Refractories

US Industry Study with Forecasts for 2014 & 2019

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US demand to advance 8% annually through 2014

US demand for refractory products is forecast to advance 8.0 percent annually to $3.1 billion in 2014, reflecting a rebound in steel manufacturing from dismal 2009 levels. Of the nearly $1 billion total gain in refractory demand by value between 2009 and 2014, the metals industry will account for more than 75 percent. Total market demand by tonnage for the same period is forecast to climb 6.1 percent per annum to 2.7 million tons in 2014. This level of consumption, though comparable to 2004 levels, still falls short of the 3.5 million tons consumed in 1999.

Value gains to outpace tonnage gains

The US refractory industry has been negatively affected in recent years by one of the steepest declines in production that the iron and steel industry has ever seen. Given the refractory-intensiveness of ferrous metal production processes, coupled with the fact that this sector typically accounts for about half the value of refractories consumed, refractory producers had to contend with a significant decline in demand for their products in 2009. Although recovery in US steel production, as well as other economic sectors, will bode well for refractory demand growth through 2014, this growth is best considered in the context of improving refractory technologies. These technologies have, in effect, lowered refractory consumption per unit of output in steel and other refractory-consuming industries, thereby limiting tonnage gains, but supporting value gains through higher prices.

Preformed shapes, monolithics to grow the fastest

Among refractory forms, demand for preformed shapes and certain monolithics will mirror shipments and see the strongest gains, because of their ease of use and versatility, respectively. From a materials perspective, demand growth for nonclay materials will outpace that for clay materials. The switch to better-performing products will continue, with the best opportunities expected for silicon carbide, extra-high-alumina, and zircon and zirconia refractories among nonclay products and high-alumina clays in that segment.

Minerals to be fastest growing nonmetallic market

Among the various nonmetallic refractory markets, the best growth opportunities will be found in the nonmetallic minerals market (cement, glass and ceramics) due to economic recovery and in non-manufacturing markets through less traditional end uses such as waste-to-energy generation and restaurants with in-house bakeries and stone ovens. However, the impact of these small markets on aggregate refractory demand will be minimal.
Materials

Magnesite & Chrome

Shipments of magnesite and chrome refractories, which accounted for 22 percent of total US refractory shipments by value in 2009, are expected to increase 7.6 percent annually to $445 million in 2014. Dollar gains will reflect both increased tonnage demand and price increases in these refractories. Tonnage shipments dropped an average of 5.2 percent annually between 1999 and 2009. Although volume shipments will recover through 2014 as the US economy recovers from recession, magnesite and chrome refractory shipments are not expected to revisit 1999 levels. Despite the modest growth prospects, magnesite and chrome will continue to account for the largest share of nonclay refractory output in both value and volume terms, a testament to the materials' relatively low cost and position as basic, well established and well understood refractory materials.

Despite the anticipated recovery in volume shipments through 2014, shipments of magnesite and chrome refractories will be constrained by competing specialized materials. Competing materials include certain types of nonclay refractories, which are expected to continue to replace magnesite and chrome refractories because the other materials offer such advantages as superior performance in harsh operating environments or easier disposal. For example, spinel refractories have increasingly replaced magnesia-chrome refractories, which can be difficult to dispose of due to the formation of toxic hexavalent chromium as the refractories degrade.

Growth will also be limited by stiff competition from foreign suppliers, which supply some of the same overseas markets served by US producers, as well as the significant amount of imports in the US market. Leading foreign producers of magnesite and chrome refractories exporting into the US include China, Brazil and Austria. Resco Products accused

<table>
<thead>
<tr>
<th>Item</th>
<th>1999</th>
<th>2004</th>
<th>2009</th>
<th>2014</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonclay Refractory Shipments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% zircon &amp; zirconia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zircon &amp; Zirconia Refractory Shipments</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bricks &amp; Shapes</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Monolithics</td>
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<tr>
<td>Other Forms</td>
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<td>$/ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Zircon/Zirconia Refractory Shpts (000 tons)</td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table IV-5: Zircon & Zirconia Refractory Shipments

Chart VI-1: US Refractory Market Share by Company ($2.1 billion, 2009)
Sample Profile, Table & Forecast

BNZ Materials Incorporated
6901 South Pierce Street, Suite 260
Littleton, CO  80128
303-978-1199
http://www.bnzmaterials.com

Annual Sales:  $40 million (estimated)
Employment:  160 (estimated)
Key Products:  insulating firebricks, calcium silicate structural insulation, mortars, cements and castables

BNZ Materials is a manufacturer of specialty industrial insulation and refractories for the furnace, petrochemical, aluminum, electrical, glass, steel and other industries.  The Company is privately held.

The Company is involved in the US refractory industry through the production of insulating firebricks, calcium silicate (CaSiO₃) structural insulation, mortars, cements and castables.  BNZ insulating firebricks from BNZ Materials are made from high-purity refractory clays and other ceramic raw materials, as well as organic filler that is burned out during the manufacturing process to provide a uniform and controlled pore structure.  These firebricks are designed for use as primary hot face refractory linings or back-up insulation in applications with temperatures ranging from 2,000 to 3,200 degrees Fahrenheit, including furnaces, flues and kilns.  BNZ insulating firebricks are available in standard, specialty cemented, machined and ZELIE JUMBO models.  Specifically, ZELIE JUMBO insulating firebricks do not require mortar joints, and are produced in sizes of up to 24 inches by 9 inches by 3 inches.

TABLE III-3
REFRACTORY BRICK & SHAPE SUPPLY & DEMAND
(million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>1999</th>
<th>2004</th>
<th>2009</th>
<th>2014</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refractory Demand</td>
<td>2159</td>
<td>1992</td>
<td>2070</td>
<td>3045</td>
<td>3500</td>
</tr>
<tr>
<td>% bricks &amp; shapes</td>
<td>54.9</td>
<td>56.0</td>
<td>55.8</td>
<td>55.5</td>
<td>54.3</td>
</tr>
<tr>
<td>Brick &amp; Shape Demand net exports</td>
<td>1185</td>
<td>1115</td>
<td>1155</td>
<td>1690</td>
<td>1900</td>
</tr>
<tr>
<td>Brick &amp; Shape Shipments</td>
<td>1185</td>
<td>1115</td>
<td>1155</td>
<td>1690</td>
<td>1900</td>
</tr>
<tr>
<td>By Form:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Bricks</td>
<td>740</td>
<td>600</td>
<td>645</td>
<td>850</td>
<td>950</td>
</tr>
<tr>
<td>Preformed Shapes</td>
<td>473</td>
<td>454</td>
<td>560</td>
<td>770</td>
<td>875</td>
</tr>
<tr>
<td>By Material:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonclay</td>
<td>722</td>
<td>674</td>
<td>845</td>
<td>1185</td>
<td>1370</td>
</tr>
<tr>
<td>Clay</td>
<td>491</td>
<td>380</td>
<td>360</td>
<td>435</td>
<td>455</td>
</tr>
<tr>
<td>$/ton</td>
<td>948</td>
<td>1065</td>
<td>1452</td>
<td>1575</td>
<td>1690</td>
</tr>
<tr>
<td>Brick &amp; Shape Shipments (000 tons)</td>
<td>1280</td>
<td>990</td>
<td>830</td>
<td>1030</td>
<td>1080</td>
</tr>
</tbody>
</table>

“Shipments of standard bricks are forecast to advance 5.7 percent per year to $850 million by 2014. In volume terms, standard brick shipments will increase 3.9 percent annually to 570,000 tons, not quite returning to 2004 levels. Gains will be driven by recovery from recession, especially in steel and glassmaking, in the US and its principal trading partners. However, the high cost of standard brick refractories, inclusive of their installation, and imports from foreign suppliers will restrain growth somewhat.”

--Section III, pg. 50-1
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