zogics

BIG ASS FANS | CLEAN AIR SYSTEM

CLEAN AIR SYSTEM (CAS) DRAMATICALLY REDUCES AIRBORNE DISEASE TRANSMISSION INFECTION RISK IN FITNESS FACILITIES

*The installation of Big Ass Fans CAS ion technology on two **Powerfoil X3.0** fans in a fitness facility provides an average of more than 63k positive ions and 82k negative ions respectively, resulting in a SARS-Cov-2 infection risk reduction of 93% for a representative occupant.*

BACKGROUND:

During the public health conditions brought forth by the COVID-19 pandemic, public fitness environments have made significant changes to mitigate the risk of disease transmission. In addition to ubiquitous health screenings and social distancing measures, many facilities have initiated contactless check-ins, increased cleaning with a focus on high-touch areas, and are maximizing outdoor air intake from HVAC units to improve indoor air quality. Big Ass Fans (BAF) can provide additional safety measures using bipolar ionization equipment integrated into overhead HVLS ceiling fans to quantifiably improve the safety in public fitness environments. By using fans to distribute ions to the occupant breathing zone, BAF can leverage the **ions' ability to effectively deactivate pathogens** while simultaneously providing cooling airflow without the generation of harmful byproducts such as ozone.

PROJECT SCOPE:

BAF engineers installed two 14' Powerfoil X3.0 fans with **CAS** ion technology at one major fitness chain location. Relevant measurement setups were determined to characterize both the interaction of the two fans (where the highest generated ion concentrations were found) and the extents of the space (to find the minimum expected ion concentrations in the target area). (14) measurement locations were identified for testing at three distinct fan speeds (0%, 50%, 100%) and two sensor heights (43 and 67 inches above the finished floor) to align with definitions in **ASHRAE Standard 55**. BAF engineers measured both positive and negative ion concentrations at each measurement location as well as ozone concentrations to ensure no ozone was being produced by the ionizing equipment for 3 minutes for each polarity/height/fan speed. The reported values are 3-minute averages.

KEY DATA AND OUTCOMES:

The findings of the testing show the ability of the system to deliver significant ion concentrations of both polarities that will have a meaningful germicidal effect in the space. **Average ion concentrations exceeded 46k for both polarities at 50% fan speed and exceeded 63k for both polarities at 100% speed (figure 1). Also noteworthy is the fact that zero ozone was detected at any point in the testing window, confirming CAS products' ozone free certifications.**

Space Average Observed Ion Concentrations (Ions/cc)		
Configuration	Positive Ions x 1000	Negative Ions x 1000
Baseline (0%)	2.13	2.78
50% Speed	46.31	52.45
100% Speed	63.11	82.77

Figure 1: Ion Concentrations at various test conditions

Ion distribution was also generally even as demonstrated by the concentration gradients shown below (figure 2). The true impact of BAF-CAS implementation is a reduction in the infection risk for occupants. This can be modeled using the Wells-Riley infection model, in this case specifically for SARS-CoV-2 with a baseline of 1 outdoor air change per hour from the existing HVAC equipment, 60-minute occupancy, and one sick occupant in the facility (figure 3). **The results from this model show a 93% infection risk reduction, which means members are more than 14 times less likely to become infected in a space with BAF-CAS than with standard HVAC systems alone.**

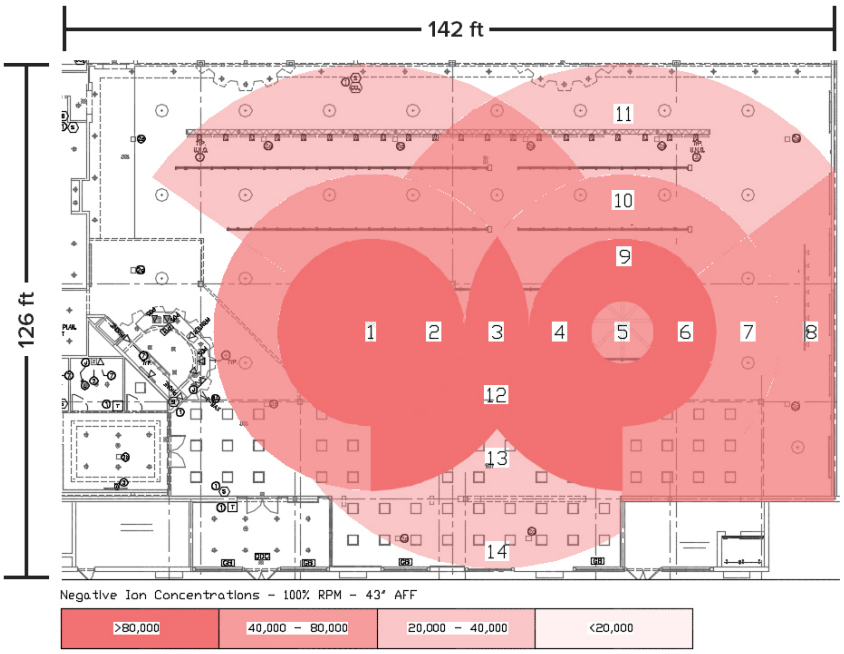

Figure 2: *Ion concentration gradient at 100% RPM and 43" AFF.*

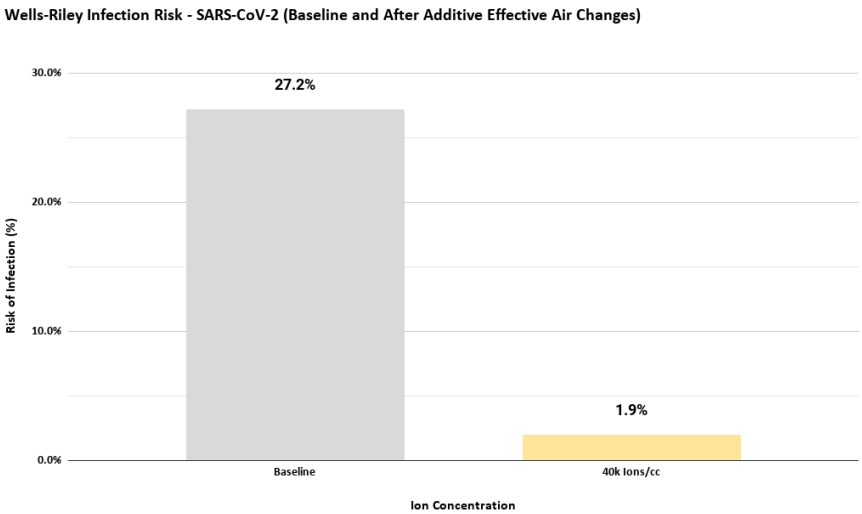

Figure 3: *Wells-Riley Risk Reduction Estimate for 40k avg. ion compared to baseline mechanical systems in a fitness facility.*

FURTHER ACTIONS:

Based on the results, fitness centers of all sizes, both conditioned and unconditioned environments, can benefit from CAS ion technology installation. Proper layout and commissioning can effectively mitigate airborne spread of diseases and create healthier, cleaner spaces for both employees and patrons alike.