Airborne
Underwater
Geophysical
Signals

AirSENCE

ADVANCED
ACCURATE
AFFORDABLE

Continuous Ambient Air Quality
Micro-Monitoring Station
(caaqMMS)

Airborne Underwater Geophysical Signals

AirSENCE

Low-cost sensor-based air monitoring systems of the future are now essential for today's world… And they are here now!!!

AirSENCE

is an **Advanced, Accurate & Affordable** *continuous ambient air quality* **Micro-Monitoring Station-caaqMMS** which provides continuous, real-time, accurate and reliable measurements of air pollution and local weather data.

It provides concentrations for gaseous pollutants including NO, NO$_2$, CO, O$_3$, SO$_2$, VOC, CO$_2$ and also for all particulate matter fractions including PM$_{10}$, PM$_{2.5}$, PM$_1$. It can provide weather data for Wind Speed and Wind Direction, Noise, Rain-fall, and Light.

AirSENCE has been developed in collaboration with a leading-edge research institute: the **Southern Ontario Centre for Atmospheric Aerosol Research** (SOCAAR) at **University of Toronto.** It incorporates a fast-response, multi-parameter sensor array and robust machine learning-based signal processing and data fusion to provide an Industrial Internet of Things (IIoT) network for real-time, 24/7 ambient air monitoring

AirSENCE can be used for *any and every* kind of ambient air monitoring applications like:

- **Urban Pollution monitoring**
- **Industrial fence-line monitoring**
- **Ambient air quality research**
- **Air monitoring linked to quick action plans**
- **And many more….**

AirSENCE is highly effective for applications where quick action based on air pollutant levels are essential like *school air quality measurements, particulate monitoring on railway stations and/or loading stations, air monitoring of airports and seaports etc.* It is also an ideal and cost effective solution for large and critical projects like urban baseline data collection.

AirSENCE can be a most cost-effective partner for all your air monitoring needs as it provides *accurate data, ease of operations, portability, low maintenance, advanced communication, secured cloud storage*. In-short, it provides everything that users expect in a low-cost air monitoring station.

AirSENCE is the best caaqMMS to complement and support currently used reference systems by enabling efficient and accurate ambient air mapping - *effectively and accurately*
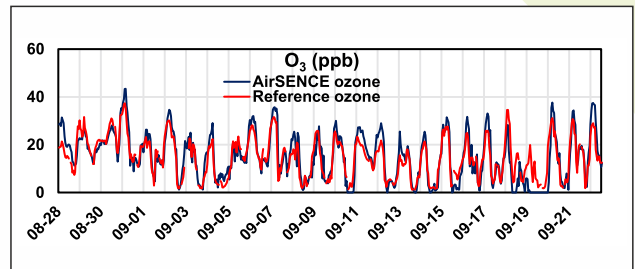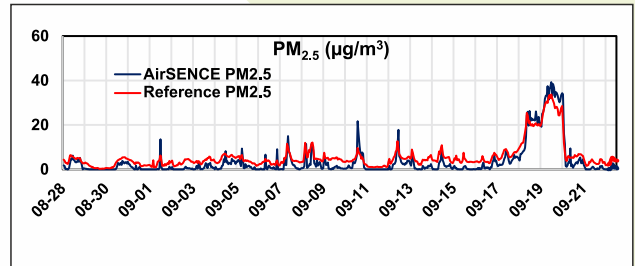
AirSENCE - SALIENT FEATURES

ACCURATE DATA
Data generated by AirSENCE has high correlation with reference system data

HIGH RESOLUTION DATA
AirSENCE provides high temporal resolution by generating continuous real-time data at every minute. User can acquire data with higher time intervals depending on their requirements.


LOW POWER CONSUMPTION
AirSENCE has an average power consumption of 6W and can be operated using solar power or external battery.

MODULAR DESIGN
AirSENCE has plug & play sensor design and sensors can be replaced in the field in minutes.

TINY FOOTPRINT
AirSENCE is small and light weight making it portable and easy to install

ANYWHERE INSTALLATION
AirSENCE can be installed on a pole or any vertical surfaces

WEATHERPROOF ENCLOSURE
AirSENCE has an IP65 rated weatherproof polycarbonate enclosure which allows installation in virtually any climate.
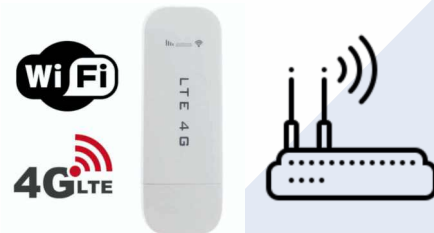
MULTIPLE COMMUNICATION MODES
AirSENCE offers 3 different communication modes including WiFi, Local Area Network (LAN) and 4G-LTE GSM.

DATA STORAGE & ACCESS
Every AirSENCE device stores data on a cloud server with web-browser based secure access having individual user-ID and password.
User can access the data *anytime* from *anywhere* using *any-device* like PC, Laptop, Tablet or even using Smartphone

GENERAL SYSTEM SPECIFICATIONS

Physical

Dimensions (H X W X D)	239mm (9.41") x 322mm (12.68") x 177mm (6.97")
Weight	2.2kg (4.85 lbs)
Operating Temperature Range	-10 to +55°C
Operating Pressure Range	300 to 1,100 hPa
Humidity Range	0 to 95% RH
Communication	Ethernet, Wi-Fi, 4G LTE Cellular with fallback to 3G
Enclosure Details	
Material	Polycarbonate
Rating	NEMA 4 / NEMA 4X IP65 sealing
Mounting Options	Pole mount or wall mount (kits availble)

Electrical

Power Supply	9-36 VDC at 5A OR Power over Ethernet
Power Consumption	6W average, 10W Max (w/o Cell), 15W Max (With Cell)
Certification	ESA

DATA MANAGEMENT

Data Computing and Storage

AirSENCE has an on-board micro-computer with the following specifications:

Computer Type	Micro-computer for IoT applications
Brand	Onion Omega
Mounting	Surface Mount
Computing	Drop-in WiFi-enabled Linux computing
Dimensions	34 x 20 x 2.8mm
Components	Built-in CPU, memory and flash storage
Processor	580MHz MIPS MT7688AN CPU
Other features	USB, ethernet, 2xUART's, I2C, SPI, GPIOs interfaces
Storage	32GB (Store's data for more than 5 years)

Data Accessibility

- Data is recorded at 1 minute intervals.
- Final polished Data is transferred from AirSENCE device to AUG cloud server or customer private server.
- Data can be transferred from AirSENCE device to any other server.
- Data is never handled by any external software while it is transferred from AirSENCE system to cloud server.
- Data can be viewed on AUG dashboard using individual secure login credentials.
- User can view & compare data of multiple AirSENCE devices on single dashboard.
- Downloaded data can be averaged over intervals of 1 minute, 2 minutes, 15 minutes, 1 hour or 24 hours.
- Data gets downloaded in CSV format.

SENSORS SPECIFICATIONS

Parameter/Pollutant	Detection	Optional Weather Sensor
Particulate Matter <10 μm (PM$_{10}$)	0 - 1,000 μg/m^3	Wind Speed & Direction
Particulate Matter <2.5 μm (PM$_{2.5}$)	0 - 1,000 μg/m^3	Rain Guage
Particulate Matter <1.0 μm (PM$_1$)	0 - 1,000 μg/m^3	Noise
Nitric Oxide (NO)	0 - 6,000 ppb	Solar & UV Radiation
Nitrogen Dioxide (NO$_2$)	0 - 9,000 ppb	
Carbon Monoxide (CO)	0 - 8,000 ppb	
Ozone (O$_3$)	0 - 9,000 ppb	
Sulfur Dioxide (SO$_2$)	0 - 10,000 ppb	
Carbon Dioxide (CO$_2$) (Optional Sensor)	0 - 10,000 ppb	
VOC (Optional Sensor)	0 - 40 ppm	

PRECONFIGURED MODELS

AirSENCE DUST-WATCH

Configuration:
PM Sensor (PM$_{10}$, PM$_{2.5}$ & PM$_1$),
Temperature, humidity, wind speed and wind direction, ambient noise

AirSENCE STANDARD

Configuration:
NO, NO$_2$, CO, O$_3$, SO$_2$, PM (PM$_{10}$, PM$_{2.5}$ & PM$_1$),
Temperature, humidity, wind speed and wind direction

AirSENCE PRO

Configuration:
NO, NO$_2$, CO, O$_3$, SO$_2$, PM (PM$_{10}$, PM$_{2.5}$ & Pm$_1$),
Temperature, humidity, wind speed and wind direction, ambient noise

AirSENCE ELITE

Configuration:
NO, NO$_2$, CO, O$_3$, SO$_2$, VOC, CO$_2$, PM (PM$_{10}$, PM$_{2.5}$ & PM$_1$),
Temperature, humidity, wind speed and wind direction, ambient noise, rainfall

URBAN / CITY MONITORING

Air monitoring in urban areas has now become a necessity due to exponential growth of the cities. Emissions from increasingly dense vehicular and infrastructure activities are the major sources of air pollution in these areas and have completely changed the air quality characteristics of major cities around the world. Most cities around the world still lacks comprehensive air pollutant baseline data which poses major hurdles in formulating development strategies and infrastructure planning.

Conventional air monitoring systems have severe limitations for creating spatial and temporal pollution maps of any cities because of their size and cost. Every city is currently in need of *Air Mapping* using networks of low-cost air monitoring systems rather than just *Measuring Air* at a few locations.

The Advanced, Accurate and Affordable features of AirSENCE are the perfect fit for creating Air Mapping network in any city around the world. Its *small foot-print, low initial cost of procurement, accuracy of results, ease of installation, operation and maintenance, autonomous operation and data handling* makes it the most ideal choice for urban air quality monitoring.

Recommended Model: AirSENCE PRO

THERMAL POWER PLANT

Coal based power plants continue to be operated on a massive scale around the world. They are the major contributors to the world's air pollution because of the sheer volumes of coal they burn, and insufficient measures being deployed to treat their emissions.

Major air pollutants emitted to the atmosphere from any coal based thermal power plants are *Particulate Matter, NO_x and SO_x*. Particulate Matter pollutants includes *fine coal particles, fly ash after coal burning and sulphates and nitrates particles which are generated during combustion.* Due to massive heights of thermal power plants stacks, severe effects of these emissions show up several kilometers away from these power plants and can extend for several hundred kilometer.

As a caaqMMS, AirSENCE provides real-time continuous measurements of all PM fractions and other gaseous pollutants along with essential weather parameters. It's unique features makes it the most suitable solution to monitor ambient air around thermal power stations.

Since most of these plants are situated at remote locations, features like *low cost of procurement, ease of installation, autonomous operation, low maintenance cost, remote data storage, accessibility of data on smartphone, networking of devices etc.* make AirSENCE the best solution for this most critical application.

Recommended Model: AirSENCE STANDARD

CEMENT PLANTS

Cement is one of the most essential raw materials for the development and continued growth of any country. At the same time, the cement industry is a major contributor to the total air pollution load of the world. Every aspect of the cement industry contributes to the problem, including extraction and transportation of raw materials, its manufacturing process and transportation of the finished product.

The cement industry heavily emits both gaseous as well as particulate pollutants. Major gaseous pollutants emitted during manufacturing process are CO_2, CO, NO_X and VOCs. Particulate pollution includes all PM fractions which are PM_{10}, $PM_{2.5}$ and PM_1 and sources of which includes raw material transportation, the manufacturing process and even the transportation of the finished product.

As a caaqMMS with sensors for NO, NO_2, CO_2, VOC and PM as well as wind speed and direction, AirSENCE provides a tailor-made solution for real-time continuous monitoring of ambient air in and around the cement industry. Features like "cost effectiveness, operational simplicity, lack of routine maintenance protocols and ease of data storing and viewing" makes it the best air monitoring solution for cement manufacturers.

Recommended Model: AirSENCE STANDARD

CHEMICAL INDUSTRIES, REFINERIES & INDUSTRIAL AREAS

Chemical industries and refineries are the major global sources of various gaseous pollutants, particularly VOCs. These industries are critical contributors to the world's overall air pollution load as they emit pollutant gases not only during their manufacturing processes but also during the transportation of raw materials and finished product.

VOCs emitted from such plants are now a major cause of concern for authorities and citizens situated around them, as VOCs are an indirect but major contributors in smog generation. VOCs and NO_2 in atmospheric air generates tropospheric ozone (O_3) in the presence of sunlight. This tropospheric ozone generates smog when combined with $PM_{2.5}$ particles and NO_2. This smog is a major nuisance around several parts of the world as it leads to road accidents and respiratory diseases.

AirSENCE is a caaqMMS with a full range of gas sensors making it the best solution for continuously monitoring ambient air in and around such chemical plants and refineries. AirSENCE can be effectively used by authorities to carry out air pollution monitoring of areas with dense chemical industries as well as the residential areas near to them. Data provided by AirSENCE can be best utilized by authorities to understand how and to what magnitude these air pollutants infiltrate into residential areas and to take remedial measures.

Recommended Model: AirSENCE ELITE

AIRPORTS / RAILWAY STATIONS / SEAPORTS

Nowadays it has become essential to monitor air in and around mass commuting area like airports, railway stations & even the seaports.

Ambient air around any airport usually has high concentrations of particulate matter and gaseous pollutants like NO, NO_2 and VOCs emitted as a result of aircrafts as well as transportation and fuelling. These pollutants are able to infiltrate into airport terminals and severely affect the wellbeing of those inside the terminals. High commuter turnouts also elevate CO_2 and noise levels inside the terminals.

AirSENCE with sensors for all gaseous and PM pollutants combined with noise sensor provides tailor made solution for airport authorities to monitor external and internal air. Advanced features and accurate data of AirSENCE allows authorities to take immediate corrective actions.

Similarly, railways and seaports have remarkably high concentrations of particulate & noise pollution. Continuous movement of trains causes particulate matter to enter inside railway stations, while high commuter volumes, public address announcements and train horns increase the noise pollution and affect commuters adversely. Similarly, the continuous loading and unloading of ships in seaports generates a substantial amount of particulate pollution. Seaports also observes very high levels of noise coming from high decibel ship horns.

Recommended Model: For Airports AirSENCE ELITE

For Railway Stations & Seaports AirSENCE DUST-WATCH

SCHOOLS PREMISES MONITORING

Various studies by well-known universities have explicitly shown that air pollution in schools is a major cause of poor performance and attendance of students as they spend much of their time in school premises.

Due to increased social awareness, parents around the world are now knowledgeable of the high health hazards associated with air pollution and they are raising their concerns with school authorities regarding this issue.

AirSENCE with its *small footprint, ease of operations and maintenance with capability of displaying air monitoring results on LCD screens* makes it the most suitable choice for school management. Online displays of air quality measurement results imparts much-needed confidence to parents and enhances a school's reputation.

Recommended Model: AirSENCE STANDARD

AIR QUALITY RESEARCH

Air quality research has come a long way in past 50 years but in last decade there are major advances in technologies and remarkable developments in air monitoring instrumentation, methods and other tools to measure and monitor air quality and evaluate emissions from various air pollution sources. Air quality research institutes are working on various applications like *Determining the sources and compositions of air pollution, conducting exposure assessments, improving monitoring capabilities and supporting public health research.*

Air quality research institutes are carrying out extensive research to understand the sources of air pollutants, how those pollutants are transported through the environment and how people and ecosystems are exposed. This is enables the formulation of more effective and targeted air quality management solutions.

Researchers are developing, evaluating, and applying measurement and monitoring capabilities to better characterize source emissions, air quality, and human and environmental exposures for individual and mixtures of air pollutants.

AirSENCE, a comprehensive caaqMMS with all relevant gas, particulate, and weather sensors provides powerful tool for researchers to carry out short and long studies at various locations. Features like *small footprint, light weight, easy portability, installation in all types of climates, accurate data, easy operation, low maintenance and data accessibility on smartphone* make AirSENCE the best tool for modern air quality research.

Recommended Model: AirSENCE ELITE

AIR MONITORING AROUND LANDFILL SITES

Megacities produce vast quantities of solid waste and landfills are the major headache for every municipal corporation around the world. Obnoxious odours and mixture of air pollutants are major components of landfill emission and air pollutants emitted are CO, NOx, SO_2, CO_2, Particulate Matter, Hydrocarbons and VOCs.

AirSENCE, a caaqMMS provides most effective solution for fence-line monitoring of landfill sites. All the relevant gas and particulate sensors are installed in a small, lightweight enclosure making AirSENCE the best tool to monitor landfill air emissions. Easy installation, autonomous operation, low maintenance and smartphone data accessibility enables authorities to measure air pollutants of such hazardous sites very effectively from remote locations.

Recommended Model: AirSENCE ELITE

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