zogics

BIG ASS FANS | CLEAN AIR SYSTEM

CLEAN AIR SYSTEM (CAS) WITH ION TECHNOLOGY: MITIGATING INFECTION RISK IN LARGE, HIGH DECK APPLICATIONS

*The installation of Big Ass Fans (BAF) CAS ion technology on three 18' diameter **Powerfoil X3.0** fans in a 21,500 sqft, 35 ft tall maintenance hangar provides an average of more than 40k positive and negative ions respectively, significantly reducing occupant infection risk from person-to-person disease transmission.*

BACKGROUND:

During the public health conditions brought forth by the COVID-19 pandemic, public and workspaces have seen 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 deliver improved air quality. BAF can provide enhanced safety measures using bipolar ionization equipment integrated into both overhead fans and directional fans to quantifiably improve the safety of the indoor environment. This technology is similar to that which is used in private and commercial aircraft to clean recirculated cabin air. By using circulating fans to distribute freshly generated ions into the occupant breathing zone, BAF can leverage the **ions' ability to effectively deactivate pathogens** while simultaneously providing comforting airflow without the generation of harmful concentrations of any byproducts such as ozone.

PROJECT SCOPE:

BAF engineers installed three 18' Powerfoil X3.0 fans with **CAS** ion technology in the space. Relevant measurement locations were determined to characterize both the interaction of the 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) locations were identified for testing at three distinct fan speeds (0%, 50%, 100%). 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 and 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. Ion concentrations exceeded 22k for both polarities at 50% fan speed and approached or exceeded 40k 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.

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 or natural ventilation, 60-minute occupancy, and one sick occupant in the facility (figure 3).

Ion Concentration Comparison - Summary		
Condition	**Positive Ions x 1000**	**Negative Ions x 1000**
Baseline	0.50	0.75
50% RPM	22.81	33.74
100% RPM	39.99	47.93

Figure 1: *Ion Concentrations at various test conditions*

The results from this model show a 94% infection risk reduction, which means members are more than 15 times less likely to become infected in a space with BAF-CAS than with standard HVAC systems alone.

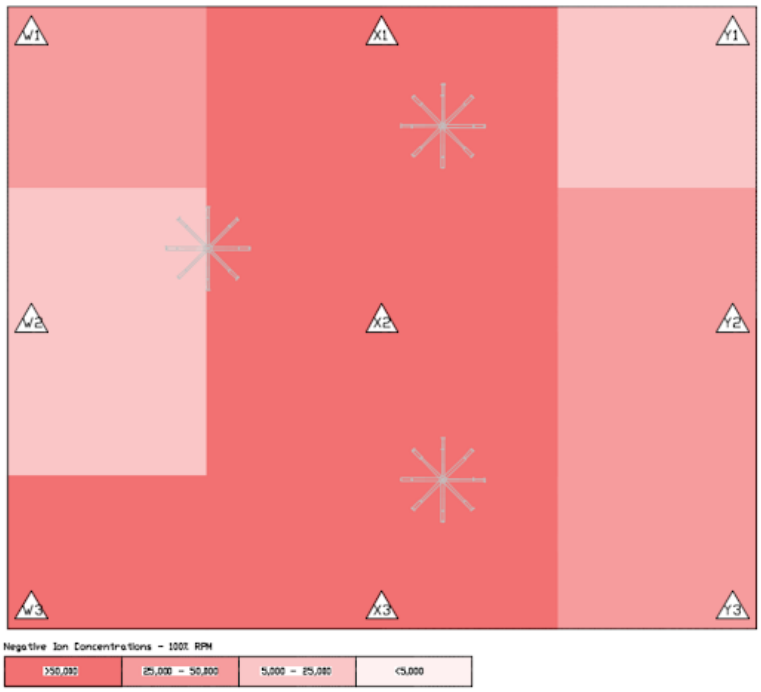

Figure 2: *Negative Ion concentration gradient at 100% RPM*

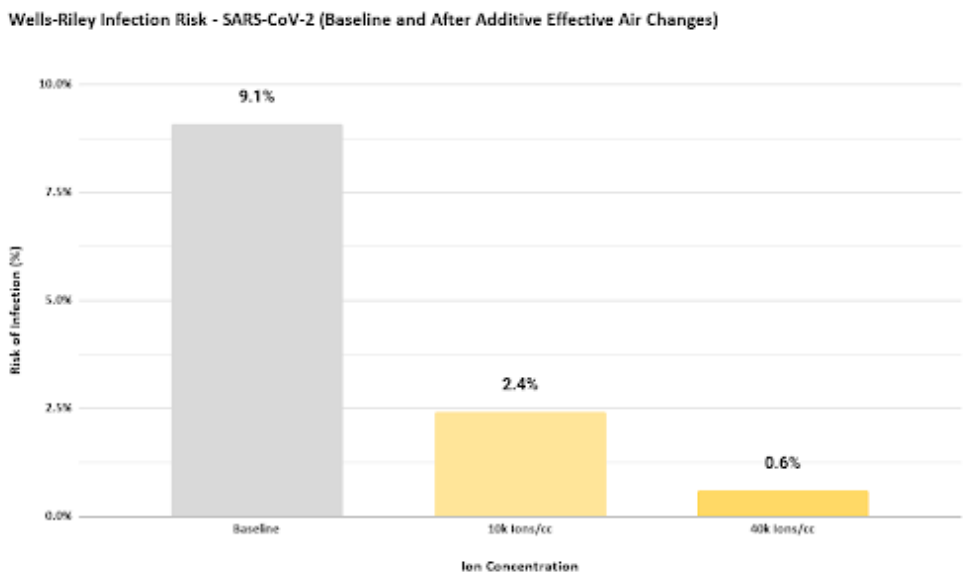

Figure 3: *Wells-Riley Risk Reduction Estimate for 40k and 10k avg. ion concentration compared to baseline*

FURTHER ACTIONS:

The success of the PFX 3.0 CAS in delivering a high concentration of ions to a voluminous industrial space showcases the capabilities of the system, specifically compared to in-duct ionization systems, which for voluminous spaces are more expensive to operate and much less effective than in-room ionization with BAF CAS. Building owners and occupant safety stakeholders can use these results to confidently implement BAF CAS in their own large spaces, both conditioned and unconditioned environments.