Flame Retardants

US Industry Study with Forecasts for 2013 & 2018

Study #2557 | September 2009 | $4700 | 225 pages
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Flame retardant advances will reflect renewed vigor in key markets such as insulated wire and cable, and construction, as well as more stringent fire codes and flammability requirements.

**US demand to reach $900 million in 2013**

US demand for flame retardants is expected to reverse its decline and is forecast to expand 2.7 percent per annum to 950 million pounds in 2013, valued at $900 million. Flame retardant advances will reflect renewed vigor in key markets such as insulated wire and cable, and construction. Other stimulants include more stringent fire codes and flammability requirements. Price increases will moderate significantly due to more normal energy and raw material costs.

**Phosphorus compounds to be fastest growing type**

The industry will continue to be impacted by trends away from halogenated flame retardants due to health and environmental concerns. Alumina trihydrate will continue to be the most widely used flame retardant type, accounting for 43 percent of total demand due to its low cost, excellent performance and widespread applications. Best growth is expected for phosphorus-based flame retardants. Growth will be driven by non-halogenated phosphorus grades, which have a more benign environmental footprint than brominated compounds, which will rise at the slowest pace, restrained by legislative mandates and customer demands for more environmentally-friendly materials. Demand for chlorinated compounds will decrease through 2013 due to their adverse health and environmental impacts.

**Wire & cable to be fastest growing market**

Construction products accounted for one-third of total flame retardant demand and will grow at an average pace to 313 million pounds in 2013, driven by insulation and cushioning opportunities for flame retardants used in foamed polyurethane and polystyrene. Insulated wire and cable will exhibit the fastest growth in light of rapidly rebounding wire and cable production. Motor vehicle markets will be buoyed by rising production levels, elevated temperatures in under-the-hood applications and increased use of lighter weight plastic materials, which offer improved fuel efficiency. Flame retardants used in electrical and electronic products will grow at a slow pace through 2013 due to the continued exodus of electronics production to offshore countries with lower labor costs and governmental incentives, particularly in Asia. Textile markets for flame retardants will also exhibit slow growth due to the cost advantages of offshore producers. Smaller aircraft and aerospace markets will be stimulated by stricter flame retardance standards, the aging of the commercial aircraft fleet and growing military aircraft procurement levels.

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Demand for alumina trihydrate (ATH) flame retardants is forecast to rise 2.8 percent annually to 407 million pounds in 2013, valued at $131 million. Advances will reflect opportunities in key markets such as wire and cable insulation, carpets and rugs, and residential construction. Non-halogenated flame retardants will also benefit ATH as uses employ ATH in applications previously using halogenated compounds. Further growth will be threatened by the high ATH levels required for flame retardance, which can compromise the mechanical strength of the material to which it is added. Additionally, ATH has a relatively low upper-use temperature, which prohibits its use with high processing temperatures such as polypropylene and nylon.

By volume, alumina trihydrate accounted for 43 percent of flame retardants used in the US in 2008, yet only 14 percent of market value. ATH is the least expensive product on the market on a per pound basis, although larger quantities are needed to achieve the same level of flame retardance as lesser quantities of other products. In plastics applications, ATH often functions as a filler and extender in addition to a flame retardant. As a flame retardant, ATH releases its contained moisture when exposed to fire, which helps to absorb heat energy as well as release moisture into the air, which dilutes combustible gases and toxic fumes. ATH thus functions as both a flame retardant and a smoke and fume suppressant.

Despite ATH’s popularity as a flame retardant in plastic applications, it does have its drawbacks. For example, ATH cannot be used if the plastic processing temperature exceeds 390 degrees Fahrenheit. Additionally, the high loading factors required can lead to a decrease in the mechanical and electrical properties of the plastic. In response, a number of producers have introduced surface modified grades of ATH, usually with silicone compounds, that improve processability.

Table IV-3

<table>
<thead>
<tr>
<th>Item</th>
<th>1998</th>
<th>2003</th>
<th>2008</th>
<th>2013</th>
<th>2018</th>
</tr>
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<tbody>
<tr>
<td>Building Construct Expend (bil 2000$)</td>
<td>633.2</td>
<td>682.0</td>
<td>600.7</td>
<td>700.0</td>
<td>797.0</td>
</tr>
<tr>
<td>lb FR/mil $ construction expend</td>
<td>423</td>
<td>453</td>
<td>455</td>
<td>447</td>
<td>449</td>
</tr>
<tr>
<td>Flame Retardants in Construction</td>
<td>267.9</td>
<td>309.1</td>
<td>273.2</td>
<td>313.0</td>
<td>357.5</td>
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<tr>
<td>Insulation</td>
<td>96.0</td>
<td>111.0</td>
<td>93.4</td>
<td>114.3</td>
<td>129.8</td>
</tr>
<tr>
<td>Roofing Material</td>
<td>30.6</td>
<td>34.8</td>
<td>33.6</td>
<td>40.0</td>
<td>46.0</td>
</tr>
<tr>
<td>Wood Panel Binder Resins</td>
<td>24.5</td>
<td>26.3</td>
<td>24.0</td>
<td>27.8</td>
<td>30.8</td>
</tr>
<tr>
<td>Other Construction Products</td>
<td>116.8</td>
<td>137.0</td>
<td>122.2</td>
<td>130.9</td>
<td>150.9</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.67</td>
<td>0.71</td>
<td>0.90</td>
<td>0.96</td>
<td>1.02</td>
</tr>
<tr>
<td>FR Demand in Construction (mil $)</td>
<td>179</td>
<td>221</td>
<td>247</td>
<td>300</td>
<td>366</td>
</tr>
<tr>
<td>% construction</td>
<td>31.7</td>
<td>33.5</td>
<td>32.9</td>
<td>33.3</td>
<td>34.2</td>
</tr>
<tr>
<td>Flame Retardant Demand (mil $)</td>
<td>565</td>
<td>660</td>
<td>750</td>
<td>900</td>
<td>1070</td>
</tr>
</tbody>
</table>
Sample Profile,
Table & Forecast

COMPANY PROFILES

Eastern Color & Chemical Company
35 Livingston Street
Providence, RI 02904
401-331-9000
http://www.easterncolor.net

Annual Sales: $35 million (estimated)
Employment: 70 (estimated)
Key Products: flame retardants for textiles and plastics

Eastern Color & Chemical is a privately held manufacturer of pigment dispersions and other chemicals for the leather, paper, textiles and plastics industries. Its key products include foaming agents, thermosetting resins, softeners, waxes, lubricating materials and wetting agents, among other industrial chemicals. Eastern Color & Chemical operates through five main divisions: Pigment, Pulp and Paper Chemical/Pigment, Chemical, Lenox Chemical and International.

The Company competes in the US flame retardant market via the Pulp and Paper Chemical/Pigment division and the Chemical division. Among other products, these divisions make flameproofing agents. Eastern Color & Chemical’s flameproofing agents are marketed under the ECCO FLAMEPROOF and ECCOGARD brand names.

ECCO FLAMEPROOF flameproofing agents from Eastern Color & Chemical include several grades designed to insure flame retardance when used in textiles. Examples of these products are ECCO FLAMEPROOF LB-2 liquid flameproofing agents for dry-clean-only fabrics; ECCO FLAMEPROOF CPE semi-durable organic phosphate reaction formulations for synthetics and cellulosics; ECCO FLAMEPROOF

TABLE III-4

<table>
<thead>
<tr>
<th>POLYOLEFINs DEMAND FOR FLAME RETARDANTS</th>
<th>(million pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>1998</td>
</tr>
<tr>
<td>Polyolefins Demand lb FR/000 lb polyolefins</td>
<td>3750</td>
</tr>
<tr>
<td>Flame Retardants in Polyolefins</td>
<td></td>
</tr>
<tr>
<td>Alumina Trihydrate</td>
<td>2.2</td>
</tr>
<tr>
<td>Brominated Compounds</td>
<td>7.0</td>
</tr>
<tr>
<td>Chlorinated Compounds</td>
<td>7.6</td>
</tr>
<tr>
<td>Antimony Trioxide</td>
<td>4.9</td>
</tr>
<tr>
<td>Other Flame Retardants</td>
<td>13.7</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.51</td>
</tr>
<tr>
<td>FR Demand in Polyolefins (mil $)</td>
<td>43</td>
</tr>
<tr>
<td>% polyolefins</td>
<td></td>
</tr>
<tr>
<td>Flame Retardant Demand (mil $)</td>
<td>565</td>
</tr>
</tbody>
</table>

“Demand for flame retardants used in polystyrene plastics will expand 1.5 percent yearly to 54 million pounds in 2013, valued at $93 million. Opportunities are anticipated for construction products such as flame retardant polystyrene insulation panels, with further growth constrained by a sluggish nonresidential construction market. Demand for flame retardant polystyrene in electrical and electronics applications will be restrained due to ...”

--Section III, pg. 47
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