



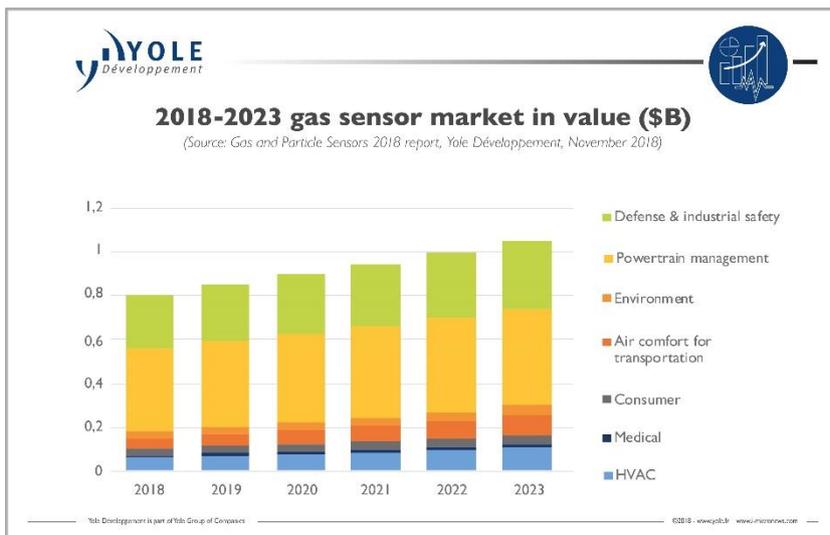
**FOR IMMEDIATE RELEASE:**

**Air quality monitoring: cars, homes & buildings are driving the gas and particle sensor market**

*Extracted from the following reports: Gas and Particle Sensors 2018 report from Yole Développement - Miniaturized Gas Sensor Comparison 2018 report from System Plus Consulting*

**LYON, France – November 27, 2018:** Air quality monitoring in cars, homes and other buildings is driving the gas and particle sensor market.

Yole Group of Companies including [System Plus Consulting](#) and [Yole Développement \(Yole\)](#) is covering the gas and particle sensor industry with two dedicated analysis: [Gas and Particle Sensors technology & market analysis](#) and [Miniaturized Gas Sensor Comparison](#). Both partners combined their expertise to analyze the evolution of the sensing technologies and identify its impact within different gas and particle monitoring market segments. The reverse engineering and costing company, System Plus Consulting proposes a detailed structural, process & costing report focused on four gas sensors for consumer applications made by leading device manufacturers: Robert Bosch, ams and Sensirion. To complete this technology approach, the market research and strategy consulting company Yole reveals its vision of the gas & particle sensor markets, with detailed market segmentation, competitive landscape, market forecasts, technology roadmap...



Outdoor air pollution is one of the major challenges of the 21st century, announces Yole Group of Companies. About 4 million deaths globally are attributed to it<sup>1</sup> in 2014. Later, another estimate in 2016, is that more than 90% of the world’s population lives in regions where air pollutant levels are higher than the WHO<sup>2</sup> specified limits. Thus, there is a global drive to tackle this problem,

specifically by developing and installing gas and particle sensors. Analyst of Yole Group of Companies give you below a snapshot of this industry.

<sup>1</sup> Source: World Health Organization (WHO) estimate, 2014.

<sup>2</sup> WHO : World Health Organization

For a long time, gas and particle sensor market has been restricted to industrial applications to ensure air quality control and workers' safety. Then, gas sensing have been steadily adopted for HVAC. Here the main driver was the energy consumption saving enabled by better control of the air conditioning. Nowadays, degradation of the global air quality is impacting many different places, homes, offices, hotels, cars and urban areas.

The market has therefore evolved and the primarily market driver is today the air quality monitoring to ensure inhabitant and user safety. Air quality control is even becoming a selling argument to promote hotels or restaurants!

This trend also extends to other environments, such as personal vehicles, public transportation, and homes.

As an example, the market for air purifier systems, which often embed gas and particle sensors, is expected to expand from US\$16 billion in 2017 to US\$33 billion in 2023 with an impressive 12.5% CAGR<sup>3</sup>.

Commercial vehicles have increasingly adopted gas and particle sensors onboard to ensure high quality of air for their customers. Previously sensors were embedded in-cabin to activate the air conditioning system when CO<sub>2</sub> and VOC<sup>4</sup> concentrations become critical. Today, additional sensors can be found out of the cabin to sense the outside environment and close the ventilation system if pollution is detected. MOS<sup>5</sup> is the preferred technology because of its low cost, small size and improved sensitivity compared to previous generation. To support this increasing market demand, historical players involved in gas sensors, such as Paragon, and Amphenol, which has acquired SGX, are now developing particle sensors. The big sensor leaders like Robert Bosch and Sensirion have identified the air quality market as a very promising one. They are therefore using their know-how to develop new technical solutions for both gas and particle sensing.

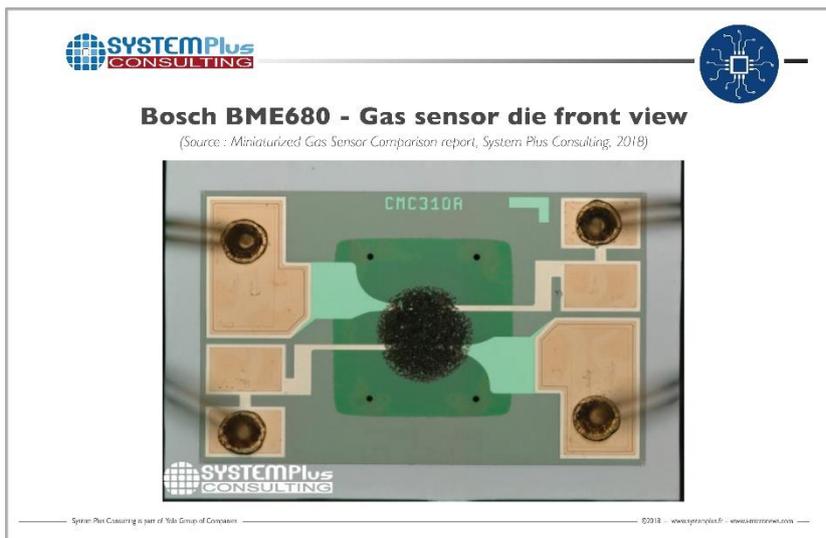
Although it had big promise, the consumer segment is taking more time than expected to be a real significant share of the gas sensors market. Nevertheless consumer depollution systems for example are growing fast especially in Asia. Those systems often include both gas and particles sensors.

*"Gas sensors miniaturization has allowed their introduction to consumer applications and their manufacture in large volumes", explains **Audrey Lahrach, Cost Analyst from System Plus Consulting**. And she adds: "At System Plus Consulting, we engaged a deep analysis of the technologies developed by the leading companies such as Robert Bosch, ams and Sensirion. Our aim was to identify and understand the technical choices as well as evaluate the related manufacturing costs. According to our results, technological choices especially at the integration level point out the*

<sup>3</sup> CAGR: Compound Annual Growth Rate

<sup>4</sup> VOC: Volatile Organic Compound

<sup>5</sup> MOS: Metal Oxide Semiconductor



performances of each device and so the market segments devices' manufacturer targets.” Under its miniaturized gas sensor report, System Plus Consulting has reviewed four different gas sensors from three manufacturers. The analysts propose a relevant comparison of the following components: the AS-MLV-P2 and the CCS801 from ams, the BME680 from Robert Bosch and the SGP30 from

Sensirion. This report includes a relevant description of each structure and design, the related technical choices, process flows and costs.

Under a promising gas sensor market, expected to reach more than US\$ 1 billion in 2022, both partners, Yole and System Plus Consulting combine their expertise to propose a comprehensive view on both technology manufacturing disruption and business opportunities. Technical requirements, gases to be measured, market forecasts, technologies, main suppliers and regulations are fully analyzed in the collection of reports performed by the partners.

Discover a detailed description of both reports on Yole Group websites: [Gas and Particle Sensors Technology & Market Analysis](#) and [Miniaturized Gas Sensor Comparison](#).

**ABOUT THE REPORTS:****Gas and Particle Sensors 2018**

*Air quality is breathing life into the sensor market!* – Performed by Yole Développement, part of Yole Group of Companies.

**Companies cited in the report:**

Air Liquid, AKM, AlphaMOS, AlphaSense, Alphasenzors, Amphenol, ams, APIX, Aryballe, Bosch, DD Scientific, Delphi, DENSO, E+E, Edinburgh Sensors, eLichens, Figaro, GSS, Hanwei, Honeywell, IDT, Infineon Technologies... [Full list](#)

**Authors:**

- With almost 20 years of experience in MEMS, Sensors, and Photonics applications, markets, and technology analyses, **Eric Mounier**, PhD provides deep industry insight into current and future trends. As a Fellow Analyst, he is a daily contributor to the development of MEMS and Photonics activities at Yole Développement (Yole), with a large collection of market and technology reports as well as multiple custom consulting projects: business strategy, identification of investments or acquisition targets, due diligence on both the buy and sell sides, market and technology analysis, cost modelling, technology scouting, etc.

Previously, Dr. Mounier held R&D and Marketing positions at CEA Leti, France. He has spoken at numerous international conferences and has authored or coauthored more than 100 papers.

Eric has a Semiconductor Engineering degree and a Ph.D in Optoelectronics from the National Polytechnic Institute of Grenoble, France.

- **Benjamin Roussel, PharmD** is Director, Life Sciences and Healthcare at Yole Développement (Yole), part of Yole Group of Companies. By supporting industrial companies and R&D institutes in their development, Benjamin and his team are creating the bridge between innovative microtechnologies and numerous diagnostic, pharmaceutical, life science and medical device applications. Benjamin Roussel is the author of a large collection of market & technology reports focusing on bioMEMS, microfluidics and solid state medical imaging, and performs multiple custom consulting projects.

Thanks to his deep knowledge of these industries and related technologies, he has spoken in more than 20 industry conferences worldwide over the last five years.

Before joining Yole, Benjamin worked in an International Pharmaceutical company in the pharmacovigilance department.

He holds a Pharmacy diploma from the University Claude Bernard Lyon, France, in addition to a master's degree in Technology and Innovation Management from EM Lyon Business School, France

**Miniaturized Gas Sensor Comparison 2018**

*Comparison of four gas sensors for consumer applications made by Bosch, ams and Sensirion* – Performed by System Plus Consulting, part of Yole Group of Companies.

**A complete teardown analysis with:** Package views and dimensions - Package cross-sections - Precise measurements - Die descriptions - Technology descriptions - Cost analyses - Cost comparison...

**Authors:**

- **Audrey Lahrach** is in charge of costing analyses for IC, LCD & OLED Displays and Sensor Devices. She holds a Master degree in Microelectronics from the University of Nantes.
- **Véronique Le Troadec** has joined System Plus Consulting as a laboratory engineer. Coming from Atmel Nantes, she has extensive knowledge in failure analysis of components and in deprocessing of integrated circuits.
- **Yvon Le Goff** has joined System Plus Consulting in 2011, in order to setup the laboratory of System Plus Consulting. He previously worked during 25 years in Atmel Nantes Technological Analysis Laboratory as fab support in physical analysis, and 3 years at Hirex Engineering in Toulouse, in a DPA lab.



### ABOUT SYSTEM PLUS CONSULTING

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product. System Plus Consulting engineers are experts in Integrated Circuits – Power Devices & Modules – MEMS & Sensors – Photonics – LED – Imaging – Display – Packaging – Electronic Boards & Systems. Through hundreds of analyses performed each year, System Plus Consulting offers deep added-value, reports to help its customers understand their production processes and determine production costs. Based on System Plus Consulting's results, manufacturers are able to compare their production costs to those of competitors. System Plus Consulting is a sister company of Yole Développement (Yole). More info. on [www.systemplus.fr](http://www.systemplus.fr)



### ABOUT YOLE DÉVELOPPEMENT

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS & Sensors - Imaging - Medical Technologies - Compound Semiconductors - RF Electronics - Solid State Lighting - Displays - Photonics - Power Electronics - Batteries & Energy Management - Advanced Packaging - Semiconductor Manufacturing - Software & Computing - Memory and more...

The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. . For more information, visit [www.yole.fr](http://www.yole.fr) and follow Yole on [LinkedIn](#) and [Twitter](#).

- Consulting & Financial Services: Jean-Christophe Eloy ([eloy@yole.fr](mailto:eloy@yole.fr))
- Reports: David Jourdan ([jourdan@yole.fr](mailto:jourdan@yole.fr))

Yole Développement, System Plus Consulting, Knowmade, PISEO and Blumorpho are part of Yole Group of Companies.

Yole Group of Companies - Press Relations & Corporate Communication: Sandrine Leroy ([leroy@yole.fr](mailto:leroy@yole.fr))

###

