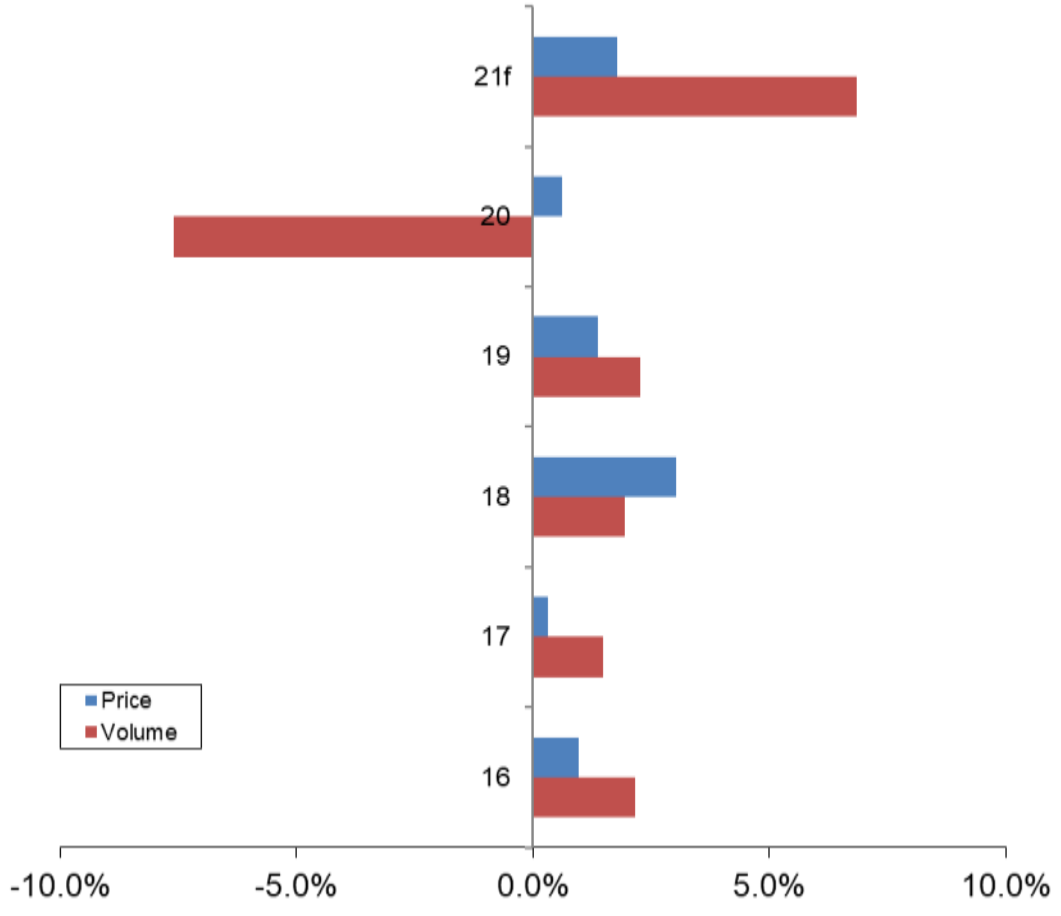



*Source: U.S. Census Bureau , The ChemQuest Group, Inc.*

# OEM Coatings – 2020 and Outlook for 2021

- **Volume decreased 7.6% and value 7% in 2020**
- **Transportation related coatings make up about 1/3 of the market in terms of value with the remaining 2/3 split among durable goods**
- **ChemQuest forecasts volume to increase 6.8% in 2021 and value to increase 8.6%**
  - Value increase is the result of a mix change as higher value segments like Auto OEM are expected to grow greater than lower value segments including packaging
- **Light vehicle sales in the U.S. were 14.7 million in 2020 demand is expected to rebound in 2021, but supply chain challenges remain**
  - EV is rapidly emerging as a driver as they continue to grab share from IC powertrain vehicles and manufacturers announce they will be EV only in the future

***2020 = $7.1B and 330MM gals***




Source: U.S. Census Bureau , The ChemQuest Group, Inc.

# OEM Coatings – Key Trends

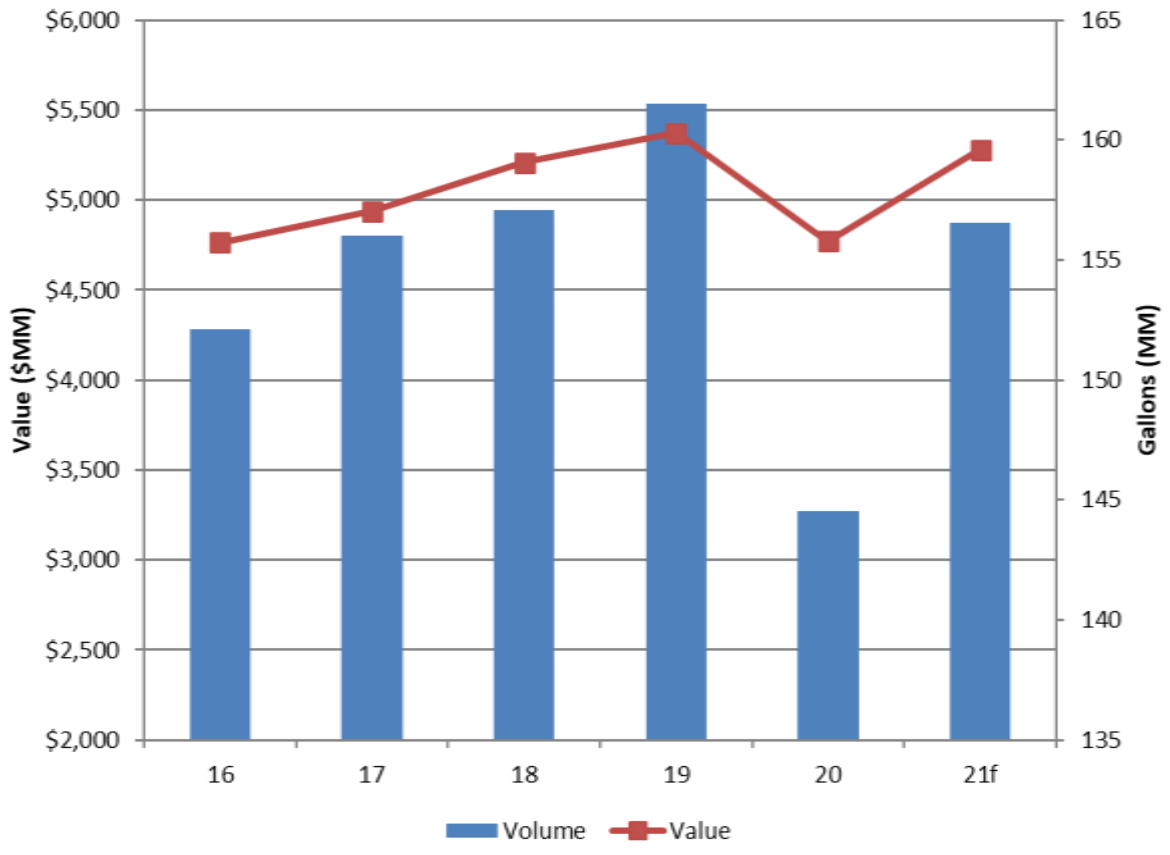
| Trend | Implications/Opportunities |
|---|---|
| **Operational Efficiencies** | Improve productivity at customers' painting operations, for example, wet-on-wet applications, reduced labor, faster cycle times, etc.<br>Increase paint shop productivity and profitability – compact process |
| **Reshoring** | In 2019, a record 1389 companies announced the return of 145,000 jobs = second highest rate on record<br>Since 2010, >750,000 jobs have been added = 31% increase in U.S. manufacturing job |
| **Innovative Solutions** | Auto – matte finishes, glamour clear coats<br>Solar heat management – enable darker colors, increase passenger comfort, reduce external substrate temperatures, reduce cost<br>Premium vivid colors with uniform pigment distribution – nano pigments where pigment is embedded into polymer – extremely durable<br>Enable printed electronics/graphene<br>Self healing / self cleaning<br>Coating technology for energy saving (low temperature cure) and storage |
| **Robust Functionality Across Multiple Substrates** | Coatings are a common link across many substrates - coat mixed material substrates, enable coating on composites, alloys and plastics to replace metal, contributes to light-weighting, energy efficiency and reduced corrosion<br><br>Drive toward weight reduction to achieve "fuel efficiency" requires robust look and performance across diverse substrates, for example steel, metal alloys, plastics, and composites. |

*Source: The ChemQuest Group, Inc.*

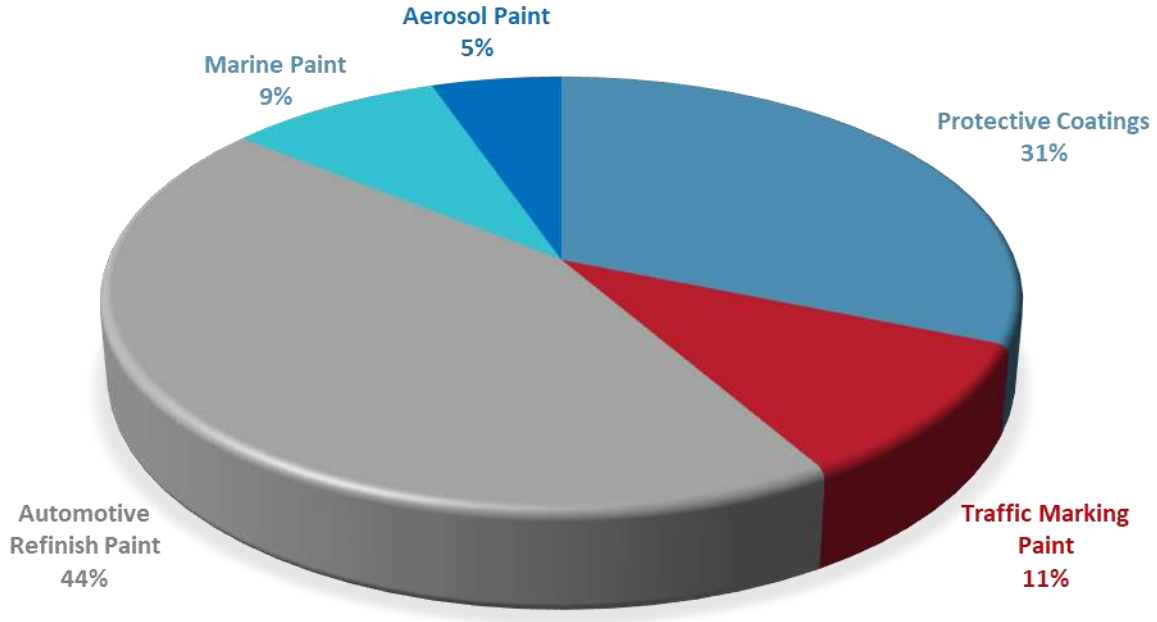
# SPECIAL PURPOSE COATINGS

# Special Purpose Coatings – Growth Trends and End Market Segments

## *Historical Volume & Value Trends*




## *End Market Segment Share*

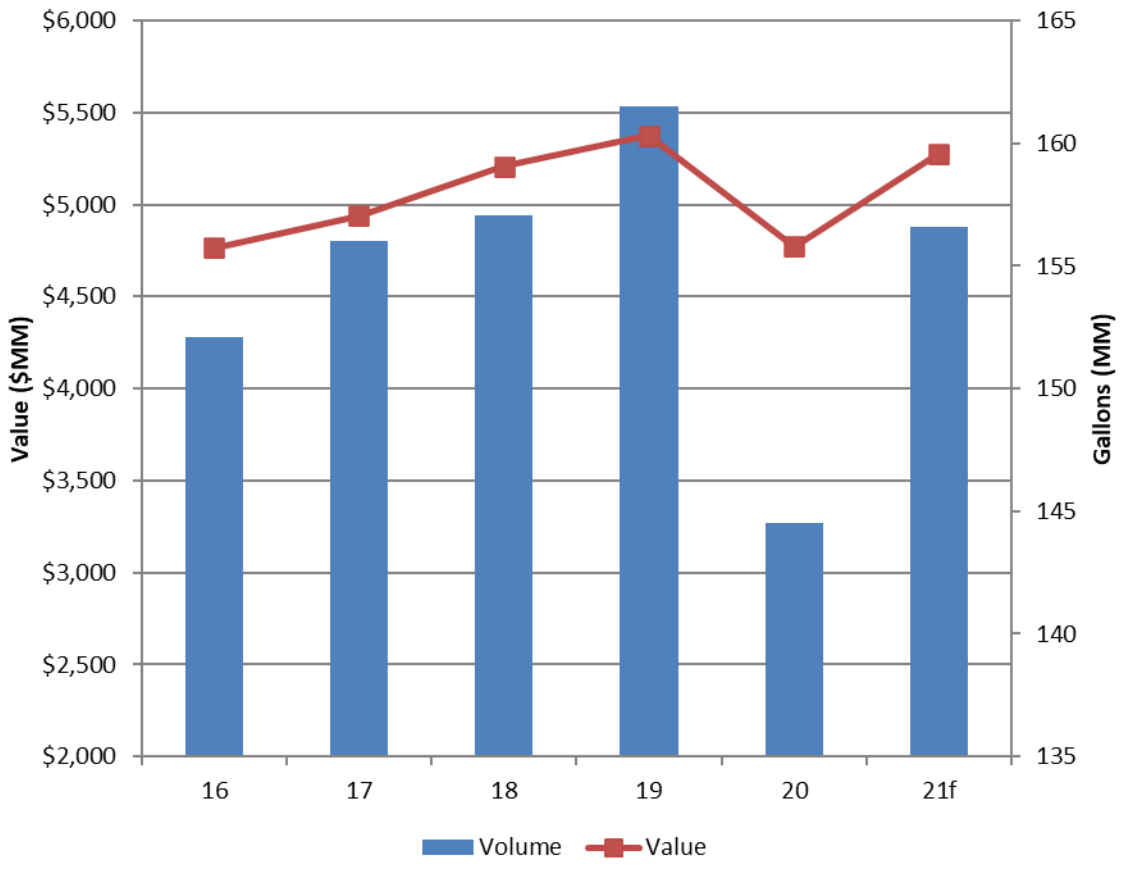



*Source: U.S. Census Bureau, The ChemQuest Group, Inc.*

# Special Purpose Coatings – 2020 and Outlook for 2021

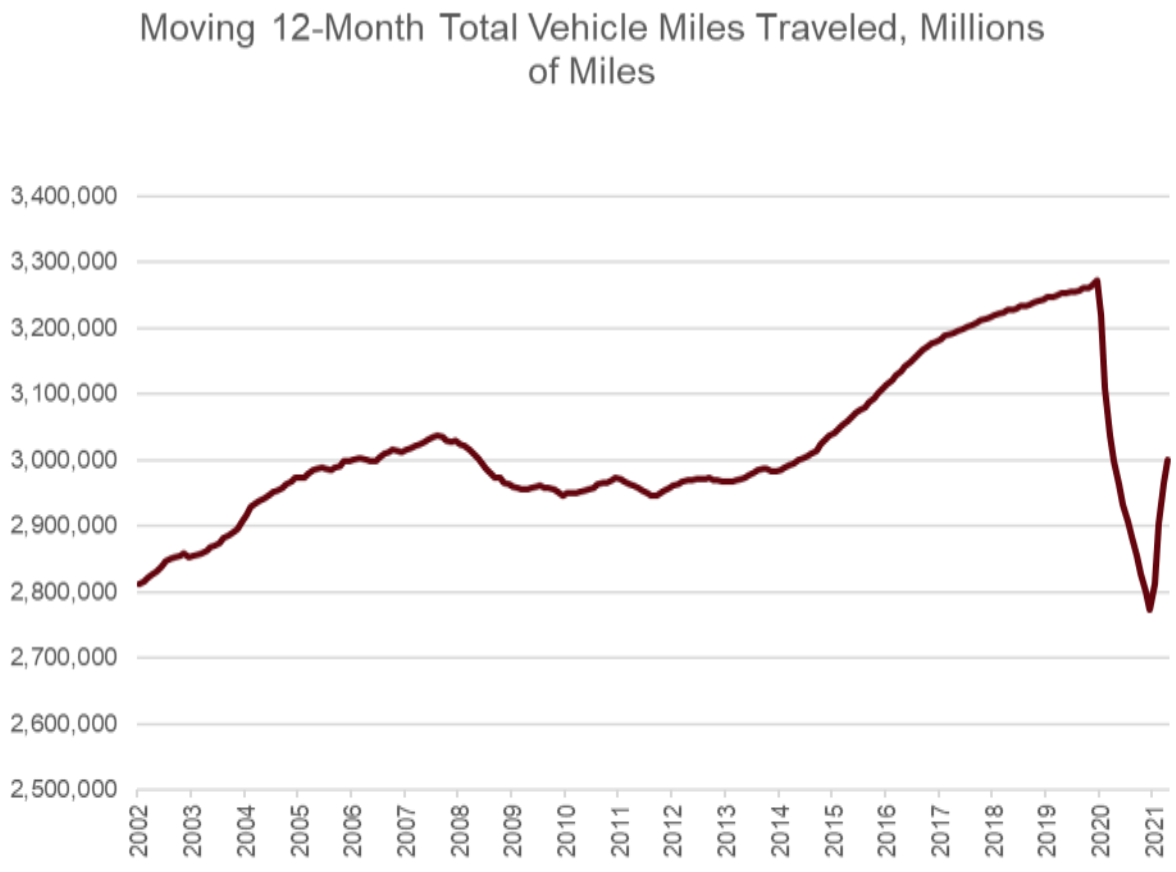
- **Volume and value decreased 10.5% and 11.2% respectively in 2020**
- **Protective coatings led special the decline in special purpose segments in 2020**
  - All segments were negative in 2020
- **Auto refinish continues to be one of the highest value segments (along with OEM aerospace)**
  - Vehicle miles driven returned, but is about 10% less than it had been before Covid-19
- **Expect volume and value to bounce back 8.3% and 10.6% respectively in 2021**
  - The greater increase in value decline is from a mix change in the segment; higher priced Auto refinish will outperform relative to other segments

***2020 = $4.7 billion and 145 million gals***




*Source: U.S. Census Bureau, The ChemQuest Group, Inc.*

# Refinish Coatings Indicators





*Source: U.S. Federal Highway Administration*

# Special Purpose Coatings – Key Trends

| Trend | Implications/Opportunities |
|---|---|
| **Infrastructure Spending Outlook** | State and local government spending under pressure due to revenue decline. Most projects haven't been impacted and infrastructure is expected to be part of the $1.9 trillion legislation package. |
| **Oil & Gas Outlook** | Oil & Gas is 37% of protective coatings volume and were heavily impacted in 2020. Specialty coatings look to be worst performing sector due to their exposure to this sector. |
| **Refinish Outlook** | Autonomous vehicle research and the trend of collision avoidance systems will continue to lower the rate of accidents. CCC Information Services is forecasting that technology will reduce accident frequency by ~30% in the next 25 years |
| **Innovative Solutions** | Faster return-to-service of assets<br>Intelligent surfaces - repair assets only when needed, lower maintenance costs, improved safety<br>Utilize structural health monitoring to extend asset life and reduce maintenance costs - Provide real-time asset assessment utilizing "Internet of Things"<br>Corrosion protection in extreme environments – increase infrastructure longevity |

*Source: The ChemQuest Group, Inc.*

# TECHNOLOGY & INNOVATION

# Innovation Driven Growth


***Each coating is a unique solution to customer challenges***

# Global Megatrends


**Cybersecurity**
- Data Security
- Artificial Intelligence
- Big Data Analysis
- Augmented Reality
- 3D Printing
- Robotics

**Global Health**
- Antiviral Research
- Prevention
- Nutrition
- Mobility

**Reshoring for Economic Stability**
- Domestic Source of Supply
- New Competitors
- Shifts in Commodities
- Supply Chain Instability

**Global EV**
- Battery Technology
- Heat Management
- Light-weighting

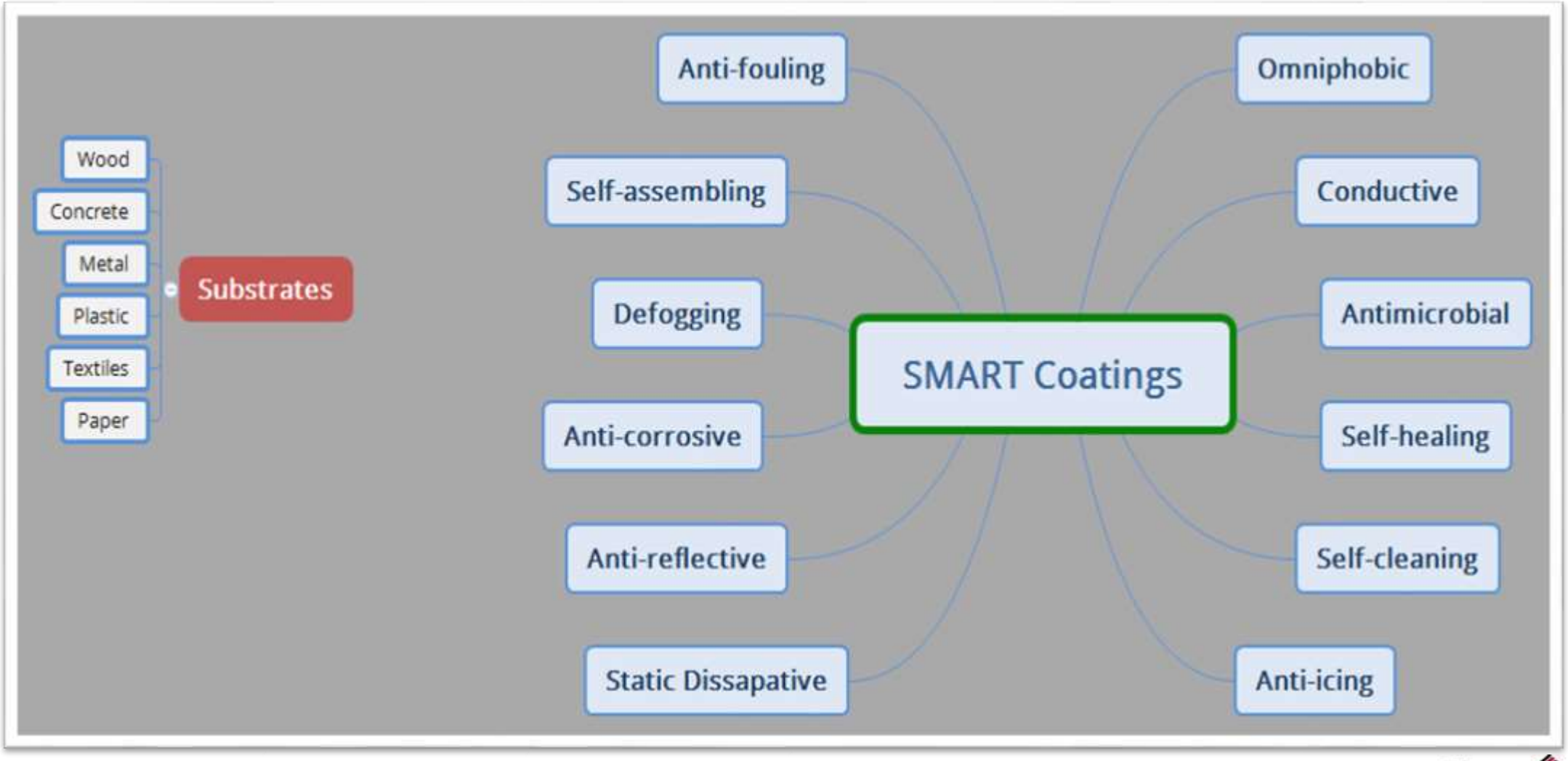
**Less Hydrocarbons, More Carbohydrates**
- Biobased
- Solar, wind, geothermal growth
- Concern for our Planet

**Climate Change**
- Water Scarcity
- Flooding
- Resource Scarcity
- Fire Damage

*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

# Smart Coatings by Functionality

Smart coatings combine functionality with design to offer the usual functions of coatings, such as protection and decoration, as well as unique functions based on environmental stimuli

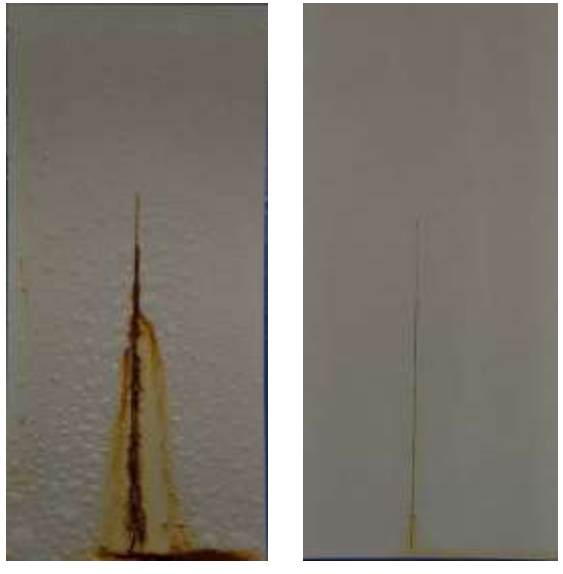



*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

# Examples of Smart Anti-Corrosion & Anti-fouling Technology

*www.synmatter.co*

- pH Triggered Release of Corrosion Inhibitors from Particles
- Platform Technology Developed at NASA

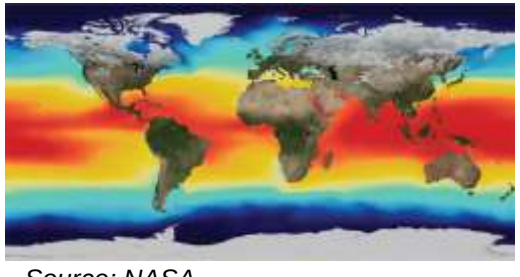


*www.autonomicmaterials.com*

- Inspired by nature, the self-healing microencapsulated technology begins to repair coating damage immediately and without manual intervention.

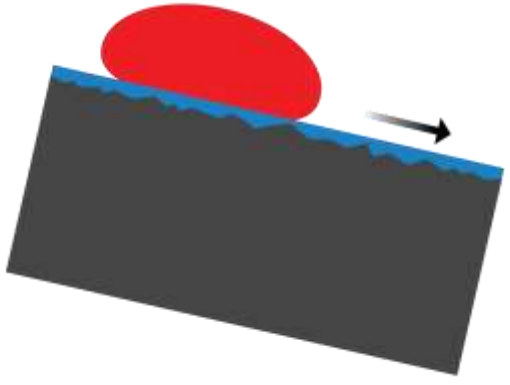
**Self-Healing Additive Technology**

Microcapsules deliver self-healing agents to the site of coating damage in response to common physical, mechanical, thermal and related everyday environmental stresses.



*Source: NASA*

*www.adaptivesurface.tech*



**SLIPS® coatings create a fully liquid surface that is ultra-smooth and super-slippery; unwanted fluids and biological foulants slide right off**

*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

# Examples of Sustainability as a Technology Driver

ZERO
ENERGY READY HOME
U.S. DEPARTMENT OF ENERGY

Net zero emissions - achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions removed from the atmosphere.

- Cooler roof
- Lower het transfer
- Tighter building envelope
- Solar panels

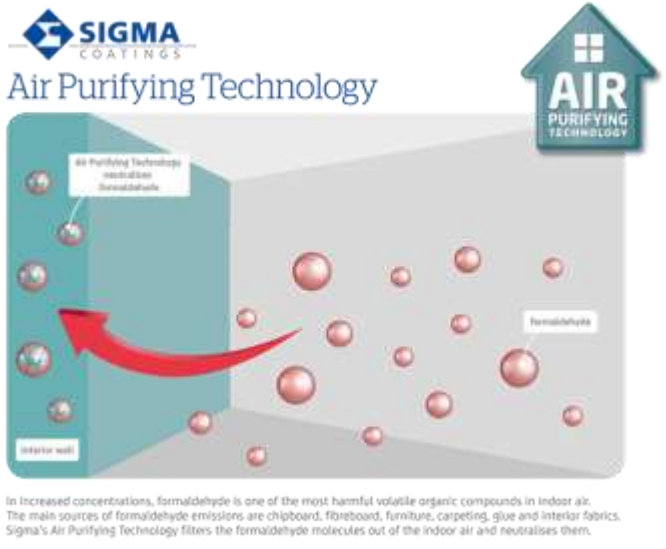
Mandated in CA

**Benefits of net-zero**

- Comfortable environment- The airtight structure and high level of insulation means steady temperature changes, very few drafts and reduced outside noise.
- Cost savings- Lowers your cost of ownership by eliminating energy bills.
- Healthier lifestyle- Fresh air ventilation, which circulates clean, filtered air through the house and drastically reduces allergen and pollutants.

PPG New Product Introduction

45% bio-based DSM resins


*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

# Current Research Trends & Technology Color

- Coatings colors are typically created by addition of pigments or dyes.
- A new approach to color involves designing and incorporating **biomimetic** structural color. Structural color arises through the reflection of light from complex nanostructures.

- Toyota spent over 15 years developing the new Structural Blue color that covers the surface of Lexus LC500s. Inspired by the blue morpho butterfly, Toyota engineers in Ann Arbor, Michigan, and Japan partnered with Viavi Solutions.

*Toyota's Structural Blue Color*

*Source: https://www.thedrive.com/sheetmetal/15034/the-lexus-lcs-blue-paint-took-15-years-to-develop*

Harvard University lab is studying "angle independent" structural color. In one example, polymer microcapsules were created with a microfluidic device to give polystyrene-hydrogel core-shell particles.

*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

# Current Research Trends & Technology Application

- One of the most innovative new methods for coating application uses aerial robotics or drones.
- Apellix, a Florida-based startup, has developed and demonstrated drones for coatings testing.
  - The Apellix autonomous ultrasonic testing (UT) drone can measure wall thickness of industrial structures up to 300 ft above ground level while acquiring over 100 separate site measurements per hour.
  - The Apellix autonomous dry film thickness (DFT) drone can measure thickness by contact with structure up to 300 ft above ground level while acquiring over 100 separate site measurements per hour.
- Apellix is developing a drone for spray paint application and cleaning and won the Akzo Nobel Paint the Future Competition.

*Apellix Drone for Spray Paint Application and Cleaning*


*Source: https://www.suasnews.com/2018/07/apellix-granted-ustpo-patent-for-its-umbilical-cabling-and-tethering-ucat-systems-for-aerial-robots-and-drones/*

*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021*

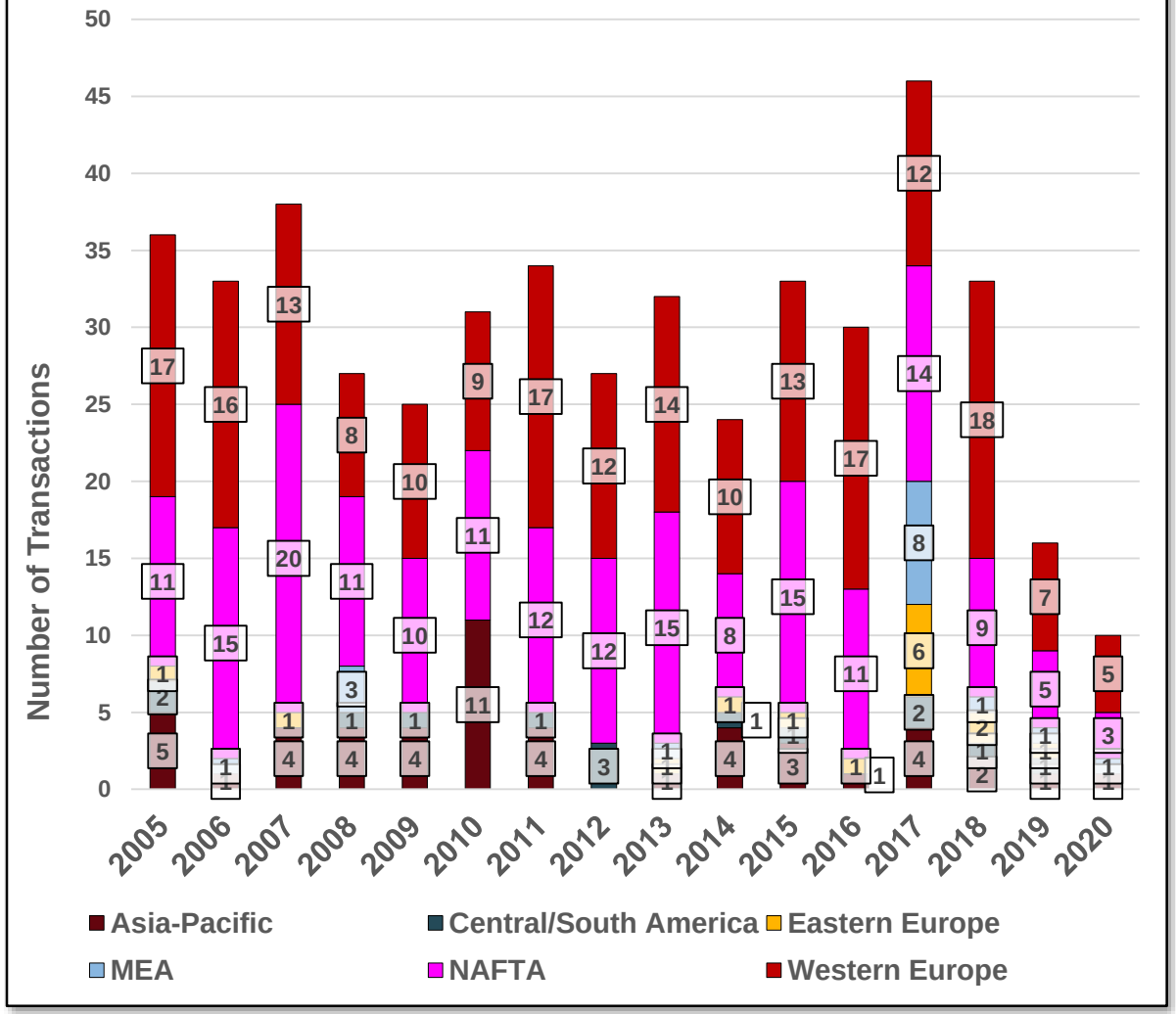
# M&A

# Active M&A Consolidation – 475 deals since 2005

## Top 10 Global Coatings Companies Represent 50% of Total

- Results of consolidation in global coatings over the past two decades:
  - **Europe and North America account for ~80% of the transactions**
  - **Top ten coatings manufacturers now account for ~50% of the market total**
  - **Top 100 global coatings companies represent 85% of all coatings**
- The multinationals continue their global expansion through both organic growth and acquisitions
- Financial buyers are quite active in the space often competing on equal footing with strategic buyers.
- The **primary challenge** for coating companies is the **maturity of growth** and technology **leading to challenges in sustained organic business growth**, hence leading to growth via M&A
- Multiples are at an all time high, reaching **15-17X EBITDA for large cap** companies and creating a frothy market. **SME multiples are 7-10X EBITDA**.

## Coatings Related Acquisitions by Region Since 2005




*Source: Zephyr, S&P Cap IQ*

# SUSTAINABLE GROWTH IMPLICATIONS

# Nascent future trends resulting from Covid-19 lessons shifting face of coatings space

- **Remote work / schooling from home**
  - Shifted new household formation away from urban areas to the suburbs
  - Housing price appreciation
  - Low inventory
  - Increasing DIY projects
  - Finishing garage space and basements
  - Vehicle miles driven declines impact on refinishing
  - Office space, furniture and furnishings

- **Accelerating trend away from brick-and-mortar stores**
  - Increasing demand for commercial warehouse space
  - Heavy truck and last-mile delivery vehicles (Amazon, FedEx, UPS)

- **Catalyst for innovation and technology and digital enabled new business models acceleration**
  - Greater demand for anti-microbial and anti-viral coatings, particularly for high-touch end-uses and promote safe and secure working environments for all
  - Accelerating e-commerce channel sales – Covid-19 comp sales via e-commerce nearly doubled

- Accelerated deglobalization of supply chains and renewed trade-off between resilience vs. cost resulting in **strong reshoring interest**

- **Continued behavioral changes leading to uneven impact** among sectors of the economy as well as the coatings industry; however, sectors that underperformed in 2020 are among the best performers over the next 12 months including aerospace and oil & gas
  - Headwinds
    - Transportation OEM particularly aerospace; however, auto & light truck, heavy truck and fleet (last mile) – robust 2nd half
    - Protective (Oil & Gas particularly hard hit in 2020)
    - Hospitality
    - Office Buildings
    - Entertainment and sports complexes
    - Education
    - Religious
    - Refinish
  - Tailwinds
    - Architectural coatings (residential)
    - Packaging
    - Consumer electronics
    - Appliances
    - Medical
    - Infrastructure related

*Source: The ChemQuest Group, Inc.*

# Stay ahead of the competition by actively seeking new opportunities and collaborations

- **Global Health**—While the aging population was previously a primary focus of much research and development, the COVID-19 pandemic put everyone's health and well-being squarely in the spotlight. The **National Science Foundation** quickly responded by **accelerating approvals** of proposals to develop antivirus technologies. **Paint and coating formulators submitted a record number of applications** for funding new innovative approaches to antiviral formulas. These will hopefully address the needs created by current and future viral pandemics.
- **Reshoring for Economic Stability—**The global shutdown associated with the pandemic put paint manufacturers in the position of trying to locate domestic sources of raw materials to fill their sales orders. Just-in-time and lean manufacturing processes only work when materials are readily available to make products. Thus, **more than 80% of North American manufacturers are reshoring** to bring back domestic sources of production and operation. It is estimated that this effort will **drive $443 billion of economic value during the next 12 months**. Coatings manufacturers are currently working through their supply chains to ensure their sources of supply are stable.
- **Global EV—**Every major automobile manufacturer has announced plans for conversion to electric vehicles in the next 10–15 years. Thus, battery technology development and its associated heat management, light-weighting, new charging station infrastructure, and transportation and delivery of goods will all be sources of new technology development and innovation. Drone technology is being used for last-mile deliveries, and developments are underway for electric air taxis and short-distance electrically powered airplane flights. **These changes create new opportunities for coating uses and will affect how paints and coatings are delivered to the customer.**
- **Less Hydrocarbon, More Carbohydrates—**Every day, new articles discuss the replacement of petroleum-based raw materials with **carbohydrate-based raw material offsets**. Consumers are concerned about the wellbeing of the planet and desire safer products in their homes that do not carry hazardous warnings. Packaging, cosmetics, food, homecare, and personal products are all being reformulated to contain less harmful ingredients. **Paints and coatings are difficult to fully reformulate with these offsets**, **but as many raw material suppliers are providing solutions, formulators should remain aware of newly introduced biobased materials**.
- **Climate Change—**Still a strong megatrend, climate change has produced the need for products, services and technologies that address issues related to increased environmental temperatures, water shortages, devastating storms, floods, and fires. **Innovations in paints and coatings that can help reduce surface temperatures, provide cooler interior buildings, restore damaged homes, and provide resistance to water, mold, and mildew, and UV radiation continue to be necessary to address these adverse conditions**.

*Source: The ChemQuest Group, Inc., Vickie Scarborough, CTT July 2021, Thomas Insights 2021, Reshoring Initiative*

# Greater supply chain resilience required for future business growth

## Four Key Resilience Factors

1. **Visibility across the entire supply network**.
   - **Data Sharing** – The crisis of 2020 made clear that the **"old ways"** of purchasing **will no longer produce optimal results**—we have had a powerful **light shone on the importance of visibility across the supply chain**. Increased data sharing by raw material producers, paint and coatings manufacturers, lumber suppliers, steel producers, et al.
2. **Agility**—the **speed** at which the **supply network can respond to shifts in the environment**, such as scaling production quickly and easily to meet demand, reconfiguring plants and logistics networks, opening new demand channels e.g., shifting from a brick and-mortar model to e-commerce.
   - **Chemical logistics system** – A properly functioning chemical logistics system must be a top priority all along the supply chain including customers. **The entire system reacts to the smallest changes**, delays, or fluctuations in the supply chain, often leading to production downtimes and delivery problems to end-user customers.
3. **Diversification of supplier base**, production footprint and transportation partners.
   - **Four influencing factors** - **Delivery capability, managing complexity and digitization are key.**
4. **Contingency planning**—that stresses the ability, coupled with appropriate tools, to anticipate and respond to disruptions.
   - **Risk Assessment**– No organization can react to changes in the supply chain without creating a risk assessment of its own logistics. This is of primary **importance allowing for intelligent planning** and maximum control.

***Those who prefer to see the current chaotic situation as the result of COVID-19, in light of the assumption that "things will return to normal" at some point in the future, have a very rude awakening ahead of them.***

*Source: The ChemQuest Group, Inc., George Pilcher, IMPDA Q2 2021, Capgemini Research, Rethinking Supply Chain Resilience Post covid-19 World*

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