2B Technologies
An InDevR Company

2B Buzz

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Model 211 Scrubberless Ozone Monitor Certified as a Federal Equivalent Method (FEM)

Designation of the Model 211 Ozone Monitor as a Federal Equivalent Method (FEM) was published in the Federal Register on June 18, 2014. As a designated FEM, the Model 211 Ozone Monitor may be used by states and other monitoring agencies under 40 CFR Part 58, Ambient Air Quality Surveillance, for monitoring for compliance with the Clean Air Act. The Model 211 replaces the traditional solid phase ozone scrubber with a titration of ozone using nitric oxide gas generated on-line in the photolysis of nitrous oxide. The N_2O may be supplied from "Whippit" cartridges (used for producing whipped cream) for portable applications. Because of its lack of interference from other UV-absorbing species such as aromatic compounds and mercury vapor, the Model 211 provides a more accurate measurement of ozone. Use of a gas-phase ozone scrubber assures that potentially interfering species occur at the same concentrations during both reference and signal measurements, thus cancelling their contributions to the ozone determination. For the past

two years the Model 211 has been undergoing testing by the EPA for evaluation as a possible new Federal Reference Method (FRM) as well.

New Product: Model UV-106-W Aqueous Ozone Monitor™

For our industrial ozone customers we recently developed a new ozone monitor that is capable of measuring dissolved ozone even in "dirty" water where interfering UV-absorbing compounds and particulates may be present. The Model UV-106-W Aqueous Ozone Monitor™ uses our patent-pending MicroSparge™ technology to measure dissolved ozone in water with high precision and accuracy. Unlike most dissolved ozone sensors, the instrument does not make use of a membrane that will foul over time. Instead, dissolved ozone is measured by nearly complete sparging of ~2 mL of water with ozone-scrubbed ambient air and integrating the gas-phase concentration of ozone stripped from solution. A small correction, based on the temporal profile of ozone removed from solution, is made to account for any dissolved ozone remaining. Because ozone is measured in the gas phase, interferences from particles and dissolved inorganic and organic compounds are removed, making the instrument applicable to both ultra pure water and "dirty" water, such as drinking water, which can contain a wide variety of dissolved inorganic and organic impurities and suspended particles.

Features:

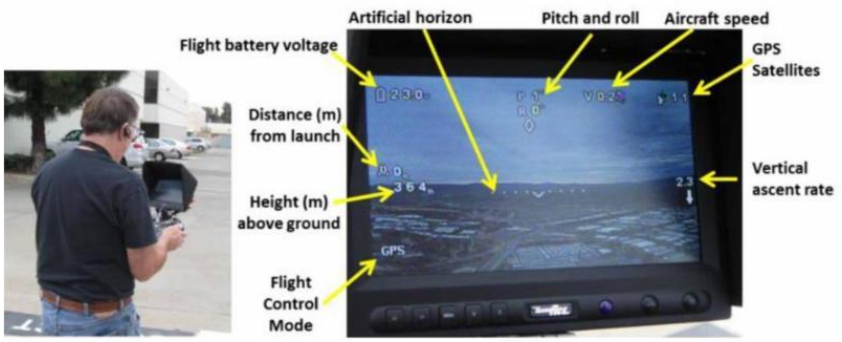
- Interference-free measurement of dissolved ozone in ultra pure or "dirty" water
- NEMA water-proof housing
- New measurement every 10 s
- Internal data logger logs 16,368 lines of data
- Precision and accuracy of 0.05 ppm or 1% of reading
- Both serial and user-scaleable analog outputs (0-2.5 V

and 4-20 mA)
- Selectable data averaging times of 10 s, 1 min, 5 min and 1 hr (custom averaging times available)
- LED alarm

Our new Aqueous Ozone Monitor is currently undergoing beta site testing. We expect to begin accepting orders on September 1, 2014. For more detailed information on the Model UV-106-W, including a schematic diagram and specifications, see Model UV-106-W.

Case Study: Quadcopter Profiling of Ozone and Meteorological Parameters by T&B Systems

In recent years there have been significant advances in the technology, performance and affordability of small Unmanned Aerial Vehicles (UAVs). Because of these advances, they have been demonstrated to provide a versatile sampling platform for a wide variety of measurements. T&B Systems has recently developed and tested a platform based on quadcopters.

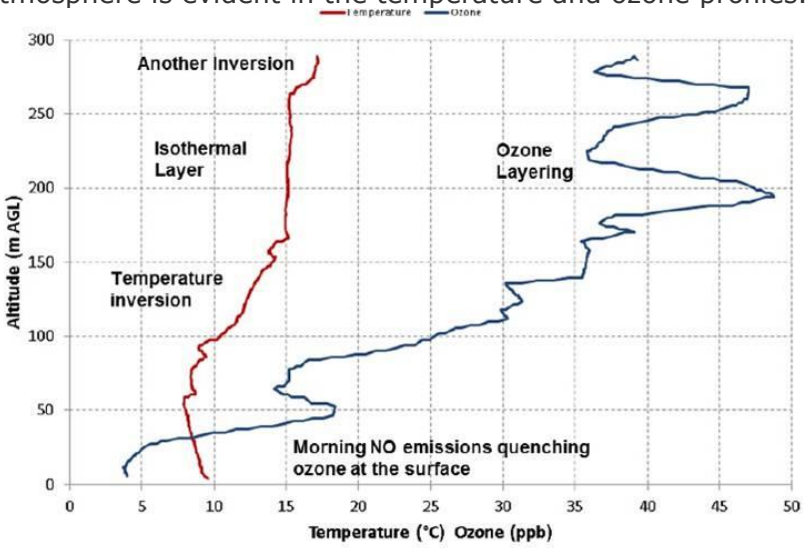


The T&B Systems platform includes precise flight controls with first person view, display of flight parameters and air to ground telemetry of key data.

Data collected using this platform include meteorology, air quality, high definition video and other information using specially adapted sensors that are similar to what can be used on tethered or free-flight balloons. The difference is that the tether is removed, allowing a controlled flight to areas of interest based on visual images and telemetry of real-time data to a ground station displayed on a flight control screen.

The T&B Systems quadcopter makes use of the 2B Technologies Personal Ozone Monitor (POM) for ozone measurements.

Autonomous modes can be flown with pre-programmed flight paths and waypoints to repetitively document environmental changes over time. An example of vertical profiles of ozone and temperature obtained during winter in southern California is shown below. Ozone was measured using a 2B Tech Personal Ozone Monitor (POM). These data show a low lying temperature inversion near the ground and very low ozone near the surface . Ozone is much higher, however, within a few hundred meters of the surface, and the complex layering of the atmosphere is evident in the temperature and ozone profiles.



Unlike fixed wing platforms, the multi-rotor systems can also be "parked" with high precision at an X-Y-Z coordinate for measurements over a time period to collect integrated particulate or gaseous samples, or visibly document air quality conditions, such as the location of a visible plume. Additionally, methods are being developed for the measurements of winds using the technology this platform provides.

Because of the promising future of UAV platforms for studies of air pollution, T&B Systems has acquired multiple systems and

is continuously working with them to develop instrumentation, data links and applications. For more information about applications of UAV platforms for air pollution meteorological studies, contact Bob Baxter at bbaxter@tbsys.com.

Air Pollution News: Ethanol Fuels Ozone Pollution

For those of us who have considered ethanol a panacea for green fuel, a recent study in Brazil may have us thinking twice!

In São Paulo, a shift in vehicles using ethanol rather than gasoline has been found to increase ground-level ozone pollution. Ozone at ground level can be very harmful to the health of humans, crops, and ecosystems. It's also a greenhouse gas and contributes significantly to global warming. In São Paulo and around the world, ground-level ozone is being formed when sunlight drives a chemical reaction with hydrocarbons and oxides of nitrogen emitted from vehicles (among other sources).

Though ethanol has been promoted as a "green" fuel, its impact on air quality has been difficult to assess until recently, when a study published in Nature Geoscience explored what happened when the residents of São Paulo (the largest city in the Southern Hemisphere) changed their fuel habits.

São Paulo Smog

Ethanol prices are largely determined by the global prices of sugar, which is fermented to produce the fuel. In the past few years the world has been witness to large fluctuations in the

cost of ethanol. However, in São Paulo, the government has controlled a steady price for gasoline, causing a rise in gasoline consumption. This has provided researchers an opportunity to assess the impact of "a large switch [to gasoline] over a relatively short timescale," says Alberto Salvo, an economist at the National University of Singapore. The results? The rise in gasoline consumption has caused an average drop of 15 micrograms per cubic meter in ground-level ozone concentration.

But how could burning gasoline instead of ethanol actually reduce ozone formation? It is believed that gasoline combustion results in higher hydroxyl radicals concentrations in the atmosphere. Nitrogen dioxide combines with hydroxyl radicals to form nitric acid. This creates a "quenching effect" which shuts down ozone-forming reactions, resulting in lower ozone levels.

Ultimately, there is no cure-all when it comes to fuel; burning gasoline clearly has its own set of burdens on environmental health. Nevertheless, these findings illustrate that ethanol may not be the golden (or should we say green) child of the future of fuel.

For more details please see:
http://www.nature.com/news/ethanol-fuels-ozone-pollution-1.15111

Announcing GO3 Treks

2B Technologies was pleased to receive a Phase I SBIR grant from the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health (NIH) to provide an exciting, real-world STEM project to fund students from 50 schools around the US to monitor in real-time their personal exposure to air pollution. The GO3 Treks project will be carried out in collaboration with the GO3 Foundation.

In this project, each school will be loaned portable air pollution monitors to measure black carbon and ozone. Students will form and test hypotheses about the spatial and temporal variance of these pollutants in their neighborhoods and measure their own

personal exposures, while learning about the sources and transformations of air pollutants, their associated health risks, environmental justice, and much more.

Students will carry out personal monitoring experiments of their own design, such as measuring ozone as a function of altitude on a hike through the Rocky Mountains, or exploring the difference in black carbon levels as they walk across the Golden Gate Bridge. The data will be uploaded to Google Maps/Earth for display and discussion by students around the world in a blog format on the GO3 Social Network.

2B Tech Personal Ozone Monitor (top) and AethLabs microAeth personal black carbon monitor (bottom) will be used in the GO3 Treks project.

Follow this newsletter for highlights of these exciting student air pollution measurements starting this fall semester in 50 schools around the US!

GO3 Treks Participating Schools