World Thermoset Resins, a new study from The Freedonia Group, is designed to provide you with an in-depth analysis of the major trends in the world market for thermoset resins 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, World Thermoset Resins. Ordering information is included on the back page of the brochure.

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Study Highlights

This study analyzes the world market for thermoset resins. Historical data are provided for 1989, 1994 and 1999, with forecasts provided to 2004 and 2009. Thermoset resins are presented by type (polyurethane, phenolic, unsaturated polyester, epoxy, amino, alkyd and silicone resins) and by region (North America, Latin America, Western Europe, Eastern Europe, Africa/Mideast and Asia/Pacific). Demand in thousands of metric tons is provided for key countries within each region; and is presented by market (construction, household durables, transportation and other markets). As used in this study, the term “sales” is synonymous with “demand” and is equivalent to production plus imports, less exports. The entire study is framed within the overall industry’s economic and market environment.

World Highlights

- **Worldwide demand for thermoset resins will advance 4.1 percent annually to 24 million metric tons in the year 2004.**

- **Construction products (coatings, adhesives, carpet padding, decorative laminates, and molded bathtub and shower products), household durables (coatings and adhesives) and transportation equipment (coatings, adhesives and seat padding) will continue to comprise the majority of thermoset demand.**

- **Household durables will record the most rapid growth, as improvements in global per capita GDP spark improved demand levels for a variety of products which use thermoset based coatings and adhesives, such as furniture and appliances.**

- **Due to the economic recession of the early 1990s and the Asian financial crisis later in the decade, demand for thermoset resins faltered, and actually trailed GDP growth throughout much of the 1990s. However, this trend is expected to reverse itself, with thermoset resin demand slightly outpacing gains in GDP.**

Industry Structure

- **The worldwide thermoset resin industry is extremely concentrated, with the top ten companies accounting for more than three-quarters of total 1999 demand.**

- **In terms of the overall market, the ten largest companies are Borden, Bayer, Neste Chemicals, BASF, Dow Chemical, Dyno Industrier, Shell, DSM, Rhodia and Dainippon Ink.**
Study Highlights

**World Thermoset Resins Demand**

(THOUSAND METRIC TONS)

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<td>1455</td>
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<td>3.4</td>
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Sample Table

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World Thermoset Resins #1255

Order form on last page
Tables and Charts are featured for each region and country. Historical data and forecasts are presented for 1994, 1999, 2004 and 2009.

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<thead>
<tr>
<th>Population (mil persons)</th>
<th>Gross Domestic Product (bil 197 U$)</th>
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<td>$GDP/capita</td>
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<td>kg/capita</td>
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<td>kg/000$ G DP</td>
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<tr>
<td>Silicones</td>
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<td>Epoxies</td>
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<table>
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<th>Thermoset Demand within each Country</th>
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<tbody>
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Table - World Thermoset Resin Demand by Market
Table - Other Markets for Thermoset Resins
Table - Construction Markets for Thermoset Resins
Table - Transportation Equipment Markets for Thermoset Resins
Table - Selected Thermoset Resin Cooperative Agreements
Table - Selected Thermoset Resin

Additional content and sections include Industry Concentration & Market Share, Chart - World Thermoset Resin Market Share, 1999, Polyurethanes, Phenolics, Unsaturated Polyesters, Epoxies, Aminos, Alkyds, Silicones, and more.

World Thermoset Resins #1255
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The Market Environment Section discusses key indicators that drive demand for thermoset resins, including motor vehicle production and Freedonia's uniquely developed macroeconomic indicators.

This information provides you with an understanding and an analysis of the climate in which the global thermoset resin industry operates and helps you build your market strategy to sustain long-term growth.

World Motor Vehicles in Use

The number of motor vehicles in use throughout the world is forecast to increase two percent per year to 799 million units in 2004. This forecast represents a significant deceleration from the previous decade’s pace, with the lower forecast primarily representing slower growth in ownership levels in all regions save Africa/Mideast. In the case of Asia, major consumer durables were among the sectors that were most heavily impacted by the region’s financial crisis as residents of the region curtailed nearly all discretionary spending until the situation stabilized. Even slower growth is being prevented by sustained expansion in the Chinese market, where vehicle ownership levels are quite low but rising rapidly in line with income levels and economic development. Also aiding gains will be above-average increases in India, South Korea and Taiwan, while slow growth in the large Japanese market will continue to be the primary drag on the regional total. Nonetheless, Japan will retain by far the highest per capita utilization rates in the region.

In developing regions, vehicle registrations will be promoted by expansions in income levels, which are putting initial vehicle purchases within the financial grasp of more ordinary citizens. While the most rapid annual gains are being seen in these developing regions, vehicle usage will remain heavily concentrated in the world’s developed regions, particularly North America and Western Europe. In 2004, these two regions will account for almost 60 percent of all vehicles in use throughout the world, although they collectively account for less than 15 percent of the world’s population.

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World Supply & Demand

The Market Overview Section highlights the key issues that have affected the global thermoset resins market over the past ten years and summarizes contributing growth factors.

This information helps you:

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

Polyurethane

Worldwide demand for polyurethane resins is forecast to advance 4.4 percent annually to 7.6 million metric tons in the year 2004. Growth is related to the production of transportation equipment and consumer durables, the primary end-use markets for coatings and foams; and construction markets, which also utilize polyurethane coatings and carpet underlay made from polyurethane foam.

Polyurethane is formed by the chemical reaction of an isocyanate and a polyol in the presence of a variety of modifiers and other materials. Depending on the type of starting materials used, a variety of polyurethane forms can be produced, ranging from soft thermoplastic elastomers to rigid foams. Nearly all polyurethanes are based on two isocyanates: methyl diphenyl di-isocyanate (MDI) and toluene di-isocyanate (TDI). MDI is generally preferred for rigid foams and molded flexible foams for use in furniture. TDI is generally preferred for foams used in cushioning, seating and mattresses. Such products as coatings, adhesives and sealants can utilize either MDI or TDI, although MDI seems to be gaining favor in many of these applications.

On the global level, there are relatively few suppliers of polyurethanes, with Bayer being the world’s largest. Some of Bayer’s polyurethane materials are manufactured in a joint venture with Royal Dutch/Shell called Bayer Shell Isocyanates, which manufactures both MDI and TDI at a facility in Belgium. Rhodia is also a major manufacturer of polyurethanes. Other competitors include BASF, Dow Chemical, Olin and Shell (operations not included in Bayer Shell Isocyanates). All but Olin (TDI only) make both MDI and TDI; and BASF, Bayer, Dow Chemical, Olin, Rhodia and Shell all make polyether polyols, the other major component necessary for polyurethane production.

World Amino Resin Supply & Demand

(Thousand metric tons)

<table>
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<td>99</td>
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<tr>
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<td>Latin America</td>
<td>34</td>
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<tr>
<td>Western Europe</td>
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<td>902</td>
<td>1065</td>
<td>1260</td>
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<td>Africa/Mideast</td>
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<tr>
<td>Asia/Pacific</td>
<td>770</td>
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The Markets Section analyzes supply and demand trends and considers the threats and opportunities in each country and region.

**France**

France will record growth in GDP of about 2.6 percent annually in inflation-adjusted terms through 2004. Although GDP growth was unfavorably affected by the recession of the early 1990s, since that time, currency reform, the privatization of state-run businesses and relatively low inflation has allowed for modest growth. Future advances will be predicated on declining unemployment, continued privatization of state-run businesses, stronger domestic consumption patterns and improved foreign trade dynamics.

The French economy is the second largest in Western Europe, and although the economy contains large tracts of arable land, giving France a sizable agricultural base as well. France is a major exporter of motor vehicles and other engineered goods, textiles, chemicals and agricultural products.

Consumption of thermoset resins in France will advance 4.2 percent annually to 895,000 metric tons in the year 2004. This represents per capita demand of more than 12 kilograms, slightly below the regional average. Aminos and polyurethanes are the largest volume thermoset resins in use in France, followed by unsaturated polyesters and alkyds. Growth will result from improvements in real GDP, coupled with coating and adhesive reformulation which will spur demand for polyurethanes, epoxies and silicones. The relatively high level of demand for amino resins is in part due to increasing use of melamine for decorative laminates, but is primarily the result of expanding opportunities for urea-formaldehyde resins in plywood and particleboard adhesives and specialty enamel coatings for major appliances.

Production of thermoset resins in France will advance 4.4 percent per year to 825,000 metric tons in the year 2004. The expansion in production will be due to both improving domestic demand and recovery in export shipments, which...
Market Share

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

- market share
- manufacturing trends
- mergers and acquisitions
- competitive strategies
- marketing and distribution

Market Share & Competitive Strategies

Industry Restructuring

Although the thermoset resins industry has historically been dominated by large, multinational chemical firms, the relatively low technological requirements of most of these resins and the ability to produce them economically in relatively small batches has allowed for the participation of a number of smaller competitors. Nevertheless, there has been considerable merger activity in the industry in recent years, a trend which generally reduces the number of significant players. Following are a number of the most significant acquisitions and divestitures which have occurred.

In December 1999, Dyno Industrier sold its European and North American coatings resin business to McWhorter Technologies. The acquired business manufactures alkyd resins, technology and customer lists, but not plants. This sale is part of Dyno’s exit from the North American thermoset resins business. The company sold its 50,000 metric ton urea-formaldehyde and 50,000 metric ton phenolic resins businesses and a small melamine resin operation to Georgia-Pacific in 1995.

Dyno has instead focused its thermoset resins operations on the West European and Asian markets, conducting capacity expansions at existing sites, setting up joint ventures (particularly in Asia) and making several acquisitions to increase its presence in Western Europe, like the buy-out of Synthite (urea-formaldehyde and melamine resins) in the UK in 1995. That acquisition led Dyno to close its existing plant in Duxford, UK, which was older and less efficient.

In December 1999, Morgan Grenfell Private Equity (an investment group which had acquired Vianova Resins from Hoechst in 1998), sold Vianova to Solutia, formerly part of Monsanto. The deal was a good one for Solutia, which had an...
The profiles section analyzes 37 companies active in the world thermoset resin industry. 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

### COMPANY PROFILES

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<td>DIC Building</td>
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</tr>
<tr>
<td></td>
<td>7-20, Nihonbashi 3-chome</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>Japan</td>
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<td>Reichhold Chemicals Incorporated</td>
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</tr>
<tr>
<td></td>
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Dainippon Ink and Chemicals (DIC) is a diversified chemical manufacturer operating in four segments: Graphic Arts; Polymers and Related Products; Specialty Plastics and Compounds; and Other. The Company’s US operations include Dainippon Ink and Chemicals America Incorporated. The Company’s consolidated sales in FY 1999 totaled $7 billion in North and South America; $7 billion in other areas. DIC employed 25,695 in FY 1999.

The Company offers products for the world thermosets industry through its $2.5 billion Polymers and Related Products segment which operates in four divisions: Synthetic Resins, Petrochemical-Related Products, Resin-Related Products and Adhesives. The Synthetic Resins division produces phenolic resins, urea-melamine resins, unsaturated polyester resins (UPRs), polyurethane (PUR) resins, alkyd resins, acrylic resins, emulsions, latex, plasticizers and fluorochemicals. DIC’s Petrochemical-Related Products division offers a broad range of products, including epoxy resins. The Resin-Related Products division manufactures thermoset molding compounds, bath units, bathtubs and synthetic marble.

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Companies Profiled

Ashland Incorporated
BASF AG
Elastogran GmbH
Bayer AG
Borden Incorporated
Spurlock Industries Incorporated
BP Amoco plc
Amoco Corporation
British Petroleum plc
Celanese AG
Ciba Specialty Chemicals Incorporated
Cytec Industries Incorporated
The American Materials & Technologies Corp.
American Melamine Industries
Fiberite Incorporated
Mitsui-Cytec
Dainippon Ink and Chemicals Incorporated
Degussa DIC Synthetic Resins Limited
DIC-Hexcel Limited
Reichhold Chemicals Incorporated
Dow Chemical Company
Flexible Products Company
Dow Corning Incorporated
DSM NV
American Melamine Industries
Dyneon Industries ASA
Forbo Hviding SA
General Electric Company
Georgia-Pacific Corporation
Hercules Incorporated
Hexcel Corporation
DIC-Hexcel Limited
Huntsman Corporation
Imperial Chemical Industries plc
Industri Kapital AB
Neste Chemicals Oy
Lilly Industries Incorporated
Guardsman Products Incorporated
McWorter Technologies Incorporated
Mitsubishi Corporation
Aristech Chemical Corporation
Occidental Petroleum Corporation
OxyChem
Sumi Durez America GP

Owens Corning
AOC LLC
PPG Industries Incorporated
PRC-Desoto International Incorporated
Rhodia SA
Rogers Corporation
Royal Dutch/Shell Group of Companies
Solutia Incorporated
Vianova Resins
Stepan Company
Sumitomo Chemical Company Limited
Sumi Durez America GP
Total Fina Elf SA
Cook Composites and Polymers Company
Union Carbide Corporation
Valspar Corporation
Engineered Polymer Solutions Incorporated
Wacker-Chemie GmbH

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

Since 1985, Freedonia has published over 1,500 titles covering areas such as plastics, chemicals, coatings and adhesives, building materials, industrial components and equipment, health care, packaging, household goods, security, and many other industries.

Freedonia has produced a wide variety of titles, including:

- Phenolic Resins
- Epoxy Resins in North America
- World Paints & Coatings
- Adhesives

Because Freedonia is a reliable information source, our forecasts are cited in numerous publications such as The Wall Street Journal, The Financial Times, Adhesives & Sealants Newsletter and Chemical Week.

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, world population, polyester production, 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
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Epoxy Resins in North America

The North American epoxy resin market will be supported by building repair and remodeling in the US, industrial activity in Mexico and a rebounding housing market in Canada. Use in wood panels will remain favorable due to gains in oriented strand board and particleboard, which require more resin per square foot. This study analyzes the $2.6 billion North American epoxy resin industry to 2004 and 2009 by raw material, application and market. It also evaluates market shares and profiles key companies.

Powder Coatings

Having become well established and widely used in the last decade, powder coatings demand in the US will grow nearly 8% annually. Suppliers will now focus on exploiting new applications in existing markets (e.g., automotive primers and clearcoats), and improving the performance of powders on non-metal substrates (e.g., wood, plastics). This study analyzes the $785 million US powder coating industry to 2003 and 2008 by type and market. It also presents market shares and profiles key industry participants.

Adhesives

US demand for adhesives will decelerate with slowing construction and manufacturing sectors. Favorable residential repair and improvements demand will help offset this trend, as will steady growth in the less cyclical packaging sector. Water-based, hot melt and radiation-curable adhesives will lead gains. This study examines the US adhesives industry to 2003 and 2008 by product and market. It also presents market share data and profiles leading competitors.

Paints & Coatings

Coating shipments in the US will reach 1.3 billion gallons in 2002. Strongest gains will arise in industrial coatings, with architectural paints lagging due to a slower construction market. Efforts to reduce toxic emissions and pigment materials will continue the shift away from low solids, solvent-based coatings. This study examines the US paints and coatings industry to 2002 and 2007 by type and end use. It also profiles key firms and evaluates market share.

Phenolic Resins in North America

The North American phenolic resin market will be supported by building repair and remodeling in the US, industrial activity in Mexico and a rebounding housing market in Canada. Use in wood panels will remain favorable due to gains in oriented strand board and particleboard, which require more resin per square foot. This study analyzes the $2.6 billion North American phenolic resin industry to 2004 and 2009 by raw material, application and market. It also evaluates market shares and profiles key companies.

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