

# 20 Years of Excellence in Toxic Gas Sensor Manufacture

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**City Technology's German facility in Bonn is the centre of excellence for the design and manufacture of the Sensoric family of electrochemical toxic gas sensors. Enjoying a reputation for innovation, City Technology is a world leader in the production of gas sensors for use in personal and fixed gas detection systems. Originally developed 20 years ago, Sensoric sensors have become synonymous with highly specialised technology solving difficult operational problems.**

Sensoric sensors must not only reliably respond to toxic gases, which are either poisonous, explosive, flammable, or exhibit all three characteristics, but they must also function effectively in harsh operating environments. Providing reliable and rapid measurement of low-level leaks or excessively high concentrations of such gases is critical for uninterrupted industrial operation and the protection of life and property.

Toxic gases, also known as exotic gases, include hydrides, hydrogen fluoride, hydrogen cyanide, hydrogen chloride, fluorine, ozone, hydrazine and many others. Whilst these are innately dangerous, many established and emerging industrial processes rely upon them, along with the mining, petrochemical and energy generation industries.

Today, the Sensoric range can detect more than 40 different gases, extending the original focus of hydride sensors measuring critical-to-manufacture toxic gases in semiconductor facilities, through to specialist sensors for the detection of hard to measure toxic gases used in refrigeration, water treatment and other industrial hygiene applications.

## Semiconductor and photovoltaic

The semiconductor industry is one in which the use of Sensoric sensors is critical. The digital world as it presently exists would arguably not have achieved the scale and reach we take for granted if it were not for the use of toxic hydride gases such as arsine, silane, phosphine, diborane and hydrogen selenide, which are essential to wafer fabrication in the global semiconductor industry. Low cost, high volume manufacturing on a global scale is a reality in part because of the measurement and control provided by specialist gas sensors such as Sensoric.

Sensoric arsine sensors are used to ensure safe work environments in Metal Organic Chemical Vapour Deposition (MOCVD), sometimes called the Metal Organic Vapour Phase Epitaxy process (MOVPE), which facilitates the manufacture of LEDs and high power, high frequency transistors. MOCVD uses very large quantities of pure arsine, AsH<sub>3</sub>, as a key enabler. High output LEDs are widely used in mobile phones and are now moving into energy-efficient home lighting. The production of large screen flat panel TVs is another rapidly increasing sector: acidic gases are essential to the manufacturing process; potential leaks are monitored and measured with Sensoric sensors.

More recently, hydrides are being used in the rapidly growing photovoltaic industry, which is emerging in response to the pressure for carbon reduction in energy production.



## Food production, refrigeration and energy generation

The Sensoric product range also includes electrochemical sensors that detect challenging gases such as ammonia, which, although both toxic and corrosive, is widely used in the refrigeration, food production and pharmaceutical manufacturing industries.

Ammonia was, before the invention of Freons some 80 years ago, the most commonly used refrigerant. Today, it is enjoying a resurgence in popularity in industrial refrigeration plants, where it offers high efficiency and low cost and is an effective environmentally friendly replacement for hydrofluorocarbons. Ammonia-based air conditioning and refrigeration plants are now found in commercial, public and industrial buildings such as hotels, hospitals, prisons, schools and airports, as well as in their more traditional food, cold storage and beverage manufacturing applications.

On a global scale, mandatory standards rightly pose ever more stringent requirements associated with the use of toxic gases. Consequently, standards such as EN 378 and ASHRAE

15, which both deal with the safety requirements associated with mechanical refrigeration, have recently been updated to reflect the trend towards the increasing use of ammonia as a refrigerant gas. The widespread use of Sensoric ammonia sensors enables the technology to be safely extended into new areas.

Sensoric ammonia sensors are also helping in the emerging environmentally friendly energy generation industry. Ammonia is a key element in Kalina cycle geothermal plants,





which are emerging as a viable alternative to carbon-based generating plants. The Kalina thermodynamic cycle converts thermal energy to mechanical power; it is optimised for use with thermal sources such as geothermal heating that are at a relatively low temperature compared to the ambient temperature. The cycle uses a working fluid with at least 2

components, typically 30% water and 70% ammonia. The wide boiling range of the mixture gives noticeable efficiency gains when compared to other technologies used in the geothermal generation of electricity.

## Water treatment

Chlorine, a halogen, has principal uses in the production of a wide range of industrial and consumer products, in water treatment plants and in disinfectants and bleach. It is also widely used to kill bacteria and other microbes in drinking water supplies and public swimming pools. Sensoric sensors are primarily used in chlorine manufacturing plants and for measuring chlorine dioxide levels in water treatment facilities.

## Other industries

Sensoric electrochemical sensors are used to protect against leakage or over-concentration of toxic gases used in other critical industries. Hydrogen fluoride, corrosive and toxic, is widely used in the petrochemical industry as a catalyst in alkylation processes in oil refineries. Hydrogen cyanide, which is extremely flammable and very toxic, is used in the electroplating industry, the mining sector and metallurgy, either in its own right or as a precursor to the production of sodium cyanide and potassium cyanide. Sensoric sensors are also used to monitor potential hydrazine leakage from the reserve fuel tanks on the European Space Agency's Ariane 5 rockets.

## Conclusions

Over the past 20 years Sensoric technology has not only changed the dynamics of the global semiconductor industry, it

has played a large part in the electronic revolution which is transforming the social and industrial landscapes of the developed and developing world.

Sustained investment in R & D, new product innovation and a continual programme of enhancements to existing sensors, are just some of the reasons why Sensoric and City Technology have maintained their pioneering position in the world of toxic gas detection in both established and emerging industries. Close working partnerships with customers are also a central part of the Sensoric philosophy, demonstrated by the fact that the first customers for Sensoric sensors remain major users of the products some 20 years later.

The company's commitment to advanced manufacturing and outstanding service, will ensure that the developments seen during the last 20 years lay the foundations for Sensoric's sustained growth in the highly specialised toxic gas sensor market.

