Phenolic Resins in North America, a new study from The Freedonia Group, provides you with an in-depth analysis of major trends in the industry and the outlook for product segments and major markets -- critical information to help you with strategic planning.

This brochure gives you an indication of the scope, depth and value of Freedonia’s new study, Phenolic Resins in North America. Ordering information is included on the back page of the brochure.

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Demand for phenolic resins in North America is forecast to increase one percent per year to 4.5 billion pounds in 2006, lagging real (i.e., inflation-adjusted) gains in the general economy.

Phenolic resin demand will benefit from ongoing shifts in the wood panel product mix favoring oriented strand board and particleboard over softwood plywood, since these chip-based boards have more intense adhesive requirements per board foot than veneer-based boards such as plywood.

Outside the construction sector, phenolics are used primarily in household products (e.g., molding compounds and furniture) and industrial materials, such as friction materials, foundry molds, abrasives and laminates, as well as in various components that are produced from phenolic molding compounds.

Opportunities in the electrical and electronic equipment market will provide gains in molding compounds, where phenolics will continue to hold an edge due to their high heat resistance and good electrical properties.

The industry is highly concentrated, with the top three suppliers -- Borden Chemical, Georgia-Pacific and Dynea (Industri Kapital -- Sweden) accounting for over 80 percent of total sales.
Study Highlights

Phenolic Resin Demand in North America, 2001

Phenolic Resins Demand in North America (million pounds)

<table>
<thead>
<tr>
<th>Item</th>
<th>1996</th>
<th>2001</th>
<th>2006</th>
<th>% Annual Growth</th>
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<tbody>
<tr>
<td>Gross Domestic Product (bil 96 US$)</td>
<td>9166</td>
<td>10980</td>
<td>12785</td>
<td>3.7</td>
</tr>
<tr>
<td>lbs phenolic/mil $ GDP</td>
<td>418</td>
<td>485</td>
<td>508</td>
<td>3.1</td>
</tr>
<tr>
<td>Phenolic Resin Demand</td>
<td>3528</td>
<td>3227</td>
<td>3250</td>
<td>0.9</td>
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<tr>
<td>Adhesive/Bonding Applications:</td>
<td>3528</td>
<td>3227</td>
<td>3250</td>
<td>0.9</td>
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<td>Wood Panels</td>
<td>2528</td>
<td>2725</td>
<td>2865</td>
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<td>General Adhesive/Bonding</td>
<td>1060</td>
<td>1245</td>
<td>1300</td>
<td>2.0</td>
</tr>
<tr>
<td>Molding Compounds &amp; Other</td>
<td>240</td>
<td>257</td>
<td>285</td>
<td>1.4</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.53</td>
<td>0.55</td>
<td>0.58</td>
<td>3.3</td>
</tr>
<tr>
<td>Phenolic Resin Demand (mil US$)</td>
<td>2036</td>
<td>2344</td>
<td>2600</td>
<td>2.9</td>
</tr>
</tbody>
</table>

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Phenolic Resins in North America #1533

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Freedonia Industry Study
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Market Environment & Feedstock Considerations

The Market Environment and Feedstock Considerations Sections discuss factors influencing phenolic resin demand, including market trends and the outlook for construction.

This information provides you with an understanding and an analysis of the climate in which the phenolic resins industry operates.

Toxicity Issues

Phenolic resins are heavily affected by regulatory and environmental considerations related to potential toxicity. Regulations relate to their own production and housing of feedstocks, phenol and formaldehyde. In the US, for example, formaldehyde and phenol are regulated under Title III of the Clean Air Act (Air Toxics Program). The Act, which came into effect in 1990, intensified existing regulations, and dictated that the best available air pollution controls (or MACT -- maximum achievable control technologies) be installed on all “major source” plants, which are defined as plants emitting at least ten tons per year of the given pollutant or 25 total tons per year of any and all targeted pollutants. Existing plants were given three years to install the necessary equipment after being placed in a “polluter category,” which was determined by the United States Environmental Protection Agency (EPA). New plants have to match the lowest-level polluters in their category.

Formaldehyde is toxic if inhaled, ingested or contacted by the skin for a prolonged time. In the US, OSHA is responsible for setting standards relating to worker exposure limits. The current standards define the permissible exposure level (or PEL) for an eight hour shift as one part per million parts air (one ppm). Other regulations require a labeling standard for wood products indicating if formaldehyde is employed in its production.

North America - Phenol Pricing Trends by Country

(US cents per pound, bulk quantities, list price)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North American Average</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Applications

The Applications Sections provide demand for historical years and forecast growth to 2006 and 2011.

This information helps you:

• Analyze your company’s growth potential in the industry.

• Outline your strategic plans for five and ten years out.

• Establish sales goals.

Demand by Market - Household

In 2001, the household market accounted for 23 percent of total phenolic molding compound demand. In the household market, phenolic molding compounds find use in appliance and houseware applications, where good flammability and heat resistance are required. Typical applications include handles and knobs for cookware, steam iron skirts, and heated components on toasters, ovens and broilers. Gains will be limited by mature markets (such as cookware) and intense competition from various alternative materials, particularly other thermosets and engineering thermoplastics. In particular, efforts to raise the heat resistance of various thermoplastics have reduced the competitive advantage phenolics hold in these applications. In addition, thermoset polyester molding compounds are finding greater use in the household market at the expense of phenolics since polyester molding compounds do not need to be painted. Phenolic molding compound demand in the household market is forecast to decline to 38 million pounds in 2006.

Motor Vehicle Market

The motor vehicle market accounted for eight percent of total phenolic molding compound demand in 2001. In this market, phenolics are valued for their light weight, chemical resistance, and thermal and dimensional stability. Typical applications for phenolic molding compounds in the motor vehicle market include poly-v pulleys, camshaft sprockets and powertrain components (e.g., transmission torque converter reactors, fuel rails, commutators, thermostat housings and fuel pump components). Phenolic molding compounds will continue to face intense competition from various alternative materials (e.g., other thermoset molding compounds and thermoplastics) in the motor vehicle market, restricting gains through 2006. Thermoset polyester molding compounds, for example, are gaining use in the motor vehicle market at the expense of phenolics due to their superior thermal stability. Phenolic molding compound demand in the motor vehicle market is forecast to stay flat at 15 million pounds in 2006.

Mexico - Phenolic Resin Demand in Wood Panel Adhesive Applications by Market (million pounds)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico Wood Panel Shpts (mil sq ft)</td>
<td></td>
<td></td>
<td>407</td>
<td>449</td>
<td>508</td>
</tr>
<tr>
<td>lbs phenolic/000 sq ft panels</td>
<td>32.0</td>
<td>33.4</td>
<td>31.5</td>
<td>31.3</td>
<td>30.8</td>
</tr>
<tr>
<td>Phenolic Resin Demand</td>
<td></td>
<td></td>
<td>13</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Construction</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Mexico</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Wood Panel Applications</td>
<td>2111</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

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Phenolic Resins in North America #1533
The Supply and Demand and Demand by Market Sections analyze trends and consider the threats and opportunities in each of the major markets for phenolic resins.

The information presented will help you:

- Focus your sales and marketing efforts on high growth areas.
- Propose new areas for development.

Canada: Foreign Trade in Phenolic Resins

In 2001, production of phenolic resins in Canada totaled 460 million pounds. Buoyed by an extended expansion in the US economy and a rebound in Canada’s housing market during the latter half of 1990s, the phenolic resin industry in Canada enjoyed significant growth during that period. However, a projected slowdown in the US economy, as well as construction market, a key segment for Canadian wood panels, will limit production gains through 2006. Steady, albeit decelerating, gains in the domestic market will offset this sluggishness. As such, phenolic resin production in Canada is forecast to increase 2.1 percent per year through 2006. Canada’s residential building sector will decelerate through 2006, limiting phenolic resin demand. Phenolic resin demand in Canada is forecast to increase 2.4 percent per year through 2006.

Canada’s trade surplus in phenolic resins is forecast to total 65 million pounds in 2006, based on exports of 190 million pounds and imports of 125 million pounds. Foreign trade is more important in the Canadian phenolic resin industry than in the US, with exports accounting for 39 percent of production and imports accounting for 29 percent of demand in 2001. The vast majority of trade is conducted with the US. For example, the US typically accounts for 90 percent of total Canadian phenolic resin exports and 95 percent of total Canadian imports. As its economy recovers from a mild recession in 2001, the US will continue to provide good export opportunities for Canada due to its large wood panel industry. Western Europe also represents a small but important market for Canadian phenolic resin exports.

North America - Phenolic Resin Demand in Motor Vehicle Markets

(million dollars)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicle Production (000 units)</td>
<td>12745</td>
<td>15445</td>
<td>15850</td>
<td>17550</td>
<td>19250</td>
</tr>
<tr>
<td>lbs phenolic/vehicle</td>
<td>9.9</td>
<td>10.9</td>
<td>12.4</td>
<td>14.0</td>
<td>15.7</td>
</tr>
<tr>
<td>Motor Vehicle Markets</td>
<td>126</td>
<td>168</td>
<td>196</td>
<td>245</td>
<td>303</td>
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<tr>
<td>Foundry Moldings</td>
<td>58</td>
<td>81</td>
<td>96</td>
<td>120</td>
<td>150</td>
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<tr>
<td>Friction Materials</td>
<td>50</td>
<td>70</td>
<td>90</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>Molding Compounds</td>
<td>17</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>13</td>
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<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>% motor vehicles</td>
<td>4.0</td>
<td>4.4</td>
<td>4.6</td>
<td>5.5</td>
<td>6.3</td>
</tr>
<tr>
<td>Phenolic Resin Demand</td>
<td>3166</td>
<td>3828</td>
<td>4227</td>
<td>4450</td>
<td>4830</td>
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</table>

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Industry Structure

Gain a better understanding of your competition and analyze your company's position in the industry with information about:

- industry concentration
- market share
- overview of leading suppliers
- competitive strategies
- acquisitions & divestitures
- industry restructuring
- manufacturing & technology
- cooperative agreements
- manufacturing & technology
- distribution
- marketing

INDUSTRY STRUCTURE

Competitive Strategies

Phenolic resin manufacturers tend to stress low costs and balanced operations to optimize capacity. For companies involved in the molding compound segment, a strong commitment to product development is essential. Three general, broad-based strategies are employed to maintain profitability: low cost leadership, product differentiation, and market segmentation. In addition, companies pursue product line expansion and increased market presence through acquisitions and the formation of strategic partnerships.

The dominant strategy, low cost leadership, is achieved through the aggressive adoption of labor- and materials-saving technologies, favorable access to suppliers, the construction of efficient scale facilities, vigorous pursuit of cost reductions, and tight process and overhead control. Nearly all producers of chemicals and resins adopt a low cost leadership approach to the marketplace since this strategy encompasses many of the basic elements for the success of any business or production operation. However, the adoption of this strategy alone is rare among phenolics producers. As products take on specialty nature, other strategies must be employed beyond the basic low cost approach.

Differentiation strategies involve creating real or perceived differences in similar products via advertising, packaging, quality, or vendor reputation. Most of the differentiation strategies employed in the phenolics industry center on high performance molding compounds, and the marketing of these materials may require considerable effort by the producer to educate consumers about developments. Adhesive and bonding formulations of phenolic resins represent commodity chemicals, but even in this segment differentiation can be established by factors such as reliability and consistency of product, or performance variables such as water resistance or flame retardancy.

The existence of established tradenames promotes differentiation by company and resin and contributes to the existence of mobility barriers. Among the better
The Profiles Section analyzes 37 companies active in the North American phenolic resins market. These profiles represent a sampling or cross-section of the types of companies involved in the industry.

Divisions, subsidiaries, joint ventures, etc., are discussed under appropriate parent companies.

Sources for profiles included:

- Information provided by key staff members in the respective companies
- Annual reports
- 10-K reports
- Security analysts reports
- Corporate product literature

Schenectady International (SII) is a privately-owned manufacturer of chemical intermediates, coatings and adhesive resins, imaging products, friction materials, electronics coatings and chemicals, magnet wire enamels, insulating varnishes and rubber compounding resins. The Company operates through two segments: Chemical and Polymer. In November 2001, the Company moved its headquarters to a new location in Schenectady. The complex, which occupies over 120,000 square feet, houses Schenectady’s headquarters, the Chemical and Polymer segments’ offices, and a laboratory.

The Company is active in the North American phenolic resins industry through its Chemical and Polymer segments. In addition, SII operates in the US through Schenectady International Group Incorporated; in Canada, through Schenectady Canada Limited; and in Mexico, through Schenectady Mexico SA de CV. Worldwide, SII has subsidiaries in 13 countries and maintains 22 production sites.

The Chemical segment’s products include a range of intermediate chemicals, including alkylphenols. According to the Company, it is one of the world’s leading producers of these chemicals. SII’s alkylphenols encompass 17 mono-alkylphenols, which are used to produce a wide variety of products, including...
Companies Profiled

Ashland Incorporated
Basin Electric Power Cooperative
Dakota Gasification Company
Borden Chemical Incorporated
HA-International LLC
Celanese AG
Cytec Industries Incorporated
Degussa AG
Delta-Huettenes-Albertus Incorporated
HA-International LLC
DESC SA de CV
Fenoquimia y Plastiglas de Mexico
GIRSA
Dow Chemical Company
DuPont (El) de Nemours
Eastman Chemical Company
Frontier Oil Corporation
General Electric Company
GE Plastics
Mount Vernon Phenol Partners
Georgia Gulf Corporation
Georgia-Pacific Corporation
Goodrich Corporation
Hercules Incorporated
Aqualon
Honeywell International Incorporated
Illinois Tool Works Incorporated
Wilsonart International Incorporated
Industri Kapital AB
Dynea Oy
Dyno ASA
Perstorp AB
Sydsvenska Kemi AB
Ineos Group Holding plc
Phenolchemie GmbH and Company KG
International Paper Company
Arizona Chemical Company
JLM Industries Incorporated
Mount Vernon Phenol Partners
Merichem Company
Merisol USA LLC
Mitsubishi Corporation
Noveon Incorporated
Goodrich (BF) Performance Materials
Owens Corning
Plastics Engineering Company
Plaslok Corporation
Plenco
Rogers Corporation
Royal Dutch/Shell Group of Companies
Shell Chemical LP
Rueters AG
BAKELITE AG
Schenectady International Incorporated
Solutia Incorporated
Sumitomo Bakelite Company Limited
Durez Corporation
Sunoco Incorporated
Aristech Chemical Corporation
Tembec Incorporated
ARC Resins International Corporation
Wright Corporation

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Freedonia does not just collect and reprint data; Freedonia develops data. Our analysts thoroughly investigate an industry by extensively interviewing key industry participants and analyzing information from sources such as associations, government and trade literature. Once this research is complete, Freedonia establishes one set of forecasts. All writing, editing and forecasting is done in-house to assure quality and consistency. In cases where data does not exist, Freedonia develops the data based on input/output ratios, bills of materials and flow charts. The following chart summarizes Freedonia’s methodology:
About The Freedonia Group

The Freedonia Group, Inc. is a leading international industry study/database company.

Since 1985, Freedonia has published 1,800 titles covering areas such as chemicals, coatings and adhesives, building materials, plastics, industrial components and equipment, health care, packaging, household goods, security, and many other industries.

Freedonia has produced a wide variety of titles, including:

• Insulation
• Foamed Plastics
• Decorative Laminates
• Adhesives

Because Freedonia is a reliable information source, our forecasts are cited in numerous publications such as *The Wall Street Journal, Chemical Market Reporter, Modern Plastics, Plastics News* and *Chemical Week*.

Advantages of Freedonia Reports

In-house operations
Because all of our staff work at the same location, interaction between analysts and departments provides a strong system of checks and balances.

Consistency
Our Economics Group develops indicators that are used by all analysts. Therefore, every Freedonia study is based on a consistent set of economic assumptions (GDP, construction fixed investment, resident population, etc.)

Reliable forecasts
Because all of our forecasts consider the environment in which a product or industry is operating, as well as threats and opportunities to the market, Freedonia forecasts are reliable indicators of future performance.

One-on-one interviews
All studies are produced by conducting interviews with key industry participants and end-users.

Proprietary electronic database
Freedonia’s analysts can tap into an extensive in-house electronic database containing corporate literature (including private company information), trade publications, government reports and many other sources of information.

Phenolic Resins in North America #1533

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Freedonia’s clients include major US and international companies in the manufacturing, services, consulting and financial sectors.

Typical purchasers of Freedonia studies:

- Key Executives
- Corporate Planners
- Market Researchers
- Financial Analysts
- Information Centers
- New Product Developers
- Merger & Acquisition Specialists

Since 1985 we have provided research to customers ranging in size from global conglomerates to one person consulting firms. More than 90% of the industrial companies in the Fortune 500 use Freedonia research to help with their strategic planning.

Some of Freedonia’s customers in the phenolic resins market include: Borden Chemical, Georgia-Pacific, Honeywell International and International Paper.
Wood Panels
US demand for wood panels will grow 3.6% per annum through 2006. Advances will be stimulated by modest price increases, rising raw material costs and a product mix shift towards more expensive specialty panels. Nonstructural panels such as medium density fiberboard and particleboard will lead gains based on robust industrial markets. The study analyzes the $11.4 billion US wood panel industry to 2006 and 2011 by product, market and US region. It also evaluates market share and profiles key firms.

#1528. .......... 4/02. .......... $3,600

Insulation
The US market for thermal and acoustical insulation will reach $5.8 billion in 2006, supported by greater use per structure and by upgrades for existing buildings. Fiberglass will remain the leading material but will be outpaced by foamed plastics, which will benefit from rising demand in industrial and HVAC equipment. This study analyzes the 7 billion pound US insulation industry to 2006 and 2011 by material, end-use market and US region. It also presents market share data and profiles key industry competitors.

#1524. .......... 3/02. .......... $3,800

Wood & Competitive Decking
The US market for decking will reach 5.1 billion board feet in 2005, driven by repair and improvement demand and the addition of new decks to existing structures. Wood will remain the dominant material, with cedar and exotic hardwoods leading gains. Alternative decking materials such as composites, vinyl and polyethylene will outpace wood. This study analyzes the $3.4 billion US decking industry to 2005 and 2010 by material, market and region. It also details market share and profiles key companies.

#1511. .......... 1/02. .......... $3,700

Acrylic Resins
Demand for acrylic resins in the US will reach 3.7 billion pounds in 2005. Gains will be most pronounced in industrial and specialty coatings, high quality paper finishes, pressure sensitive adhesives, and polymer property modifiers. Methacrylates will continue to account for the majority of demand, while acrylates record more rapid growth. This study analyzes the $1.9 billion US acrylic resin industry to 2005 and 2010 by type and market. It also presents market share data and profiles leading companies.

#1492. .......... 12/01. .......... $3,600

Decorative Laminates
Demand for decorative laminates in the US will grow 5.3% annually through 2005. High pressure laminates will grow the fastest based on their superior resistance to dents, abrasions and stains, and fueled by the laminate flooring market. Low pressure laminates will remain the leading segment, led by decorative foils and saturated papers. This study analyzes the $5 billion US decorative laminates industry to 2005 and 2010 by material, type and market. It also evaluates market share and profiles key companies.

#1456. .......... 8/01. .......... $3,700

Foamed Plastics
Demand for foamed plastics in the US will reach 7.8 billion pounds in 2005. Opportunities in insulation and cushioning will support demand for foamed urethane, while foamed polystyrene demand will be driven by advantages in packaging and insulation. Construction will remain the leading market based on heightened energy efficiency standards. This study analyzes the $13.7 billion US foamed plastics industry to 2005 and 2010 by type and market. It also evaluates market share and profiles key companies.

#1436. .......... 6/01. .......... $3,700

Reinforced Plastics
Growth in US reinforced plastics demand will be driven by cost and performance advantages over wood and metal in a variety of applications. Thermoset resins will continue to control over half the market, while reinforced thermoplastics grow faster because of needs for higher performing products with enhanced design capabilities. This study analyzes the $4.8 billion US reinforced plastics industry to 2005 and 2010 by reinforcement, resin and market. It also evaluates market share and profiles key firms.

#1409. .......... 4/01. .......... $3,700
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