High-Performance Flat Glass

US Industry Study with Forecasts for 2017 & 2022

Study #3034 | June 2013 | $5100 | 302 pages
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US demand to rise 4.4% annually through 2017

US demand for high-performance flat glass products is forecast to rise 4.4 percent per year to 910 million square feet in 2017, valued at nearly $9.2 billion. This will represent a substantial improvement from the performance of the market over the 2007-2012 period, when demand in area terms suffered an outright decline. Going forward, gains will benefit from a major rebound in building construction spending, continued improvement in motor vehicle production, and increased market share for high-performance products in the general flat glass market. Through 2017, the architectural market for high-performance flat glass is expected to rebound from low 2012 levels, while the motor vehicle market for these advanced flat glass products will post solid growth.

Solar control glass to be fastest growing segment

Value demand for solar control glass is forecast to rise at a double-digit annual rate through 2017, a significant improvement from the pace of the 2007-2012 period. Consumption of solar control glass products is largely concentrated in the architectural market and will benefit from rapid increases in new building construction. Low-emissivity (low-e) glass is the most commonly used solar control product in residential window systems, particularly in double-pane insulated glass units (IGUs). Sales of low-e glass will see especially fast gains through 2017, benefiting from a rebound in new housing construction as well as from increased emphasis on energy efficiency. Electrochromic mirrors represent the largest application for solar control glass outside of the architectural market and account for the bulk of smart glass demand. Sales of these products will see strong growth, but will trail the average as growth in motor vehicle output trails the rapid gains in building construction. Smart window glass products -- including electrochromic windows, suspended particle device (SPD) windows, and liquid crystal device (LCD) windows -- will make strong gains but will continue to represent a minor share of the total market.

The security and safety glass segment holds the largest share of high-performance flat glass sales in value terms, accounting for over two-thirds of the total in 2012. Consumption of security and safety glass is projected to grow at an above average pace through 2017. The fastest gains are expected for laminated hurricane glass, although this will remain a regional product. In the motor vehicle market, laminated glass will increasingly be used in side and rear windows and roof applications and will continue to take market share from tempered glass.

Demand in value terms for other high-performance flat glass products will also be solid through 2017. Heads-up display windshields will post strong sales growth as these products become more common, although demand will remain largely confined to aircraft and high-value motor vehicles. Demand for self-cleaning glass will rise at an especially rapid rate from a small 2012 base. Sales of other products, including anti-reflective glass, leaded glass, and electronics glass, will rise at a more moderate rate.

Study Coverage

This industry study, *High-Performance Flat Glass*, presents historical demand data (2002, 2007, 2012) and forecasts for 2017 and 2022 by product (e.g., security and safety glass, solar control glass) and market (e.g., vehicular, architectural). The study also considers market environment factors, evaluates company market share and profiles 30 industry competitors.
Electrochromic Windows: Demand for electrochromic windows is projected to increase at an annual rate of 12% to $85 million in 2017. Non-mirror automotive uses such as sunroofs and sun visors represent the most established opportunities for growth, with architectural and automotive side window applications developing later. In the long run, producers of electrochromic glass are expected to devote more resources to product development, with efforts concentrated on technologies such as glass thickness which can be an important factor in determining performance.

For example, View (formerly Soladigm) produces electrochromic windows which are based on glass that has been treated with antimony and lithium alloys. The company offers electrochromic windows for the commercial buildings market via a partnership with Guardian Industries.

Electrochromic windows consist of thin, multilayer coatings deposited onto a single pane of glass, similar to sputter coated low-e glass. The two outside layers of the assembly are transparent electronic conductors. Next is a counter-electrode layer (or an “ion storage” layer) and an electrochromic layer, with an ion conductor layer in between. When a low voltage is applied across the conductors, ions move from the ion storage layer to the electrochromic layer, thus darkening the layer. Reversing the voltage causes the ions to move from the electrochromic layer back to the ion storage layer, restoring the layer to its clear state.

In addition to Gentex and Magna Mirror Systems (which dominates production in the electrochromic mirror segment), other flat glass makers with electrochromic technologies include AGC Glass (Asahi Glass), PPG Industries, Saint-Gobain, and Teledyne Scientific & Imaging.

Teledyne has developed “reversible electrochemical mirror” (REM) technology, which is similar to conventional electrochromic technology but has the advantage of not requiring an ion conductor layer. This technology is being developed for use in automotive applications.

TABLE IV-3
SAFETY GLASS DEMAND
(million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicle Production (000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sq ft safety glass/vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Glass Demand (mil sq ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$/sq ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Glass Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By Type:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laminated Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tempered Glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By Market:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Vehicles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerospace &amp; Other Transport</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% safety glass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security &amp; Safety Glass Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHART VI-1
HIGH-PERFORMANCE FLAT GLASS
MARKET SHARE BY COMPANY
($6.2 billion, 2012)
TABLE V-6
AEROSPACE & AIRCRAFT MARKET FOR HIGH-PERFORMANCE FLAT GLASS (million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace/Aircraft Shpts (bil 2005$)</td>
<td>133.4</td>
<td>158.6</td>
<td>154.1</td>
<td>169.0</td>
<td>180.0</td>
</tr>
<tr>
<td>sq ft high-perf flat glass/mil $ shpts</td>
<td>361</td>
<td>364</td>
<td>370</td>
<td>377</td>
<td>385</td>
</tr>
<tr>
<td>Aero/Aircraft H-P Flat Glass (mil sq ft)</td>
<td>48.2</td>
<td>57.8</td>
<td>57.0</td>
<td>63.7</td>
<td>69.3</td>
</tr>
<tr>
<td>$/sq ft</td>
<td>7.30</td>
<td>7.91</td>
<td>8.98</td>
<td>10.15</td>
<td>11.10</td>
</tr>
<tr>
<td>Aero &amp; Aircraft H-P Flat Glass Security &amp; Safety Glass</td>
<td>352</td>
<td>457</td>
<td>512</td>
<td>645</td>
<td>770</td>
</tr>
<tr>
<td>Solar Control Glass</td>
<td>neg</td>
<td>5</td>
<td>13</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>Other High-Performance Glass</td>
<td>70</td>
<td>111</td>
<td>135</td>
<td>185</td>
<td>225</td>
</tr>
<tr>
<td>% aerospace &amp; aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicular H-P Flat Glass Demand</td>
<td>3103</td>
<td>3599</td>
<td>4305</td>
<td>5910</td>
<td>6990</td>
</tr>
</tbody>
</table>

“...The forecast recovery in new residential construction, particularly new single-family housing, will provide the primary impetus for growth. The rebound in new housing will spark renewed demand for solar control glass, especially low-emissivity glass materials. Demand for products such as self-cleaning glass and smart glass will continue to be relatively small but such products will expand their market penetration. Hurricane glass will continue to be limited geographically, with consumption centered in Florida.”

--Section V, pg. 196-7
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