Fluoropolymers

US Industry Study with Forecasts for 2016 & 2021

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Advances will be spurred by an improving economic outlook, which will drive industrial output and boost construction activity, and spur volume gains in fluoropolymers considerably.

**US demand to rise 5.3% annually through 2016**

US demand for fluoropolymers is forecast to increase 5.3 percent annually to $2.4 billion in 2016, with volume totaling 198 million pounds. Advances will be spurred by an improving economic outlook, which will drive industrial output and boost construction activity. While market value gains will only slightly outpace those of the 2006-2011 period, growth in volume terms is projected to accelerate considerably. This is because the challenging economic environment associated with the 2007-2009 recession held down market volume during the 2006-2011 period while strong increases in pricing propped up value gains. Going forward, the situation is expected to reverse, with growth in market value stemming mainly from expanding volume demand, rather than rising price levels.

**PVF, PVDF to be fastest growing fluoropolymers**

Polytetrafluoroethylene (PTFE) is forecast to remain the leading product in both volume and value terms through 2016. Demand will benefit from widespread use in the large industrial processing market and expanding opportunities in emerging applications such as chemical processing and industrial filtration. However, the most robust gains are forecast for polyvinyl fluoride (PVF) and polyvinylidene fluoride (PVDF). PVF demand will rise rapidly from a relatively small base, fueled by stellar growth in the photovoltaic module segment despite greater competition from less expensive materials. PVDF will capture a greater share of the market, advancing strongly through 2016 based on rebounding growth in the architectural coating segment, as well as rising use in electronics, particularly advanced batteries.

**Construction among fastest growing markets**

The industrial processing market will remain the largest outlet through the forecast period, benefiting from tightening performance requirements, as more advanced materials are needed to withstand increasingly harsh operating conditions. However, faster gains are anticipated in the construction and electrical and electronics markets. Fluoropolymer use in architectural coatings will continue to rise due to the superior performance characteristics these materials possess over competing products. Above average advances in the electrical and electronic market will be fueled by a rebound in electrical and electronic product output overall and wire and cable production in particular, which will be supported by a turnaround in building construction activity. Furthermore, explosive growth in photovoltaic module production will generate opportunities for fluoropolymers as interest in solar power swells due to efforts to reduce dependence on fossil fuels.
Demand for PTFE is projected to reach $655 million in 2016, with market volume expected to reach 76 million pounds. Although growth in market value is forecast to decelerate from the rapid pace of the 2006-2011 period, PTFE will maintain its position as the leading fluoropolymer type in both value and volume terms. Subpar gains will be due in part to market maturity, limited opportunities for penetration into new applications, and competition from other fluoropolymers. Demand in value terms will also be restricted by pricing trends, as pricing levels become more stable following the significant increases of the latter part of the previous period.

During most of the 2006-2011 period, PTFE prices experienced a steady decline. However, the situation abruptly changed in mid-2010 when PTFE prices began to skyrocket. The initial escalation was prompted by the reduced availability of fluorspar, the key raw material in PTFE manufacture. China is the leading producer of fluorspar, and has implemented controls in recent years in order to secure enough supply to meet rapidly rising domestic demand for the material. This has restricted the amount that can be exported to other countries, thus creating a tight supply situation. Moreover, in summer months when Chinese demand for refrigerators and air conditioners spikes, chlorodifluoromethane (R-22) is diverted from PTFE and into refrigerant production, further constraining supply.

Additionally, during much of the decade, lackluster demand for low-margin PTFE caused producers to focus their efforts on more profitable specialty fluoropolymers. This reduced PTFE capacity, in turn restricted output when demand for the material rose following the recession. Also contributing to price hikes were PTFE plant maintenance shutdowns in China and Europe, as well as in Japan following the March 2011 earthquake that triggered a devastating tsunami.

### TABLE III-5

<table>
<thead>
<tr>
<th>Item</th>
<th>2001</th>
<th>2006</th>
<th>2011</th>
<th>2016</th>
<th>2021</th>
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<tr>
<td>PTFE Demand (mil lb)</td>
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<td>% granular</td>
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<td>Granular PTFE Demand (mil lb)</td>
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By Application:
- Mechanical Parts & Components
- Coatings & Liners
- Other Applications

By Market:
- Industrial Processing
- Other Markets

### CHART VI-1

US FLUOROPOLYMER MARKET SHARE ($1.9 billion, 2011)
Westlake Plastics Company
490 West Lenni Road
Lenni, PA  19052
610-459-1000
http://www.westlakeplastics.com

Annual Sales:  $40 million (estimated)
Employment:  200 (estimated)
Key Products:  fluoropolymer based rods, sheets, and films; and polytetrafluoroethylene (PTFE) filled acetal copolymers

Westlake Plastics extrudes and compresses high performance thermoplastic resins into rods, sheets, and films for the medical, automotive, semiconductor, aerospace, and chemical processing markets. The privately held company has operations at three US plants in Lenni and Mayfield, Pennsylvania and an office in Placentia, California.

The Company participates in the US fluoropolymer market via the manufacture of rods, sheets, and films from such fluoropolymers as HALAR (Solvay SA -- Belgium) ethylene chlorotrifluoroethylene (ECTFE) and KYNAR (Arkema SA -- France) polyvinylidene fluoride (PVDF). Additionally, Westlake Plastics makes DIELUX polytetrafluoroethylene (PTFE) filled acetal copolymers. Westlake Plastics makes HALAR ECTFE based products featuring resistance to chemicals and corrosion; enhanced chemical and mechanical characteristics; optimal impact strength; and extremely low permeability to liquids, gases, and vapors. These products are suitable for semiconductor process equipment, chemical storage, fluid handling, and fire safe componentry applications. The Company also makes HALAR ECTFE based films for such items as filters, diaphragms, release films, cable insulation, solar collector panels, coaxial and fiber optic wrap films, and medical bags.

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TABLE V-8
ELECTRICAL & ELECTRONIC MARKETS FOR FLUOROPOLYMERS (million dollars)

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<th>2016</th>
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<td>475.1</td>
<td>429.8</td>
<td>483.5</td>
<td>518.5</td>
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<td>lb fluoropolymer/mil $ shpts</td>
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<td>E &amp; E Fluoropolymers (mil lb)</td>
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<td>Other Fluoropolymers</td>
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<td>% electrical &amp; electronic</td>
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<tr>
<td>Fluoropolymer Demand</td>
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“Demand for fluoropolymers in the wire and cable market is forecast to rise 4.5 percent annually to $383 million in 2016, with market volume totaling over 32 million pounds in the same year. Renewed strength in this market will be based on a turnaround in nonresidential construction activity, particularly in the office and commercial sectors, which will generate demand for fluoropolymers used in plenum cable applications. Fluoropolymer consumption will further benefit from trends favoring the use of higher value wire and cable with greater flammability protection.”

--Section V, pg. 129
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**Division**

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