Chemical Sensors

US Industry Study with Forecasts for 2017 & 2022

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A continued rebound in light vehicle production, along with the increasing use of advanced, higher cost UEGO sensors to improve vehicle fuel efficiency and performance, will drive advances.

US demand to rise 4.9% annually through 2017

Chemical sensor demand in the US will increase nearly five percent per year to $1.9 billion in 2017. A continued rebound in light vehicle production, along with the increasing use of advanced, higher cost universal exhaust gas oxygen (UEGO) sensors to improve vehicle fuel efficiency and performance, will drive advances. Growth will also be supported by healthy increases in medical chemical sensor demand as the aging of the baby boomer generation leads to above average growth in the diagnosis of diabetes and other chronic conditions. More broadly, gains across the entire industry will be supported by lower average prices and improved chemical sensor technology.

Motor vehicle market to offer best opportunities

Changes within the motor vehicle industry will have the greatest impact on chemical sensor demand going forward. The increased use of gasoline direct injection and turbocharged engines by vehicle manufacturers in an effort to comply with federal corporate average fuel economy requirements will necessitate the expanded use of higher cost UEGO sensors that allow engines to achieve both higher performance and better fuel efficiency. The shift in product mix toward the higher cost oxygen sensors, the increased adoption of cabin air quality sensors, and robust increases in nitrogen oxide and ammonia sensor demand due to a strong rebound in medium and heavy duty truck production will all support strong gains in the motor vehicle and chemical sensors markets.

Growth in chemical sensor demand will also be supported by the aging of the baby boomer generation and by above average increases in new diabetes diagnoses that will continue to drive demand for portable blood glucose monitors in the medical market. Rising medical chemical sensor demand will also reflect the development of new applications and the health care industry’s increased reliance on testing and benchmarks as a means of not only improving patient care, but also reining in rising costs.

Optical chemical sensors among fastest growing types

Optical chemical sensor demand will rise at a strong pace. Increased use of demand control ventilation in commercial properties and greater adoption of cabin air quality systems in motor vehicles will drive gains. Acceleration in chemical sensor demand growth in most environmental monitoring applications due to an expanding economy and the ongoing tightening of air and water quality standards will also support advances. However, even faster growth for optical sensors will be limited by declines in automobile emissions testing due to the falling number of vehicles that need to be tested via the tailpipe.
**Chemical Sensors**

US Industry Study with Forecasts for 2017 & 2022

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**SAMPLE TEXT**

**ANALYTES**

**Dissolved Gases**

Demand for dissolved gas sensors is forecast to grow 5.6 percent per year to $92 million in 2017. Healthy growth will reflect strong demand in wastewater disinfection and treatment monitoring, as well as increased industrial activity. Additionally, rising pharmaceutical and food and beverage production will support growth, as well as increased spending on dissolved oxygen monitors in the medical market.

The main types of dissolved gas sensors are those that measure dissolved oxygen (DO) in solution. These sensors measure the partial pressure of oxygen in water (not the actual amount of oxygen in water). In many water quality applications, the DO level must be controlled. For example, in aquaculture, fish will suffocate if the level of dissolved oxygen is too low; similarly, bacteria that decompose sewage will die if DO is too low in sewage treatment facilities. In industrial applications using boilers, water must be maintained at low DO levels to prevent corrosion and scale build-up. Besides sensors that measure the partial pressure of oxygen, there are also infrared optical sensors that measure dissolved oxygen in blood by detecting the amount of hemoglobin with oxygen bound to it. This is typically done by shining infrared light through a thin part of the body such as a finger.

From an environmental monitoring standpoint, measuring dissolved gases in natural water provides information on biological processes and pollutants, and a better understanding of the effects of greenhouse gases. Pro-Oceanus Systems provides a line of advanced dissolved gas sensors, including carbon dioxide and gas tension instruments designed specifically for oceanic research applications. Sea-Bird Electronics is one of the largest manufacturers of marine instruments, including dissolved oxygen sensors.

---

**TABLE IV-2**

**ELECTROCHEMICAL SENSOR DEMAND**

(million dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
</tr>
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<tbody>
<tr>
<td>Resident Population (mil)</td>
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<tr>
<td>$ sensor/capita</td>
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<tr>
<td>Electrochemical Sensor Demand</td>
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<tr>
<td>By Technology:</td>
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<tr>
<td>Potentiometric</td>
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<tr>
<td>Amperometric</td>
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<tr>
<td>Conductometric</td>
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<tr>
<td>Other Electrochemical</td>
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<td>By Analyte:</td>
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<td>Gas Phase</td>
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<td>Liquid Phase</td>
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<td>By Market:</td>
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<td>Industrial</td>
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<td>Environmental Monitoring</td>
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<td>Medical</td>
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<td>Other Markets</td>
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<tr>
<td>$/unit</td>
<td></td>
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<tr>
<td>Electrochemical Sensors (mil units)</td>
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</tbody>
</table>

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**Chart VII-1**

**CHEMICAL SENSOR MARKET SHARE, 2012**

($1.5 billion)

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Nova Biomedical Corporation
200 Prospect Street
Waltham, MA 02454
http://www.novabiomedical.com

Annual Sales: $160 million (estimated)
Employment: over 1,000 (estimated)
Key Products: biosensors and related analyzers, and blood glucose monitors

Nova Biomedical is one of the largest private US manufacturers of in vitro diagnostics, producing clinical whole blood analyzers for the medical industry, chemistry analyzers used in bioprocessing applications, and blood glucose monitoring devices for diabetes care. In addition to its own products, the Company offers contract manufacturing of diagnostic products and medical devices.

The Company competes in the US chemical sensors industry through the design and manufacture of biosensor-based analyzers and blood glucose monitoring systems. Nova Biomedical’s analyzers encompass blood chemistry, gas, and electrolyte/chemistry types sold via the STATPROFILE, BIOPROFILE, and NOVA product lines. These systems, which employ biosensor and reagent technologies, incorporate various electrochemical biosensor technologies engineered to rapidly test and measure blood chemistry, blood gases, electrolytes, metabolites, hematologic variables, and nutrients. For example, STAT PROFILE clinical blood gas and critical care analyzers from the Company

### TABLE VI-2

<table>
<thead>
<tr>
<th>Item</th>
<th>2002</th>
<th>2007</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
</tr>
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<tbody>
<tr>
<td>Manufacturers’ Shipments (bil $)</td>
<td>3713</td>
<td>5031</td>
<td>5421</td>
<td>6520</td>
<td>7730</td>
</tr>
<tr>
<td>$ sensor/mil $ mfg</td>
<td>177</td>
<td>145</td>
<td>161</td>
<td>173</td>
<td>174</td>
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<tr>
<td>Industrial Chemical Sensor Market</td>
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<td>By Sector:</td>
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<tr>
<td>Motor Vehicles</td>
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<td>580</td>
<td>710</td>
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<td>Process Industries</td>
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<td>49</td>
<td>66</td>
<td>75</td>
<td>100</td>
<td>130</td>
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<tr>
<td>By Type:</td>
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<tr>
<td>Electrochemical</td>
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<td>74</td>
<td>91</td>
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<td>% industrial</td>
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<tr>
<td>Chemical Sensor Demand</td>
<td></td>
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</tbody>
</table>

SAMPLE TABLE

STUDY COVERAGE

This Freedonia study, *Chemical Sensors*, presents historical data (2002, 2007, 2012) plus forecasts for 2017 and 2022 for demand by product, analyte and market. The study also assesses key market environment factors, examines the US industry structure, evaluates company market share and profiles 39 US industry competitors.
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