Gasoline & Other Fuel Additives, a new study from The Freedonia Group, is designed to provide 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, Gasoline & Other Fuel Additives. Ordering information is included on the back page of the brochure.

Brochure Table of Contents

Study Highlights ................................................................. 2
Table of Contents and List of Tables and Charts .................. 4
Sample Pages and Sample Tables from:
  Market Environment ...................................................... 6
  Products .................................................................. 7
  Markets ................................................................. 8
  Market Share & Competitive Strategies ...................... 9
  Company Profiles ...................................................... 10
  List of Companies Profiled ......................................... 11
Forecasting Methodology ............................................... 12
About the Company ....................................................... 13
Advantages of Freedonia Reports .................................. 13
About Our Customers .................................................... 14
Other Titles From Freedonia .......................................... 15
Ordering Information ...................................................... 16
US Demand

- US demand for gasoline and other fuel additives is forecast to fall to 35 billion pounds in 2004, valued at $6 billion.

- Ethanol is expected to be the most promising fuel additive in the next decade, with growth forecast to reach nearly ten percent per annum through 2004.

- Although gasoline will remain the largest market for fuel additives, the ban on the use of MBTE in California and the potential phase out across the US of this oxygenate will result in significant decreases in the gasoline segment, as MTBE is the single largest additive used in gasoline.

Industry Structure and Participants

- The highly competitive US fuel additives market is comprised of a variety of suppliers, including large petroleum refining and chemical companies, smaller specialty chemical firms and Midwestern corn refiners.

- The five leading MTBE suppliers -- Lyondell, Exxon Mobil, Huntsman, Texas Petrochemicals and Valero Energy -- controlled more than 50 percent of MTBE production capacity in 1999.

- The market for specialty fuel additives is dominated by five companies -- Oronite (Chevron), BASF, Ethyl, Infineum (a joint venture between Exxon Mobil and Shell) and Lubrizol.

* Methanol, toluene and related blending components are not included.
## Study Highlights

### Gasoline & Other Fuel Additive Demand

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<td>107</td>
<td>124</td>
<td>134</td>
<td>145</td>
<td>1.5</td>
<td>1.6</td>
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<tr>
<td>lb/000 gal</td>
<td>112</td>
<td>329</td>
<td>262</td>
<td>206</td>
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<tr>
<td>Fuel Additives Demand (mil lb)</td>
<td>12036</td>
<td>36</td>
<td>4080</td>
<td>3505</td>
<td>13.0</td>
<td>-3.0</td>
</tr>
<tr>
<td>$/lb</td>
<td>0.18</td>
<td>0.17</td>
<td>0.17</td>
<td>0.23</td>
<td>0.0</td>
<td></td>
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<tr>
<td>Fuel Additives Demand (mil $)</td>
<td>2185</td>
<td>6884</td>
<td>5986</td>
<td>6847</td>
<td>12.2</td>
<td>-2.8</td>
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<tr>
<td>MTBE</td>
<td>2450</td>
<td>4120</td>
<td>2050</td>
<td>445</td>
<td>5.3</td>
<td>-13.0</td>
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<tr>
<td>Ethanol</td>
<td>1460</td>
<td>1470</td>
<td>2360</td>
<td>4320</td>
<td>0.1</td>
<td>9.9</td>
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<tr>
<td>Other Oxygenates</td>
<td>150</td>
<td>220</td>
<td>100</td>
<td>30</td>
<td>3.9</td>
<td>-14.6</td>
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<tr>
<td>Specialty Additives</td>
<td>445</td>
<td>1074</td>
<td>1476</td>
<td>2052</td>
<td>9.2</td>
<td>6.6</td>
</tr>
</tbody>
</table>

### US Fuel Additives Demand, 1999

**SUMMARY TABLE**

<table>
<thead>
<tr>
<th>% Annual Growth</th>
<th>MTBE</th>
<th>Specialty Additives</th>
<th>Ethanol</th>
<th>Other Oxygenates</th>
<th>MTBE</th>
<th>Specialty Additives</th>
</tr>
</thead>
<tbody>
<tr>
<td>59.8%</td>
<td>59.8%</td>
<td>15.6%</td>
<td>21.4%</td>
<td>3.2%</td>
<td>59.8%</td>
<td>15.6%</td>
</tr>
</tbody>
</table>

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*Gasoline & Other Fuel Additives #1265*
I. EXECUTIVE SUMMARY
  Summary Table .............................................................. 3

II. MARKET ENVIRONMENT
  General ................................................................. 4
  Macroeconomic Overview ........................................... 5
  Table - Macroeconomic Outlook .................................. 6
  Motor Vehicle Industry Overview ............................... 6
  Table - Motor Vehicle Outlook .................................. 8
  Historical Trends .................................................... 8
  Table - Fuel Additives Market, 1989-1999 .................. 10
  Pricing Trends .......................................................... 11
  Table - Fuel Additive Pricing Trends ....................... 12
  Technology .............................................................. 12
  Motor Vehicle Design Technology ............................ 13
  Fuel Technology & Standards .................................. 15
  International Activity & Foreign Trade ...................... 17
  Table - Fuel Additive US Foreign Trade ................... 18

III. ENVIRONMENTAL & REGULATORY CONSIDERATIONS
  General ................................................................. 19
  Clean Air Act .......................................................... 22
  Oxygenated Gasoline Program .................................... 23
  Reformulated Gasoline Program .................................. 24
  MTBE Ban .................................................................. 26
  Diesel Fuel Regulations ........................................... 27
  CAFÉ Standards ...................................................... 29

IV. PETROLEUM & ADDITIVE OUTLOOK
  Petroleum Industry Overview ....................................... 30
  Table - Petroleum Industry Indicators ....................... 32
  Gasoline Overview .................................................... 32
  Table - Gasoline Industry Indicators ....................... 32
  Table - Gasoline Supply & Demand ......................... 33
  Gasoline Demand by Type ....................................... 33
  Table - Gasoline Demand by Type ............................. 36
  Alternative Fuel Threats ......................................... 36
  Distillate Fuel Overview .......................................... 37
  Table - Distillate Fuel Supply & Demand ................... 38
  Jet Fuel Overview .................................................... 38
  Table - Jet Fuel Supply & Demand ............................. 39
  Residual Fuel Overview ............................................ 40
  Table - Residual Fuel Supply & Demand .................... 41
  Fuel Additive Overview ............................................ 41
  Table - Fuel Additive Outlook ................................. 43

V. MTBE & OTHER OXYGENATES
  General ................................................................. 44
  Table - Oxygenate Demand ....................................... 46
  Oxygenate Demand by Value ..................................... 46
  Table - Oxygenate Demand by Value ....................... 47
  Chart - Oxygenate Demand by Value, 1999 ............... 48
  Oxygenate Demand by Volume .................................. 48
  Table - Oxygenate Demand by Volume .................... 49
  Chart - Oxygenate Demand by Volume, 1999 .......... 50
  Oxygenate Demand by MTBE Equivalent ..................... 50
  Table - Oxygenate Demand by MTBE Equivalent ....... 51
  Chart - Oxygenate Demand by MTBE Equivalent ....... 52
  Regional Aspects ..................................................... 52
  Methyl Tertiary Butyl Ether (MTBE) .......................... 53
  Table - MTBE Demand ............................................. 55
  Product Characteristics .......................................... 56
  Producers .................................................................. 56
  Table - MTBE Capacity, 1999 ................................. 58
  Ethanol ..................................................................... 59
  Table - Ethanol Demand ........................................... 61
Market Environment & Regulatory Considerations

The Market Environment and Regulatory Considerations Sections discuss factors influencing gasoline and other fuel additives demand, including environmental concerns and technological advances.

This information provides you with an understanding and an analysis of the climate in which the gasoline and other fuel additive industry operates.

Motor Vehicle Design Technology

Changes in motor vehicle technology, which have played a major role in patterns of demand for gasoline and other fuels and, as a result, the types of fuel and additives incorporated into them, include developments in engine design and emission control technology. The evolution in engine design has continued toward modern small displacement/high output engines. The most fundamental improvements in internal combustion engine technology have occurred in energy efficiency, specifically minimizing fuel requirements per unit of output and conversely maximizing power output per unit of fuel input. Fuel efficiency advances are being driven by concerns over long term fuel pricing, fuel availability, government regulation and the extension of original equipment manufacturer (OEM) warranties.

Areas of interest in engine design technology include leaner air-fuel mixtures for larger engines and small displacement engines. Lean-burn engines offer the ability to get more power from less fuel. The major drawback of these engines is that they produce more emissions. One of the technologies being developed to reduce emissions is exhaust gas ignition (EGI), in which the catalyst is quickly heated and cold-start emissions are reduced. Small displacement engines are designed to reduce the size of the engine but not the displacement.

Control of volatile organic compounds (VOCs) has also been targeted as a way of lowering emissions while maintaining fuel economy improvements. Automobile manufacturers are working on the development of an evaporative emission control system to trap vapors in a carbon canister. When the canister is full the vapors are drawn back into the engine and burned at the optimal time.

One area where technological advances could require development of new fuel additives is for the control of engine combustion chamber deposits (CCDs).

MTBE Ban

Although MTBE has been promoted as environmentally friendly and beneficial in providing healthier air, there has been some concern over the usage of this oxygenate, due to potential or perceived health risks involved. For example, some consumers have complained that MTBE has caused them nausea, headaches and dizziness. More recently, reports that the additive had leaked from underground tanks and was detected in drinking water supplies in California sparked widespread concern. In 1998, the California State Legislature health and environmental risks of oxygenates and of Health Services to establish a drinking water standard for MTBE. At the time of writing, Congress was considering such a move, and the

Although California regulatory authorities decided not to list MTBE as a carcinogen or as a substance that causes birth defects or infertility in 1998, California governor Grey Davis banned the use of MTBE in gasoline in the state in 1999. This ban is scheduled to take effect by the end of 2002. The state has also petitioned the EPA and US Congress for a waiver from federal fuel requirements which mandate two percent oxygen requirement in reformulated gasoline. However, such a decision may not be made until summer of 2000.

California’s phase out of MTBE could spread across much of the rest of the country. At the time of writing, Congress was considering such a move, and the
Products

The Product Sections provide demand for historical years and forecast growth to 2004 and 2009.

Products discussed include:

- Methyl Tertiary Butyl Ether (MTBE)
- Ethanol
- Other Oxygenates
- Deposit Control Additives
- Cetane Improvers
- Corrosion Inhibitors
- Antioxidants
- Metal Deactivators
- Dyes & Markers
- Other Specialty Fuel Additives

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.

Ethanol

Demand for fuel-grade ethanol is forecast to rise 7.9 percent yearly to 2.1 billion gallons in 2004, with market value increasing almost ten percent to $2.4 billion. Ethanol will benefit from California’s ban on MTBE, which will phase out of this oxygenate nationwide. In addition to eliminating or reducing MTBE, the US government has proposed legislation that would promote greater production and use of renewable fuels like ethanol. The development of biomass plants for ethanol production will also support demand as will the recent extension of the federal fuel ethanol tax incentive. However, if the bill waving the federal oxygen standard in California’s ozone non-attainment areas is passed, this would reduce the potential market for ethanol as an MTBE replacement and hamper demand in the long term.

Because MTBE has leaked into supplies of drinking water, the EPA proposed that its use be reduced or eliminated and replaced in gasoline by renewable substances, such as ethanol. Unlike MTBE, ethanol is highly biodegradable and can barely be tasted at concentrations less than one percent. Ethanol will also not build up in fat, like some environmental contaminants. In addition, a study by the Renewable Fuels Association gives ethanol a clean bill of health as a clean oxygen additive in gasoline, citing evidence that no health threat is expected from an increased use of ethanol or its byproducts.

Because of new technology, ethanol production is no longer limited to the cornbelt states. For example, BC International has developed techniques for using genetically-engineered bacteria to convert agricultural wastes into ethanol. As a result, large volumes of ethanol can now be manufactured in any region that has ample agricultural, wood or municipal solid waste. In addition, biomass material is cheaper to use in the production of ethanol.

Corrosion Inhibitor Demand

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<tbody>
<tr>
<td>Gasoline Demand (bil gal)</td>
<td>112</td>
<td>117</td>
<td>128</td>
<td>140</td>
<td>151</td>
</tr>
<tr>
<td>lb/000 gal</td>
<td>0.26</td>
<td>0.32</td>
<td>0.38</td>
<td>0.38</td>
<td>0.38</td>
</tr>
<tr>
<td>Corrosion Inhibitor Demand (mil lb)</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$/lb</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrosion Inhibitor Demand (mil $)</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% corrosion inhibitor</td>
<td>5.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Specialty Additive (mil lb)</td>
<td>496</td>
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</tbody>
</table>

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Markets

The Market Section analyzes trends and considers the threats and opportunities in each of the major markets for gasoline and other fuel additives.

The information presented will help you:

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

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Diesel Fuel Additives

Demand for diesel fuel additives is expected to rise over ten percent annually, reaching over $580 million in 2004. Gains will be supported by increasingly stringent regulations for diesel engines emissions, the increase in additives necessary to obtain fuels with improved performance and handling requirements, and the growing market for "premium" diesel fuels. The development of oxygenated diesel using ethanol will also support long term advances.

Diesel fuel producers employ a broad range of specialty fuel additives, which are incorporated into packages and marketed under protected trade names. These include cetane improvers, lubricity agents, antioxidants, corrosion inhibitors, de-icers, biocides, stabilizers, deposit control agents, friction modifiers, cloud point modifiers, pour point depressants, cold weather aids and anti-plugging agents to keep filters clean. Cetane improvers account for the largest portion of diesel fuel additives in both value and volume terms.

All mid-distillates, such as diesel fuel, do not react similarly to the incorporation of additives. Depending on the crude source, mid-distillates can contain very different amounts of gum and color precursors, waxy hydrocarbons, low cetane aromatics and other products. Therefore, unlike gasoline additives, distillate fuel additives are frequently formulated for specific types of fuels, crudes or refinery processing and crude sources differences. Diesel fuel producers traditionally require lower additive loading levels. Blends from straight-run components generally required little or no additive treatment to meet product specifications. Higher treatment levels were reserved for blends containing high amounts of cracked stocks. Due to such processing and crude source differences, additive levels for distillate fuels are lower than those for gasoline.

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Non-Premium Gasoline Additive Demand

(> million dollars)

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</thead>
<tbody>
<tr>
<td>Non-Premium Gas Demand (bil gal)</td>
<td>86.1</td>
<td>93.0</td>
<td></td>
<td>84.4</td>
<td>94.4</td>
</tr>
<tr>
<td>$ additive/000 gal</td>
<td>16</td>
<td>34</td>
<td>44</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Non-Premium Gasoline Additive Demand</td>
<td>1364</td>
<td>3116</td>
<td>4697</td>
<td>4033</td>
<td>4426</td>
</tr>
<tr>
<td>% non-premium</td>
<td>66.5</td>
<td>69.8</td>
<td>72.9</td>
<td>75.9</td>
<td>76.8</td>
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<tr>
<td>Total Gasoline Additive Demand</td>
<td>2052</td>
<td>4464</td>
<td>6443</td>
<td>5313</td>
<td>5762</td>
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</tbody>
</table>

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SAMPLE TABLE

FUEL ADDITIVES BY MARKET

Diesel Fuel Additives

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

- oxygenates market share
- specialty fuel additive market share
- competitive strategies
- manufacturing
- marketing & distribution

MARKET SHARE & COMPETITIVE STRATEGIES

Marketing & Distribution

Most fuel additive sales take the form of direct sales, since the technical nature of many of these additives precludes the employment of manufacturers' agents and distributors. Sales are generally achieved through company sales personnel and sales engineers to the purchasing department employed by the fuel producer or compound blender. Within the company, in many cases purchasing departments supply relationships are negotiated by the fuel producer or compound blender. Overseas customers are supplied by overseas manufacturing facilities as well as by exports from the US. Additives manufacturers, as is the case with most chemical manufacturers, must thoroughly understand end-use industry dynamics and customer needs.

Advertising in trade journals such as CPI Purchasing, Hydrocarbon Processing, Hart's Lubricants World, Oil & Gas Journal, Oil Daily and Platt’s Oilgram News is an important avenue for marketing additive chemicals. In addition, a chemical company’s marketing service department can aid in generating customer inquiries through advertising, trade shows, trade releases and customer releases. These departments also may produce product literature, films, and supporting documentation for both marketing and end-user training applications. There are also a number of additive manufacturers advertising electronically. For instance, companies such as Chevron use the Internet to give detailed information about their products.

Intra-company transfers are significant for additives manufacturers that operate as part of a large petroleum refining entity. Most large purchasers that do not formulate chemicals in-house prefer to buy additives directly from the manufacturer, especially if the quantities involved are purchased in bulk on an annual contract basis. As with many commodity and most specialty chemical producers, the makers of additive chemicals maintain technical servicing centers and

Gasoline & Other Fuel Additives #1265

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Company Profiles

The Profiles Section analyzes 32 companies active in the U.S. gasoline and other fuel additives 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

COMPANY PROFILES

Valero Energy Corporation
One Valero Place
San Antonio, TX 78212
210-370-2000

Valero Energy is a leading US independent petroleum refiner and marketer. Among the Company’s products are reformulated gasoline, CARB Phase II gasoline, low-sulfur diesel, other fuels and oxygenates. Valero markets its products in 30 states and selected export markets. The Company had 1999 sales of $8 billion, virtually all of which was in the US. Valero employed 2,520 in

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Companies Profiled

Archer-Daniels-Midland Company
Baker Hughes Incorporated
BASF AG
BP Amoco plc
Cargill Incorporated
Chevron Corporation
Oronite Additives
Coastal Corporation
Dow Chemical Company
Equistar Chemicals LP
Ethyl Corporation
Exxon Mobil Corporation
Infineum International Limited
Nalco/Exxon Energy Chemicals LP
Ferro Corporation
High Plains Corporation
Huntsman Corporation
Lubrizol Corporation
Adibis
Lyondell Chemical Company
ARCO Chemical Company
Midwest Grain Products Incorporated
Millennium Chemicals Incorporated
Minnesota Corn Processors Incorporated
Octel Corporation
Petroles de Venezuela SA
CITGO Petroleum Corporation
PPG Industries Incorporated
Rohm and Haas Company
Morton International Incorporated
Royal Dutch/Shell Group of Companies
Infineum International Limited
Sunoco Incorporated
Belvieu Environmental Fuels
Tate & Lyle plc
Staley (AE) Manufacturing Company
Texaco Incorporated
Motiva Enterprises LLC
Star Enterprise
Texas Petrochemicals Corporation
Union Carbide Corporation
Valero Energy Corporation
VEBA AG
Degussa-Huels AG
RohMax USA Incorporated
Williams Companies Incorporated

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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:

**Forecasting Methodology**

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 Economics Group**
- Consistent framework of economic indicators on . . .
  - Gasoline Demand
  - Motor Vehicles in Use
  - Gross Domestic Product (GDP)
  - . . . and many others

**Freedonia In-house Research**
- Quantitative forecasting
- Industry structure & market share analyses
- Product analyses & forecasts

**Methodology for Gasoline & Other Fuel Additives**

**Extensive Interviews**
- Key participants
- Industry experts
- End-users

**Proprietary Electronic Database**
- Trade publications
- Government reports
- Corporate literature
- Online databases
  - . . . and many others

**Gasoline & Other Fuel Additives #1265**

Freedonia Industry Study
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 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:

- *Industrial Starch & Other Corn Chemicals*
- *Surfactants*
- *Corrosion Inhibitors*
- *Automotive Lubricants*

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

**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, motor vehicles in use, gasoline demand, 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.
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 gasoline and other fuel additives market include: Degussa-Huels AG, ExxonMobil Corporation and Huntsman Corporation.
Automotive Coatings, Sealants & Adhesives

Demand for automotive coatings, sealants and adhesives will approach $5 billion in 2003. Adhesives and sealants will offer the strongest gains due to their increased use per vehicle. Coatings demand, however, will be mitigated by the continuation of the increasing use of powders, which weigh less than solvent-based liquids. This study analyzes the 1.8 billion pound US automotive coatings, sealants and adhesives industry to 2003 and 2008 by product and market. It also details market share and profiles key companies.

#1293. . . . . . . . . 7/00. . . . . . . . . . $3,500

World Light Vehicles

The best long term growth for the major automakers will be found in the rapidly industrializing countries of Latin America, Eastern Europe and Asia. Light trucks, minivans, SUVs, etc., will remain popular, especially in developed nations where such vehicles are viewed as practical alternatives to passenger cars. This study analyzes the 53 million unit world light vehicle industry to 2004 and 2009 by type, geographic region and 36 individual countries. It also evaluates market share and company profiles.

#1262. . . . . . . . . 5/00. . . . . . . . . . $4,200

Automotive Fluids & Chemicals

The increasing number and age of light vehicles in use, as well as the popularity of larger vehicles with bigger fluid reservoirs, will support gains in US automotive fluids and chemicals demand. Market value will benefit from a shift in product mix toward higher-value products such as synthetic oils and pre-mixed antifreeze. This study analyzes the $5.1 billion US automotive fluids and chemicals industry to 2003 and 2008 by product and market. It also presents market share data and profiles key companies.

#1167. . . . . . . . . 8/99. . . . . . . . . . $3,300

Lubricant Additives

The introduction of new lubricant standards as well as growing use of synthetic base stocks will raise the loadings of additives designed to help extend drain intervals and boost performance. Nevertheless, the US lubricant additives market will remain relatively flat through 2004 due to the development and use of longer lasting lubricants, including lube-for-life products. This study analyzes the US market for lubricant additives to 2004 and 2009 by product and market. It also details market share and profiles key companies.

#1293. . . . . . . . . 7/00. . . . . . . . . . $3,500

Automotive Lubricants

US demand for automotive lubricants will reach $5 billion in 2003. Extended drain intervals and lube-for-life products will slow volume growth, except for lubricants with performance and environmental advantages. The increasing number and age of vehicles in use will also fuel gains. Professional oil changers will continue to displace the DIY sector. This study analyzes the US automotive lubricant industry to 2003 and 2008 by product, market and end-use. It also details market share and profiles key companies.

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Surfactants

Steady gains in US demand will be driven by multifunctional and biodegradable surfactants that go into better performing, regulatory-compliant formulations. Consumer demand for germicidal cleaners and milder personal care products will also benefit surfactants. Anionic surfactants will remain the dominate type. This study analyzes the US surfactants industry through 2002 and 2007 for six geographic regions and over 30 countries. The study also presents market share and profiles leading suppliers.

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Automotive Coatings, Sealants & Adhesives

Demand for automotive coatings, sealants and adhesives will approach $5 billion in 2003. Adhesives and sealants will offer the strongest gains due to their increased use per vehicle. Coatings demand, however, will be mitigated by the continuing shift to powders, which weigh less than solvent-based liquids. This study analyzes the 1.8 billion pound US automotive coatings, sealants and adhesives industry to 2003 and 2008 by market, application and type. It also evaluates market share and profiles key firms.

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World Automotive Aftermarket

Global demand for under-the-hood automotive aftermarket parts and components will grow nearly 7% annually. Fueling gains will be a rise in the average age of light vehicles in use, as vehicle owners retain existing machines and require more repair and maintenance. This study analyzes the world automotive aftermarket to 2002 and 2007 for six geographic regions and over 30 countries. The study also presents market share and profiles leading suppliers.

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