TRENDS AND OPPORTUNITIES FOR PLASTICS IN HOME CONSTRUCTION & REMODELING

ANTEC 2019
Home Innovation Research Labs

- Founded in 1964 by National Association of Home Builders
- Assist develop and commercialize new building technologies
  - Engineering research & development
  - Market & field research
  - Laboratory testing
- Leader in green home building movement (NGBS)
- Partners with ICC-ES for fast-track of code approvals
- Annual studies of 100K consumers and 1,500 builders on purchases
Construction Spending

Source: NAHB / US Census
Top Trends Shaping the Building Materials Industry

- Skilled labor shortage
  - Cost of labor also increasing
  - Cycle time lengthened (from 6 months to 7 months to complete a home)
  - Industry environment favors easy to install and pre-finished materials
  - Conditions are right for some off-site housing options

- Construction materials costs increasing
  - Building products up 2 times CPI (4% in 2018)

- Lower availability of residential development property
  - Higher density suburbs (smaller and narrower lots, less privacy etc.)
  - Remodeling outlook very good—improve/expand instead of buy new

- More rigorous energy codes--favors polymer-based insulation
  - Air tightness requirements of homes
  - Higher R-value + continuous insulation on exterior walls
  - HVAC equipment and ducts in interior space
  - Windows—next in line for sweeping upgrades
Trends Shaping the Building Materials Industry

- **Demographics**
  - Younger home owners/buyers—transitioning from renting
  - Smaller, more affordable single family homes

- **More durable products**
  - Favoring plastics in many categories on interior & exterior

- **Technology improvements**
  - Natural look continues to increase in popularity—wood and stone
  - Plastics with decorative + wear layers gaining much ground (flooring, decks, siding, windows, countertops and more)

- **Design trends favoring simpler styles (more euro and urban) and contemporary design**—primarily interiors but also exteriors
  - Exteriors incorporate lines suggestive of traditional styles
  - Wood, stone, concrete, and steel—with multiple textures on exterior
  - Open floorplans but defined living spaces

- **Blurring transition from indoor to outdoor living**—window walls or lots of glass, upgraded outdoor living space
U.S. New Housing Mix
(based on annual starts)

Source: Annual Builder Practices Reports and NAHB Housing Starts
On-Site and Off-Site: New Home Wall Construction, 2017

<table>
<thead>
<tr>
<th>Construction Method</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site built - light frame</td>
<td>79.4%</td>
</tr>
<tr>
<td>Panelized - light frame</td>
<td>9.4%</td>
</tr>
<tr>
<td>Concrete block</td>
<td>5.2%</td>
</tr>
<tr>
<td>Poured concrete</td>
<td>2.1%</td>
</tr>
<tr>
<td>Post &amp; beam</td>
<td>1.4%</td>
</tr>
<tr>
<td>Modular - light frame</td>
<td>1.3%</td>
</tr>
<tr>
<td>Insulated concrete forms</td>
<td>0.4%</td>
</tr>
<tr>
<td>Structural insulated panels</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other concrete or masonry</td>
<td>0.2%</td>
</tr>
<tr>
<td>Logs</td>
<td>0.2%</td>
</tr>
<tr>
<td>Precast concrete</td>
<td>0.1%</td>
</tr>
<tr>
<td>Autoclaved aerated concrete</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Source: Annual Builder Practices Reports
Question: CONSIDERING ONLY THE NEW HOMES YOUR COMPANY BUILDS, WHICH OF THE FOLLOWING DO YOU PLAN TO USE LESS OFTEN, ABOUT THE SAME, OR MORE OFTEN IN THE COMING YEAR COMPARED TO LAST YEAR? FIVE YEARS?
**US Residential Roofing: New Homes and Home Remodeling, 2017**

(millions of sf)

<table>
<thead>
<tr>
<th>Material Type</th>
<th>New Homes</th>
<th>Remodeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt--architectural</td>
<td>1,832</td>
<td>4,819</td>
</tr>
<tr>
<td>Asphalt--3-tab</td>
<td>338</td>
<td>5,963</td>
</tr>
<tr>
<td>Metal</td>
<td>1,615</td>
<td></td>
</tr>
<tr>
<td>Clay or Concrete Tile</td>
<td>328</td>
<td>577</td>
</tr>
<tr>
<td>Cedar shingles &amp; shakes</td>
<td>1,048</td>
<td></td>
</tr>
<tr>
<td>Single Ply</td>
<td>333</td>
<td></td>
</tr>
<tr>
<td>Slate</td>
<td>252</td>
<td></td>
</tr>
<tr>
<td>Composite</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

Residential Roofing is about an 18 billion sq.ft. per-year market.

*Source: Annual Builder & Consumer Practices Reports*
Siding Volumes in US New Homes and Home Remodeling, 2017 (millions of SF)

About **8 Billion SF** of exterior siding installed on US homes in 2017

<table>
<thead>
<tr>
<th>Material</th>
<th>New Homes</th>
<th>Remodeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal and Other</td>
<td>36</td>
<td>471</td>
</tr>
<tr>
<td>Fiber Cement</td>
<td>486</td>
<td>317</td>
</tr>
<tr>
<td>Vinyl &amp; Polymer</td>
<td>568</td>
<td>1,740</td>
</tr>
<tr>
<td>Stucco</td>
<td>432</td>
<td>254</td>
</tr>
<tr>
<td>Stone</td>
<td>232</td>
<td>174</td>
</tr>
<tr>
<td>Brick &amp; Block</td>
<td>347</td>
<td>167</td>
</tr>
<tr>
<td>Natural Wood</td>
<td>87</td>
<td>423</td>
</tr>
<tr>
<td>Engineered Wood</td>
<td>393</td>
<td>585</td>
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</table>
Siding on New Homes

Source: Annual Builder Practices Reports
Siding in Home Remodeling

Source: Annual Consumer Practices Reports
Shares of Housewrap, in New SFD Homes, 2017

<table>
<thead>
<tr>
<th>Brand</th>
<th>Market Share</th>
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</thead>
<tbody>
<tr>
<td>DuPont Tyvek</td>
<td>53%</td>
</tr>
<tr>
<td>TYPAR</td>
<td>10%</td>
</tr>
<tr>
<td>Others</td>
<td>10%</td>
</tr>
<tr>
<td>CertainTeed</td>
<td>9%</td>
</tr>
<tr>
<td>DOW</td>
<td>4%</td>
</tr>
<tr>
<td>Barricade Building Products</td>
<td>3%</td>
</tr>
<tr>
<td>Green Guard</td>
<td>3%</td>
</tr>
<tr>
<td>Owens Corning</td>
<td>3%</td>
</tr>
<tr>
<td>Grace</td>
<td>2%</td>
</tr>
<tr>
<td>REX Wrap</td>
<td>1%</td>
</tr>
<tr>
<td>James Hardie</td>
<td>1%</td>
</tr>
<tr>
<td>Grip-Rite</td>
<td>1%</td>
</tr>
<tr>
<td>Perma R Products</td>
<td>0.3%</td>
</tr>
<tr>
<td>Benjamin Obdyke</td>
<td>0.3%</td>
</tr>
<tr>
<td>Tremco Barrier Solutions</td>
<td>0.2%</td>
</tr>
<tr>
<td>Kimberly-Clark</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Homes with Housewrap: 78%
...with Self-Adhered Wrap: 16%
...with Liquid-Applied: 4%

Source: Annual Builder Practices Reports
New Home and Remodeling Window Installations, 2017 (1000’s)

An estimated 58 million windows were installed in residential properties in 2017.

Source: Annual Builder & Consumer Practices Reports
Trends in New SFD Home Window Frame Materials

Source: Annual Builder Practices Reports
Trends in Home Remodeling
Window Frame Materials

Source: Annual Consumer Practices Reports

Source: Annual Builder Practices Reports
Decking Installed in US New Homes and Remodeling, 2017 (millions of SF)

- PVC & other plastics: 8 million SF for New Homes, 24 million SF for Remodeling
- Plastic composite: 45 million SF for New Homes, 197 million SF for Remodeling
- Other untreated lumber: 5 million SF for New Homes, 42 million SF for Remodeling
- Redwood: 4 million SF for New Homes, 100 million SF for Remodeling
- Cedar: 11 million SF for New Homes, 122 million SF for Remodeling
- Treated lumber: 46 million SF for New Homes, 571 million SF for Remodeling

About 1.2 billion board feet of decking was installed on residences in 2017, ~85% for remodeling.

Source: Annual Builder & Consumer Practices Reports
Shares of Raised Porch and Decking Material in New SFD Homes

Source: Annual Builder Practices Reports
Shares of Raised Porch and Decking Material in Residential Remodeling

Source: Annual Consumer Practices Reports
The U.S. home porch and deck railing market is about 120 million linear feet per year (~1 billion feet of lineals).

Source: Annual Builder & Consumer Practices Reports
Deck and Porch Railing in New U.S. Homes

Source: Annual Builder Practices Reports
Deck and Porch Railing in U.S. Home Remodeling

Source: Annual Consumer Practices Reports
Fences & Privacy Walls Installed in New Homes and Remodeling, 2017 (millions of LF)

- Wood Vertical Boards: 138 million LF, 771 million LF
- Wood Rails or Timbers: 272 million LF
- Plastic or Composite: 212 million LF
- Chain Link: 170 million LF
- Iron or Steel: 58 million LF
- Concrete & Other: 55 million LF
- Brick or Block: 17 million LF
- Aluminum: 17 million LF
- Stone: 17 million LF

About 1.8 million LF of fence installed per year (8 billion SF)
Plastic & Composite = about 1.2 billion SF

Source: Annual Builder & Consumer Practices Reports
Fence & Privacy Walls Installed in U.S. Home Remodeling

Source: Annual Consumer Practices Reports
Flooring Installed in US New Homes and Home Remodeling, 2017 (millions of SF)

- **Carpet**: 1,017 (New Homes) + 3,368 (Remodel) = 4,385
- **Ceramic tile**: 409 (New Homes) + 1,720 (Remodel) = 2,129
- **Hardwood (solid)**: 314 (New Homes) + 1,689 (Remodel) = 2,003
- **Laminate**: 57 (New Homes) + 1,391 (Remodel) = 1,448
- **Hardwood (engineered)**: 330 (New Homes) + 749 (Remodel) = 1,079
- **Other**: 26 (New Homes) + 986 (Remodel) = 1,012
- **Vinyl tile**: 22 (New Homes) + 974 (Remodel) = 1,096
- **LVT (Luxury Vinyl)**: 151 (New Homes) + 681 (Remodel) = 832
- **Vinyl sheet**: 70 (New Homes) + 757 (Remodel) = 827
- **Marble**: 42 (New Homes) + 208 (Remodel) = 250

About **16 Billion SF** of residential flooring installed in 2017 in the U.S.
THANK YOU

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