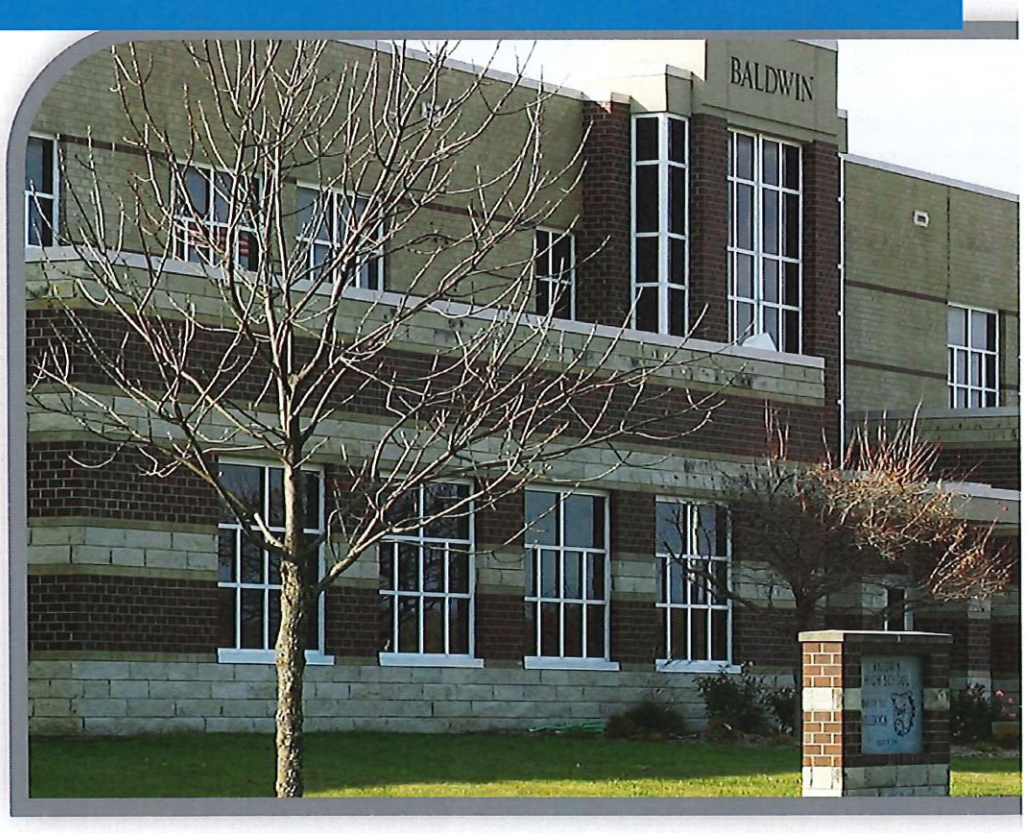
WILLDAN

Ion Generator Air Quality Report



For Baldwin USD 348

Presented to Superintendent Paul Dorathy

7/29/2021

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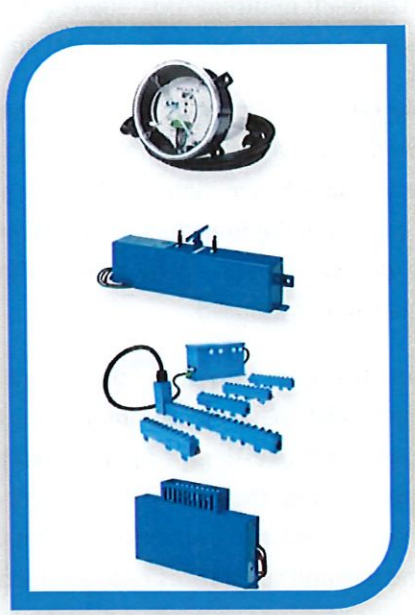
Project Summary



Willdan Performance Engineering executed an investigation of air quality at your facility in response to your investigative inquiry due to a pending litigation against the manufacturer of air filtration device that uses Needlepoint Bipolar Ionization (NPBI), Global Plasma Solutions (GPS).

Testing was performed at your facility to show actual air quality data with the NPBI equipment running and disabled to determine if any byproducts were being introduced at harmful concentrations because of their operation. Measurement was performed of an array of potential air pollutants including Ozone (O_3), explosive hydrocarbons such as Methane (CH_4), Carbon Monoxide (CO), Hydrogen Sulfide (H_2S), Volatile Organic Compounds using Isobutylene as the detection source ($(CH_3)_2C=CH_2$), and Formaldehyde (CH_2O). The results of this testing are recorded in this report.

Based on the air quality data reported from the facility, there is no material detectable generation of harmful byproducts, ozone, or volatile organic compounds as a result of the operation of the NPBI devices. All measurements of harmful substances, if any were detected at all, were well below all thresholds for safety, and present with or without the operation of the NPBI devices. This means that the facilities are safe to occupy for any length of time without being harmful to occupant health.

Should facility administrators desire to continue operating the NPBI devices to provide additional protection to occupants from contaminants such as Sars-CoV-2, they can do so without concern that the devices are generating these harmful substances in their facilities.

Disclaimer: This report is not intended to provide legal advice, or support or refute the allegations made in pending litigation against the manufacturer as they relate to the lawsuit filed against GPS. Rather, this report is intended to inform administrative and occupying individuals of the facilities' actual air quality conditions, so that informed decisions can be made regarding the operation and occupancy of the buildings.

Background

The recent Covid-19 pandemic has had a significant impact on the lives of all persons. Facility administrators in particular have been eager to find ways to allow buildings to reopen to the public so that some semblance of "normalcy" can return to daily life. However, in order to ensure the safety of building occupants, changes to facility ventilation systems needed to be considered to ensure every reasonable measure could be taken to protect those within its walls. NPBI was selected as a filtration solution because it allows for effective

contaminant neutralization and reduction and could be installed in existing equipment unlike MERV-13 filters which the current equipment is not sized for.

More recently, a lawsuit was filed against GPS claiming that their products are not safe and create harmful byproducts as a result of their operation. This pending litigation is being treated very seriously, as the health and safety of facility occupants is the very purpose for installing this equipment. In order to ensure that occupants are safe from the introduction of harmful byproducts, Willdan Performance Engineering acquired equipment to test for a variety of harmful air pollutants, so that actual facility conditions could be observed, and the safety of the occupants assured.

One of the most worrisome claims against GPS products is that they generate harmful VOCs (Volatile Organic Compounds). VOCs come in numerous forms with varying degrees of detrimental impact they can have on human health. Testing was performed to detect the presence of VOCs generally using a standard Photoionization Detector (PID), as well as a specific gas detector for Formaldehyde, as this VOC, in particular, can be harmful in lower concentrations. The equipment selected was calibrated so that if concentrations of any of the harmful substances exceeded long term limits for safety, the equipment would alarm, so that field technicians would be made aware and could record areas with dangerous concentrations of harmful substances.

Testing Procedure

To effectively and efficiently deploy testing equipment to a field location, handheld gas analyzers and air quality testing equipment were selected which could be utilized and operated in the spaces and provide immediate feedback. The Honeywell MultiRae Lite (Pumped) was selected for its ability to detect multiple substances simultaneously including Carbon Monoxide, Hydrogen Sulfide, Low Explosive Limit (a measure of Methane or other explosive hydrocarbon concentration in the air), VOCs (with Isobutylene as the test gas), and Formaldehyde. An Aeroqual 500 air quality meter equipped with an Ozone detection attachment was also utilized. GPS products meets UL 2998 standard certification for zero ozone emissions, meaning it should not produce any ozone, but testing for the presence of ozone was performed to verify. Finally, an Air Ion Counter AIC2 measured the ion concentration of the space to confirm that the ion generators were operating and generating ions during the testing.

Testing was performed in two phases, with the ion generators disabled to identify background chemical concentrations, then with the ion generators enabled to determine if the chemical concentrations were increased, decreased, or unaffected. The chemical detecting devices were allowed to operate for at least a few minutes so that their readings reached a steady state, and measurements taken. If any of the equipment alarmed, meaning that the concentration of a measured chemical exceeded the long-term exposure limit defined by OSHA, it was noted in the test documents, otherwise the measured space was deemed "safe" from harmful concentrations of the detected substance.

A number of spaces were selected to provide a sample of various space types and HVAC equipment throughout the facility. Testing equipment was placed within the space being tested typically on a table or other surface in a somewhat centrally located area of the room to simulate where occupants would likely reside and obtain reasonable measurement. Note was taken of any unique space conditions that could have an impact on the measured chemicals.

Results

The data for all testing performed are listed later in the report. However, the below table provides a quick overview of all the measurements themselves from all the sample spaces.

Table 1: Measured Air Pollutants During Testing

	Ion Generators Disabled							Ion Generators Enabled						
Space Name	Neg Ions (ions/cc)	O_3 (PPM)	LEL (%)	CO (PPM)	H_2S (PPM)	VOC (PPM)	CH_2O (PPM)	Neg Ions (ions/cc)	O_3 (PPM)	LEL (%)	CO (PPM)	H_2S (PPM)	VOC (PPM)	CH_2O (PPM)
Room 109	$-3.62x10^3$	0.000	0.0	0.0	0.0	0.0	0.05	$-2.48x10^3$	0.000	0.0	0.0	0.0	0.0	0.06
Room 107	$-1.95x10^3$	0.000	0.0	0.0	0.0	0.0	0.05	$-0.77x10^3$	0.000	0.0	0.0	0.0	0.0	0.05
Commons Floor 1	$-2.40x10^3$	0.000	0.0	0.0	0.0	0.0	0.08	$-1.22x10^3$	0.000	0.0	0.0	0.0	0.0	0.12
Library	$-2.49x10^3$	0.000	0.0	0.0	0.0	0.0	0.11	$-1.96x10^3$	0.000	0.0	0.0	0.0	0.0	0.13
Room 202/206	$-1.69x10^3$	0.000	0.0	0.0	0.0	0.0	0.09	$-6.52x10^3$	0.000	0.0	0.0	0.0	0.0	0.10
Room 213	$-2.04x10^3$	0.000	0.0	0.0	0.0	0.0	0.11	$-0.72x10^3$	0.000	0.0	0.0	0.0	0.0	0.10

As can be seen from the above table, all of the potential pollutants that were tested for, including ozone, were either not present, or in such small concentrations as to not even be perceptible to the measuring devices. It should be noted that the formaldehyde detector is more sensitive than the other detectors due to the need for low concentration detection. The data provided does show a slightly higher concentration of formaldehyde in at least one location when the ion generators were enabled, however, the measured values are nearing the threshold limit of the equipment to measure concentration and the change does not represent a significant increase that can be attributed to the operation of the GPS equipment, nor does the change represent the presence of any threat to occupant health. Formaldehyde is considered dangerous at concentrations as low as 1 part per million (PPM) and is not allowed by OSHA to exceed 0.75 PPM for long-term exposure. For the most part, other compounds require at least 10 PPM (10% LEL) or more before they are considered harmful to humans and thus do not require the same precision in detection.

Results of ion counts measured in this test were not conclusive. Ions in the air are simply charged particles that occur in nature such as from a thunderstorm. Consequently, ambient conditions can have a wide variance. These measurements were taken on different days, with the meter being calibrated to outside condition both days. Perhaps ambient environment on the second day of the readings had a higher ion count due to a large storm that was in the area during the time of testing. In retrospect the full test should have been conducted during a single day to eliminate variable of changing background levels. Note that ions generated by NPBI dissipate within minutes so there is no need to wait long after the devices are turned off to conduct the second set of readings. Similar tests were conducted at Pratt USD 382 with all measurements taken on the same day. At Pratt there was also no or very trace amounts of all the same pollutants measured, however, ion counts were higher with the GPS devices on compared to off, as expected.

Conclusion

The testing performed at the facility concludes that the occupant safety is being maintained, and the NPBI equipment is not impacting the air quality in any dangerous way. Furthermore, there is no evidence to show that the NPBI devices are generating additional harmful compounds in the occupied environment. The only VOC even perceptible to the measurement equipment, formaldehyde, remained well below the limit for safety and is

consistent with typical background levels of any healthy environment, as formaldehyde is a byproduct of many regular organic and other reactions.

It should again be noted that this testing is specific to the facility in question. Willdan Performance Engineering is not attempting to prove or disprove the allegations made in the pending litigation against GPS, as the scientific research referenced in those claims were made under very specific testing conditions which differ from the conditions of the facility tested in this study. Rather, this study was carried out to demonstrate whether or not the air quality within the space is safe and if the NPBI devices were negatively impacting that air quality and endangering the occupants.

Further testing could be carried out if specific dangers are discovered that may not have been explored in this study. However, it is the opinion of the facilitators of this study that the findings herein are more than sufficient in proving the safety of the equipment installed in the facility in question as testing has shown no indication of harmful substances nearing any level of concern being generated, or present, in the facility.