The Value of Auto-Cleaning
for Needlepoint Bipolar Ionization Systems

WHITE PAPER

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CONVENTIONAL IONIZATION DESIGN

Direct current (DC) bipolar ionization (BPI) units utilize two electrodes; one that is always positively charged and the other that is always negative. Any particles of the opposite polarity passing by the electrode will be attracted to the electrode and stick. Over time the electrode tips become contaminated with deposits and the ionization output diminishes.

Several of the U.S. suppliers of conventional BPI systems use a design pioneered by Filt Air Ltd., known as the STERIONIZER™. The design incorporates metal needles that are 3/16" (5 cm) in height to provide the ion output for their products, as shown in Figure 1. Not only do these electrodes become contaminated with particles, they eventually erode (see Figure 2), resulting in almost no ion output. Several manufacturers of conventional BPI have taken a product designed for residential use and attempted to tailor it for commercial applications.

Figure 1.
Conventional needlepoint.

Figure 2. Eroded metal needles.

GPS has pioneered the development of Needlepoint Bipolar Ionization (NPBI) through several innovations, including (1) multipoint emitter brush as shown in Figure 3, (2) emitters made from inert carbon fiber, (3) auto-cleaning of the brush emitters. These innovations have led to more than ten times (10X) higher ion output, longer life of the unit and more reliable ion output. GPS has spent significant time and money on R&D and testing confirming ion output and performance to support the value of Particles reduced, Odor neutralized, Pathogens destroyed, and Energy saved.

Figure 3. GPS multipoint carbon fiber emitter.

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TESTING

The power required to make most dielectrics break down is greater than 12.07eV (electron volts). Every gas has an electron In a side-by-side comparison, a conventional bipolar ionizer and a GPS-DM48-AC™ were mounted in separate ducts. The manufacturer claims that the conventional unit tested is rated for 1,500 CFM, whereas the GPS-DM48-AC is rated for 4,800 CFM. The conventional unit only produces about 45,000 ions/cc at its peak. The GPS-DM48-AC produces an average of 450,000 ions/cc, with peaks over 750,000 ions/cc.

The GPS-DM48-AC was preset to auto-clean once every three days, which is the factory setting. The conventional units do not have a cleaning mechanism. To simulate actual use conditions, the conventional units were not manually cleaned during the test.

THE RESULTS

Figure 4 shows a comparison of the auto-cleaning GPS-DM48-AC to a conventional non selfcleaning bipolar ionization (BPI) module. The data was collected over a period of 4.5 months. During the first 3.5 months, the conventional ionization modules produced an average of approximately 29,000 ions/cc. However, after only four months of continuous operation, the conventional ionization module's ion output decreased to an average of 400 ions/cc. The GPSDM48-AC output remained at a consistent average level for the duration of the test at approximately 447,000 ions/cc, ranging between 300,000 and 600,000 ions/cc.

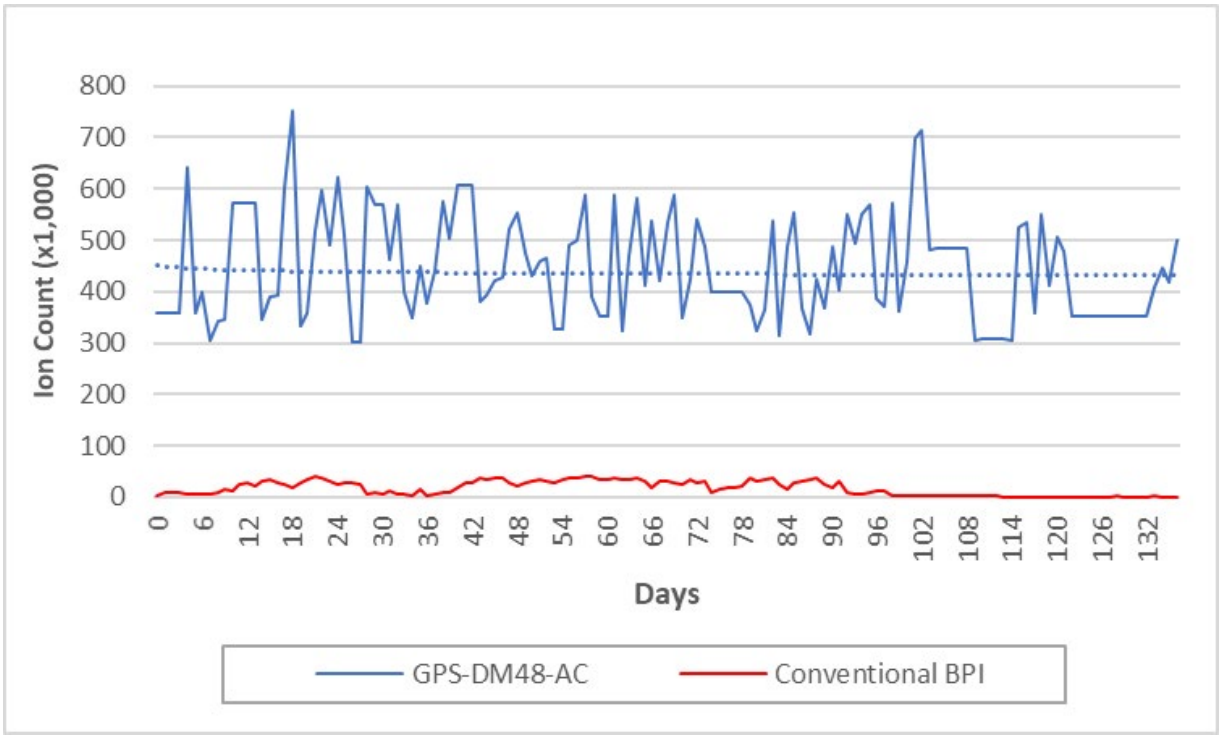

Figure 4. Ion Output of a GPS-DM48-AC versus a non self-cleaning conventional unit.

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THE COMPARISON

Manufacturers using the conventional BPI modules will use up to four modules in a single housing for a total claimed capacity of 6,000 CFM. This is done with the intent to claim to be competitive with GPS. Even with all four modules installed, the output would be a maximum of 180,000 - 200,000 ions/cc at the peak. That's still 50% less than GPS' average ion output.

Manufacturers of conventional BPI units claim that they don't lose ionization output because the needles are "recessed" and therefore don't get dirty. This is clearly not the case as demonstrated by the results of this test. Particles in an airstream are everywhere, especially submicron particles. Particles less than 0.3 microns in diameter are subject to Brownian motion and will randomly travel to the needles. Upon analyzing the needles after 4.5 months, it was clear that they were contaminated and discolored due to oxidation.

In addition to a reduced ion output due to particle impaction and deposition, the conventional modules also experience an ion output reduction as a result of using metal ionization needles versus GPS' carbon fiber brushes. Metal needles deteriorate over time in a DC ionization system, regardless of the type of metal. Carbon fiber brushes do not mechanically degrade or chemically deteriorate. Figure 5 shows a picture of the GPS carbon fiber brush after 4.5 months of operation during this test. As the picture shows, the carbon fiber brushes have maintained their integrity. Furthermore, as a result of the operation and cleaning cycle, the brushes "bloom,"further enhancing the ionization output and effective life of the units.

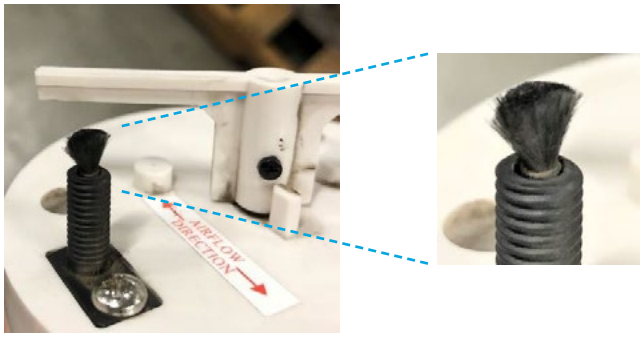

Figure 5. GPS carbon fiber emitter brush after 4.5 months of continuous operation.

Accelerated testing of the carbon fiber brushes show that the brushes undergo no degradation after more than 8 million cleaning cycles. At the factory setting of 1 cleaning cycle per every three days, the carbon fiber brushes have an effective echanical life of over 68,000 years.