

**2006 Frost & Sullivan Award for  
Product Innovation Award  
Award Recipient: SenseAir AB**

2006

FROST &amp; SULLIVAN

Product Innovation Award

#### AWARD DESCRIPTION

The Frost & Sullivan Award for Product Innovation is presented each year to the company that has demonstrated excellence in new products and technologies within its industry. The recipient company has shown innovation by launching a broad line of emerging products and technologies.

#### RESEARCH METHODOLOGY

To choose a recipient of this award, the analyst team tracks all new product launches, R&D spending, products in development, and new product features and modifications. This is accomplished through interviews with all the market participants, and extensive secondary and technology research. All new product launches and new products in development in each company are compared and evaluated based on the degree of innovation and customer satisfaction. Companies are then ranked by the number of new product launches and new products in development.

#### MEASUREMENT CRITERIA

In addition to the methodology describe above, there are specific criteria used to determine final competitor rankings in this industry. The recipient of this award has excelled based on one or more of the following criteria:

- Significance of new product(s) in the industry
- Competitive advantage of new product(s) in the industry
- Product innovation in terms of unique or revolutionary technology
- Product acceptance in the marketplace
- New product value-added services provided to customers



The Frost & Sullivan 2006 Product Innovation Award in the field of sensors for HVAC&R applications goes to Sweden-based SenseAir AB for understanding the restraints faced by conventional gas sensing products and developing two unique products, a carbon dioxide (CO<sub>2</sub>) engine sensor and a mixed metal oxide semiconductor (MMOS) technology-based carbon monoxide (CO) gas sensor. SenseAir has shown its potential for developing solutions that can be readily integrated into original equipment manufacturing (OEM) applications, thereby, leading to ease of deployment of sensors, which was limited due to cost and performance issues.

Electrochemical cell technology, which is used for industrial markets and MOS technology for consumer markets, is currently the low-cost CO detection solution. The company has found that electrochemical cell and MOS technology have been ineffective in some areas, although there is still market acceptance for these technologies. The disadvantages associated with both, be it sensitivity to environmental fluctuations or cost or lifetime, were the major driving reasons for SenseAir to come up with CO gas detection using MMOS technology. The company, with its past recognition in the gas sensing field through infrared (IR) technology, has developed a portfolio of products based on MMOS technology. By using MMOS technology, SenseAir also aims to develop sensing techniques that are well poised to perform maintenance-free as this is one of the biggest challenges currently faced by the industry.

One of the unique features of CO gas sensing based on MMOS is the ability of proprietary, inbuilt SenseAir microcontrollers to carry out operations such as self-diagnostics. Once initial factory calibration has been carried out it allows individual sensor units to handle aging factors. The presence of a self-diagnostic algorithm called automatic baseline correction or ABC is the reason behind this highly sought-after capability. SenseAir's new MMOS gas sensor is found to be better on

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performance aspects when compared to MOS sensors. Challenges such as sensitivity to environmental factors-temperature, humidity, and other interfering gases-have been easily negated with the use of the new thin film filter technology. A major area of concern, which is the sensitivity to other gases, is proficiently handled by use of active carbon filters that have a projected lifespan of more than five years. Additionally, the versatility of these sensors can be clearly seen from the fact that the use of active sensing elements-with absolutely no use of catalytics-has been stressed upon, leading to an improved sensor lifetime with high selectivity and ability to withstand overexposure with ease.

SenseAir has also developed a compact CO<sub>2</sub> transmitter module called the CO<sub>2</sub> Engine Sensor that can be used for CO<sub>2</sub> sensing in OEM products. The CO<sub>2</sub> Engine uses innovative IR waveguide technology, based on polymer precision replication technology to enable low-cost high-volume production. The patented gold metalized optical absorption cell features a long absorption path length realized by a unique multipass reflexion waveguide cell. Current solutions in this area have straight tube absorption cells, which for geometric reasons cannot offer the same long optical path lengths for any certain limited product size. The developed CO<sub>2</sub> engine is very accurate compared to peer solutions. In optical and IR absorption measurements the interaction length between light and gas is important for the sensitivity of the system--the longer path length, the stronger absorption, and larger gas detection sensitivity. By design, the SenseAir patented optical absorption cell features a

long absorption path length at a high-optical throughput and signal stability.

The main adoption driver of the developed CO<sub>2</sub> engine is its reliable sensing capability over application lifetime at an affordable cost. CO<sub>2</sub> is chemically a quite inert gas that cannot be readily detected by traditional low-cost gas sensor techniques; but instead IR gas detection has to be employed. IR technology, well known for its good performance in, for instance, medical, automotive testing, and industrial (for example, HVAC air quality sensing) applications, is however a technology that used to be far too expensive to even consider in consumer type of products. However, from a design standpoint, all aspects of the developed CO<sub>2</sub> engine product were considered for the purpose of achieving low cost. SenseAir has managed to successfully realize an efficient manufacturing process of a cost-efficient high-quality CO<sub>2</sub> sensor OEM product. With these efforts from SenseAir, cost factor in the sensing domain is set to definitely change for IR-based CO<sub>2</sub> gas sensing.

In summary, the Frost & Sullivan 2006 Product Innovation Award acknowledges SenseAir for developing gas sensing products that overcome difficulties faced by peer products with ease, thereby boosting greater deployment of gas sensors in buildings and many other areas. With its wide gamut of potential applications, sensor products such as the CO<sub>2</sub> engine sensor and the MMOS technology-based CO gas sensor are set to take gas sensing to the next level.