BLADE

JULY - OCTOBER 2022

CASE STUDY

The Gooderham & Worts Distillery District

Energy Efficiency and Indoor Air Quality Trial

Toronto, Ontario

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SYNOPSIS

In December 2021, the Distillery District management team contacted Blade Air looking for a solution to improve the indoor air quality in their buildings from the current MERV-13 filters they were running. Searching for a solution, the Distillery District's main concern was around the prohibitive costs of installing and maintaining a HEPA or UV solution, which is incredibly energy-intensive. Instead, they were looking for a solution that would be able to find a balance between their desire to continuously reduce their carbon footprint while also creating a healthier workspace for their tenants.

The solution was the implementation of the Blade Air Pro Filter, electromagnetic HVAC Filtration. These filters utilize active polarization fields to outperform HEPA in their capture efficiency of particulate matter in the viral range. Each filter has close to a 90% lower static pressure than HEPA and over 70% lower than the MERV-13s that had been installed. In addition to outperforming the capture efficiencies of HEPA, like UV, these filters are also able to inactivate viruses. The significantly lower static pressure of the units and minimal amounts of electricity required to power the solution offer significant energy savings.

With the technology selected, Blade Air and the Distillery District agreed to a trial where the solution would be implemented across two buildings- the Stone Building and the private school on-site, Voice Integrative School.
The following two trials were facilitated:

1. **Energy Savings Trial**
2. **Indoor Air Quality Monitoring Trial**

The trials were agreed to be completed on the second floor of the Stone Building, in offices that were at full capacity. The trials took place throughout a 70-day window, starting ten days prior to installation and finishing 60 days after.

The results of these trials came back with astoundingly positive results. Blade generated energy savings of up to 75% in fan motor consumption and their filters performed 2.25 times better than the MERV-13 filters in capturing and removing bacteria from the airstream.

ABOUT THE GOODERHAM & WORTS DISTILLERY DISTRICT

The Gooderham & Worts Distillery District is an internationally acclaimed village of brick-lined streets and dozens of vibrantly restored Victorian Industrial buildings. It's one of Ontario's hottest tourist attractions and home to live theatres, galleries, fashion, design and jewelry boutiques, unique cafes and award-winning restaurants. It's completely closed to traffic and just a few minutes' walk from downtown Toronto.

A collection of 47 19th-century buildings that once comprised the Distillery is now a major dining, shopping, and cultural hub in Toronto aptly called the Distillery District. Strolling through the neighbourhood's brick-paved pedestrian streets, visitors might feel as if they've been transported to Victorian-era Canada—the craftspeople who restored the old structures kept true to the original construction materials as much as possible.

The Distillery Historic District opened in 2003, and today it is widely regarded as Canada's premier arts, culture and entertainment destination.

OVERVIEW OF TRIALS

A high-level overview of the trials at the Distillery District and what they entail.

Energy Efficiency Trial

Conducted over 20 days in two phases. The first phase occurred from July 27, 2022, to August 4, 2022, and the second from August 4, 2022, to August 16, 2022.

Phase One (July 27 - August 4, 2022): Installing a meter on the existing air handling unit (AHU) and monitoring the systems' energy consumption with the MERV-13 filters installed.

Phase Two (August 4 - August 16, 2022): Installing the Blade Air Pro Filters and a variable fan drive (VFD) in the systems. Once the Pro Filters were installed, the air handler was rebalanced to the previous air flow speed measured, and the energy consumption was monitored.

The purpose of these trials was to demonstrate the capacity of the Blade Air Pro Filter to reduce energy consumption without compromising airflow.

Indoor Air Quality Trial

The indoor air quality trial consisted of three phases, where an independent third-party laboratory visited the site to take measurements of the airborne particulate matter.

Phase One (July 11, 2022): Measuring the indoor air quality with the systems that were currently installed (MERV-13).

Phase Two (August 22, 2022): Measuring the indoor air quality approximately 30 days post-installation of the Blade Air Pro Filter.

Phase Three (September 26, 2022): Measuring indoor air quality approximately two months post-installation of the Blade Air Pro Filter to demonstrate the ongoing integrity of the filters.

The purpose of this trial was to demonstrate the efficacy of the Blade Air Pro Filter in improving indoor air quality in contrast to the post-SaRs-CoV-2 pandemic standard of MERV-13 filtration.

HIGHLIGHTS

Energy Efficiency Trial

- Blade Air Pro Filter measured a 29.8% increase in airflow compared to the prior MERV-13s before rebalancing back to the original airflow speed measured.

- After rebalancing the airflow, Blade Air Pro Filter created a 75% reduction in energy consumption.

Project Period: July 27, 2022 - August 16, 2022

ENERGY EFFICIENCY TRIALS

A 75% reduction in energy consumption post-trial.

The Air Handling Unit (AHU) / Compartment unit servicing the second floor of the Stone Building uses two separate 2 HP blower motors that were retrofitted with the Blade Air Pro Filter from Blade Air and coupled with a 1 – 4HP Variable Fan Drive (VFD). The VFD was required so that the AHU could be dialled back to account for the filters' lower static pressure and allow for energy savings. The trial lasted from July 27th, 2022, to August 16th, 2022.

Phase One, from July 27th to August 4th, measured the energy consumption of the AHU with the former solution that the Distillery District was using, which were MERV-13 filters. Brand new MERV-13's were installed to ensure unbiased results on July 27th. Additionally, a traverse measurement was taken to determine airflow with the clean filters at total capacity, and the energy meter was installed.

Phase Two took place from August 4th to August 16th. On August 4th, the Blade Air Pro Filter and VFD were both installed. First, a traverse measurement was taken to determine the new airflow. Then, using the VFD, energy consumption was lowered to rebalance the airflow to a similar rate as the MERV-13s had allowed.

The results have been summarized below.

ENERGY EFFICIENCY TRIALS

36 Distillery - Filter Upgrade Paired with VFD Installation	
Preliminary Airflow measured with newly installed pleated filters	4,147 CFM
Airflow Measure with updated Blade Air Pro Filter	5,384 CFM
Log July 27 - August 4, 2022	
Amperage (A) measurement without VFD installation	4.66 A
Kilowatt (Kw) consumption	4.2 Kw
Log July 27 - August 4, 2022 (VFD speed configured to 48 Hz – airflow rate matches original measurements taken with pleated filters)	
Airflow measured with VFD and Blade Air Pro Filter	4,267 CFM
Amperage (A) measurement with VFD @ 48 Hz	1.27 A
Kilowatt (Kw) consumption	1.07 Kw

The combination of upgrading the filters and installing a Variable Frequency Drive allows for maintained system airflow, improved filtration efficiency and a 75% reduction in supply fan motor consumption.

HIGHLIGHTS

Indoor Air Quality Trial

- Blade Air Pro Filter performs 2.25x better than the standard MERV-13 filter in dispersing live bacteria in the indoor environment.
- Blade Air Pro Filter will more than likely destroy contaminants of submicron sizes, such as viruses, during their passage.
- Blade Air Pro Filter performs equally to a MERV-13 filter in managing the dispersion of living mould spores in the indoor environment.

Project Period: July 11, 2022 - September 26, 2022

INDOOR AIR QUALITY TRIALS

Significant improvements in indoor air quality
tested by an independent third-party laboratory.

This trial aimed to assess the Blade Air Pro Filter by counting and identifying before/after airborne bacteria and mould spores in the building. To complete this work, Blade Air engaged AirTests Mattests Inc., an independent third-party laboratory based out of Montreal, Canada.

The scope of work included the following:

1. **Setting up logistics and sampling protocols**
2. **Three on-site sampling sessions**
3. **Writing of the evaluation report**

The results from the independent third-party laboratory have been summarized below.

INDOOR AIR QUALITY TRIALS

Part One: Understanding the Basics of Air Filtration

All air filters perform better over time until they become saturated and must be replaced. Therefore, during the tests performed, we must assume that on Day 1, the MERV-13 filters were at their optimal efficiency level since they had been in place for some time when we assessed the air quality.

The size of airborne contaminants comes in a wide range of dimensions:

Moulds
1-100 microns
Bacteria
0.1-10 microns
Virus
0.05-0.1 microns

The smallest virus is 2000x smaller than the largest mould spore in the size scale; the smaller the size of a contaminant, the greater the likelihood that it will be hazardous to human health, mould spores vs. bacteria vs. viruses.

Ideally, due to its high static pressure drop, a MERV-13 should have a thickness of 4" to 12" to present an optimal filtering surface. For example, a filter with a thickness of 1" [which is presently used at the Distillery District] will offer the smallest filtering surface available. A pleated filter of 4" or 12" will give filtering surfaces 4 to 12 times greater than the filter of 1" thickness of the same grade (MERV-13).

In the world of standard filtration, the thicker the filter, the better its performance. During the life of a filter (3 months), the contaminants accumulating increase in the loss of static pressure in the ventilation ducts, a given quantity of contaminants will be better distributed over a larger filter surface than a smaller one.

INDOOR AIR QUALITY TRIALS

Part One: Understanding the Basics of Air Filtration cont'd

A MERV-13 filter has a 90% dust spot efficiency rating in capturing airborne mould spores. The HVAC system in place would require installing a MERV 15-grade filter to curb the circulation of bacteria in the air. Such a filter should be 6" to 12" thick and would cause a [more] significant static pressure drop [than MERV-13]. The HVAC system in place would require installing a MERV-19 [HEPA] grade filter to curb the circulation of viruses in the air. Such a filter would need to be 12" thick and cause such a significant static pressure drop that it would immediately damage the air thrust motor.

INDOOR AIR QUALITY TRIALS

Part Two: Interpretation of Findings

Live Airborne Mould Spores

According to the results obtained during this study, on average, a standard MERV-13 filter performs equally to a Blade Air Pro Filter in their mutual abilities to manage the dispersion of living mould spores in the indoor environment in which the assessment took place.

Live Airborne Bacteria

From this study, we find that the MERV-13 filter in place has a 36% efficiency rate of capturing bacteria against an 85% efficiency rate with the Blade Air Pro Filter. According to the results obtained during this study, we find that, on average, the Blade Air Pro Filter performs 2.25x better than the standard MERV-13 filter in dispersing live bacteria in the indoor environment where the assessment took place.

Live Airborne Viruses

An electromagnetic field air filter works differently than a standard paper-ply filter since particle size matters less than in a regular pleated filter. Even contaminants of submicron sizes, such as viruses, can be destroyed in the high-voltage electromagnetic field offered by this type of filter.

A MERV-13 grade filter is not designed nor capable of capturing or inhibiting viruses. Airborne viruses will pass directly through a MERV-13 grade filter media since their submicron sizes are way smaller than the interlacing of the paper fibres constituting the filter itself.

In contrast, viruses circulating through the electric field of the electronic filter will more than likely be destroyed during their passage*.

**Although this study did not assess the presence of viruses as such, it is known in microbiology that these non-living microorganisms are by nature relatively much more fragile than bacteria and mould spores when exposed to biocidal attacks of various kinds.*

INDOOR AIR QUALITY TRIALS

1. Significant Energy Savings

2. Reduced Maintenance Costs

3. Enhanced Indoor Air Quality

4. Improved Cognitive Function for Staff, Students, and Clients

For inquiries, contact us.

BLADE

www.bladeair.com
info@bladeair.com
416-701-0201