TEMPERATURE SENSOR MARKET

A STUDY OF MAJOR SENSOR TYPES (TEMPERATURE ICs, THERMISTOR, RESISTIVE TEMPERATURE DETECTORS (RTDS), THERMOCOUPLE AND IR SENSOR) & APPLICATIONS

GLOBAL FORECAST & ANALYSIS (2011 – 2016)
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1 EXECUTIVE SUMMARY

Temperature sensors have a significant place across different industry verticals. The major applications of temperature sensors are in petrochemical industry, automotive industry, consumer electronics industry, metal industries, food and beverages industry, and healthcare. The largest application segment for temperature sensors is the petrochemical segment, together with related process applications. The electronics segment follows as the second largest application segment for temperature sensors. In the automotive industry, the temperature sensors are improving passengers comfort, engine's efficiency, and performance. The demand for reliable, high performance and low cost sensors is increasing- leading to the development of new technologies such as the microtechnology and nanotechnology offering opportunities such as miniaturization, low power consumption, mass production, etc. New temperature sensors such as the IR temperature sensor offer several key advantages. They allow contactless and consequently corrosion-free measurement of temperature. These devices have gained immense popularity in food and beverage industry and chemical segment.

FIGURE 1

GLOBAL TEMPERATURE SENSORS MARKET, 2010 – 2016, BY REVENUE ($MILLION) & VOLUME (MILLION UNITS)

Source: MarketsandMarkets Analysis
The market size of temperature sensors in 2010 was $XX billion and is expected to reach $XX billion units by 2016, at a CAGR of XX%. In terms of volume, the unit shipment for temperature sensors was XX billion units in 2010 and is expected to reach XX billion units by 2016, at a CAGR of XX% from 2011 to 2016.

Table 1

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Source: MarketsandMarkets Analysis

The global temperature sensors market was valued at $XX million in 2010 and is expected to grow from $XX million in 2011 to $XX million by 2016 at a CAGR of XX% from 2011 to 2016. The APAC region commanded the largest share with $XX million in 2010; and is expected to reach $XX million by 2016, at a CAGR of XX% from 2011 to 2016.

The consumer electronics market in Japan and South Korea; along with growth of China as the major automotive power will contribute significantly to the overall APAC share. ROW, which includes countries such as Russia, Brazil is expected to consume temperature sensor at a faster rate due to the explosive growth in petrochemical industry.
In 2010, XX million units of temperature sensors were shipped and most of them found their place in the APAC region with almost XX% share of the total market. Majority of the shipment was done in Japan/Korea and China. The total shipments of temperature sensors in APAC is expected to reach XX million units by 2016, at a CAGR of XX% from 2011 to 2016. ROW is expected to consume temperature sensor at a CAGR of XX% from 2011 to 2016. ROW poses a much significant market for temperature sensors in comparison with U.S., Europe, and APAC.
The “petrochemicals” segment, along with related processing, held the largest market with a market size of $XX billion in 2010. This market was valued at $XX billion in 2011 and is expected to reach $XX billion by 2016 at a CAGR of XX% from 2011 to 2016.

The industrial segment and consumer electronics segment are estimated to be heavy users of temperature sensors; accounting for almost XX% and XX% respectively; of the total temperature sensors market. One of the largest applications for temperature sensors in automobiles is the engine control management and powertrain management. "Automotive + Aerospace” segment was valued at $XX million in 2010; and is expected to reach $XX million by 2016, at a CAGR of XX% from 2011 to 2016.
In 2010, out of the XX million units of temperature sensors shipped globally, XX million units were shipped to the consumer segment. By 2016, almost XX% of the total temperature sensors is estimated to be used for the consumer segment (i.e. XX million units out of XX million units); followed by the automotive segment with XX% of the total consumption. In 2010, for consumer electronics segment, almost XX% of the temperature sensors used are temperature IC; followed by thermistor with XX% of the total unit consumption.
### TABLE 3

**GLOBAL TEMPERATURE SENSORS MARKET REVENUE, BY PRODUCT TYPES, 2010 – 2016 ($MILLION)**

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<tbody>
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<td>RTD</td>
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<tr>
<td>Thermocouple</td>
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</tbody>
</table>

Source: MarketsandMarkets Analysis

From the perspective of product type, the market for thermocouple commanded the largest share; with a market size of $XX million in 2010 and is expected to grow from $XX million in 2011 to $XX million by 2016, at a CAGR of XX% from 2011 to 2016. This is the slowest growth for the entire range of temperature sensors under study. The other sensors will grow at a rate of XX% from 2011 to 2016 due to their increasing popularity. IR sensors form the larger part of other sensors and are increasingly used in high-temperature applications. IR sensor is supposed to replace thermocouple and RTD in most of the applications in the next five to eight years.
In 2010, XX% of the total (XX million units out of XX million units) sensors consumed were thermostors. Thermistors are expected to grow from XX million units in 2011 to XX million units by 2016, at a CAGR of XX% from 2011 to 2016.

Thermistor is widely used in automotive applications, HVAC, and consumer electronics. Temperature sensor IC is supposed to grow at a decent CAGR of XX% from 2011 to 2016. The other sensors will grow at a CAGR of XX% for the same period due to increasing popularity of contactless sensors in various industrial applications. Recent developments in sensor technology will provide more cost-effective solution of contactless sensor; thus contributing to the high growth.
2 MARKET OVERVIEW

2.1 INTRODUCTION

A sensor is a device that measures the changes in physical quantity or environmental characteristics and converts it into signals that serve as inputs for control. A temperature sensor converts temperature to an output voltage, which can be read by a voltmeter. Today’s sensors mainly utilize digital technology, which means better in efficiency and sensing performance. Digital technology has rejuvenated the era of the sensors by introducing new sensors in the market such as temperature sensor IC, thermostat, and many more. Temperature sensors can be widely classified into two main categories; namely contact sensors and non-contact sensor.

**Contact type sensor**: For these types of temperature sensors, physical contact with the object being sensed is required. These sensors use conduction method to monitor changes in temperature. They can be used to detect the temperature of solids, liquids, or gases over a wide range. Main types of contact type sensors are thermocouple, temperature IC, thermistors, and Resistive Temperature Detectors (RTD).

**Non-contact type sensor**: For these types of temperature sensors, convection and radiation are used to monitor changes in temperature. They can be used to detect liquids and gases that emit radiant energy as heat rises. They detect the radiant energy being transmitted from an object in the form of infra-red radiation. Main types of non-contact sensors are infrared sensor and optical sensor.

Non-contact temperature sensors are dominated by IR temperature sensors and they are increasingly used for use in high-temperature applications. IR sensing is highly recommended in the food and beverage industry, plastic industry, metal industry, and many more. Many tier one companies are investing in research and development to improve the existing non-contact IR temperature sensing technologies and develop newer ones. Currently, the market is dominated by thermocouples and RTDs; but we predict strong competition between contact and non-contact temperature sensing technologies in future.
Thermocouples are commonly used in most of the industries due to their simplicity, user-friendliness, and quick response to changes in temperature. Thermocouples also have the widest temperature range of all the temperature sensors; from below XX°C to well over XX°C. RTDs are also the most expensive sensing elements amongst all the temperature sensing devices. Due to their linearity, stability, and accuracy over the temperature that ranges from -XX°C to XX°C, RTDs (resistance temperature detectors) are the first choice with respect to temperature measurement devices used in all the highest-temperature industrial processes.
2.2 MARKET SEGMENTATION

This research report categorizes the global temperature sensor market on the basis of different types of sensors used in electronic systems, the applications for which the sensors are used, geographical analysis; forecasting revenue, and analyzing trends in the temperature sensor market.

**On the basis of product types:**
In this section, temperature sensor market is divided as per the type of sensor used. Temperature sensor ICs, thermistor, Resistive Temperature Detectors (RTD), thermocouple, and other sensors are the prominent sensor types used for various applications. The other sensors include various emerging sensor types such as infrared sensor, optical sensor, wireless sensor, etc.

**On the basis of applications:**
In this section, temperature sensor market is divided as per the applications for which the sensors are used. Automotive+Aerospace, Petrochemicals, Consumer electronics, Utilities, Industrial segment - are the prominent segments that consume the temperature sensor to a greater extent.

**On the basis of geography:**
North America, Europe, Asia-Pacific, and ROW are covered in the report.
2.3 MARKET DYNAMICS

This section deals with the drivers, restraints, and opportunities of the market. For the temperature sensor market, vehicle production in emerging markets, increasing government intervention, availability of strong aftermarket and continuous demand from consumer electronics and computing peripherals are acting as drivers. Competition within the technologies, pricing, and maturity of critical end-user segments are acting as restraints. Technological advancement and emergence of MEMS in temperature sensing are the future opportunities for temperature sensors.

2.3.1 DRIVERS

One of the largest applications of temperature sensors in automobiles is in powertrain and emission control management systems that are gaining popularity in the emerging markets. Drivers for this market also include government regulations in food and beverages industry. It
is used to detect sudden changes in temperature; so as to reduce the risk of food wastage. Continuous demand is expected from this segment that is acting as a major growth driver for temperature sensor. Typical applications include microprocessor-based electronics DVD players, iPads, smartphone, laptop, desktop, etc.

### FIGURE 7

**IMPACT ANALYSIS OF DRIVERS**

<table>
<thead>
<tr>
<th>Drivers</th>
<th>1 – 2 years</th>
<th>3 – 4 years</th>
<th>5+ years</th>
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<tbody>
<tr>
<td>Vehicle production in emerging markets</td>
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<td>Increasing government intervention</td>
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<tr>
<td>Availability of strong aftermarket</td>
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<tr>
<td>Continuous demand from consumer electronics &amp; computing peripherals</td>
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</table>

Source: MarketsandMarkets Analysis

### 2.3.2 RESTRAINTS

Thermocouple and RTD are at a mature stage and sold in a comparatively large quantity. RTD sensors provide good temperature range; but they cannot withstand corrosive and hazardous climate. On the other hand, IR sensing technologies have overcome the limitations of RTD by providing good operating range. Temperature sensors’ manufacturers must strike a balance with respect to accuracy, robustness, and low cost as temperature sensor is considered as a mature market. Maturity of critical segment such as petrochemicals and oil and gas is acting as a restraint for the temperature sensor.
2.3.3 OPPORTUNITIES

Loads of emerging sensors technologies are becoming popular for automotive and consumer segments such as MEMS and optical sensor, out of which MEMS is the most promising sensor technology that is supposed to rule the automotive as well as consumer electronics segment in the coming five years. Emergence of MEMS technology in temperature sensor will certainly act as an opportunity for temperature sensor. The wireless temperature monitoring solution offers the wide range of applications not only in temperature sensing but also acts as a humidity sensor, WIFI sensor, and data logger.
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