CASE STUDY

EnviroKlenz in corporate office - City of London, UK

INDUSTRY OVERVIEW

There is a widespread concern for air quality throughout the city of London, with particular focus on urban areas experiencing high concentrations of air pollution. Research conducted by Imperial College London reveals that 99% of the city of London does not meet the recommended limit for particulate matter, PM2.5, set by the World Health Organization (WHO). Legal limits of PM2.5 and nitrogen dioxide pollutions are set at four times the WHO recommendation, which possesses health risks to everyone exposed to these inadequate levels.

Ventilation plays a large factor in the remediation of poor indoor air quality, especially for business buildings and offices. Reliance on natural ventilation systems can provide air flow, however it can also allow higher amounts of outdoor air pollution from combustion and automobiles to come indoors. The addition of mechanical ventilation, when possible, is recommended for filtration and removal of airborne particulates that add to indoor pollution. This consists of updated air conditioning systems, extractor fans, and mobile air purifiers. When paired with natural ventilation, this can offer added remediation of inadequate air quality, both in terms of air pollution and illness transmission within public work settings.

Recommended short-term exposure to fine particulate matter:

15 µg/m3

of PM2.5

according to WHO short-term air quality guidelines

Air Ventilation Recommendations:

- Outdoor air ventilation, when possible, to increase indoor air flow
- Utilize air quality monitors to measure and manage indoor pollution
- Implement additional air cleaning methods to supplement natural ventilation
- Maintain particulate matter below WHO standard of 15 ug/m3 for PM2.5

STUDY BACKGROUND

- The EnviroKlenz Air System Plus was deployed and operational alongside air quality meters that measure and record particulate matter, stationing the EnviroKlenz Air System Plus in a conference room within a corporate office in London. The EnviroKlenz Air System utilizes a patented adsorptive neutralization process of capturing and removing toxic and noxious odors, chemicals, and pathogens. This is done through multi-stage decontamination, consisting of primary filtration and neutralization through the EnviroKlenz Air Cartridge, followed by UVC and HEPA filtration. The air quality monitor provides real-time measurements of particulate matter concentrations (PM1, PM2.5, PM10) and particle size distribution using a combination of multiple light scattering-based particle sensors.

- The EnviroKlenz Air System Plus and air quality monitor operated in the conference room as daily schedules were carried out as usual. Air quality readings compared data collected when the EnviroKlenz Air System Plus was turned off versus when it was turned on to gauge its impact on particulate reduction. This particularly highlights on the addition of air filtration to a space that primarily relies on a natural ventilation system.

- The results from this case study are compared to particulate matter data from the World Health Organization (WHO). Updated in 2021, the WHO has developed new air quality guidelines through research on air quality trends and exposure risks for PM2.5 pollution. These fine inhalable particulates, with diameters of 2.5 micrometers and smaller, are the common size relative to airborne illness carriers. In the case study, a broad range of particles were monitored, all with similar trends. For illustration purposes, the collected data is measured and recorded in PM2.5. It is then plotted in comparison to the WHO's air quality guidelines for PM2.5, representing a recommended short-term exposure level of 15 ug/m3 and a recommended annual average mean of 5 ug/m3.

TEST DETAILS

Testing Period:

21/09/21 - 07/10/21

Setting:

A conference room within the facility

Equipment Used:

(1) EnviroKlenz Air System Plus and (1) commercial-grade air quality monitor per operational location. Readings were captured in the ranges of PM10, PM2.5, and PM1 (sub-micron sized).

Monitor Status:

The air quality monitor was running between 21/09/21 and 07/10/21; the air quality monitor was turned on several days prior to turning on the EnviroKlenz Air System Plus to establish base-line air quality readings.

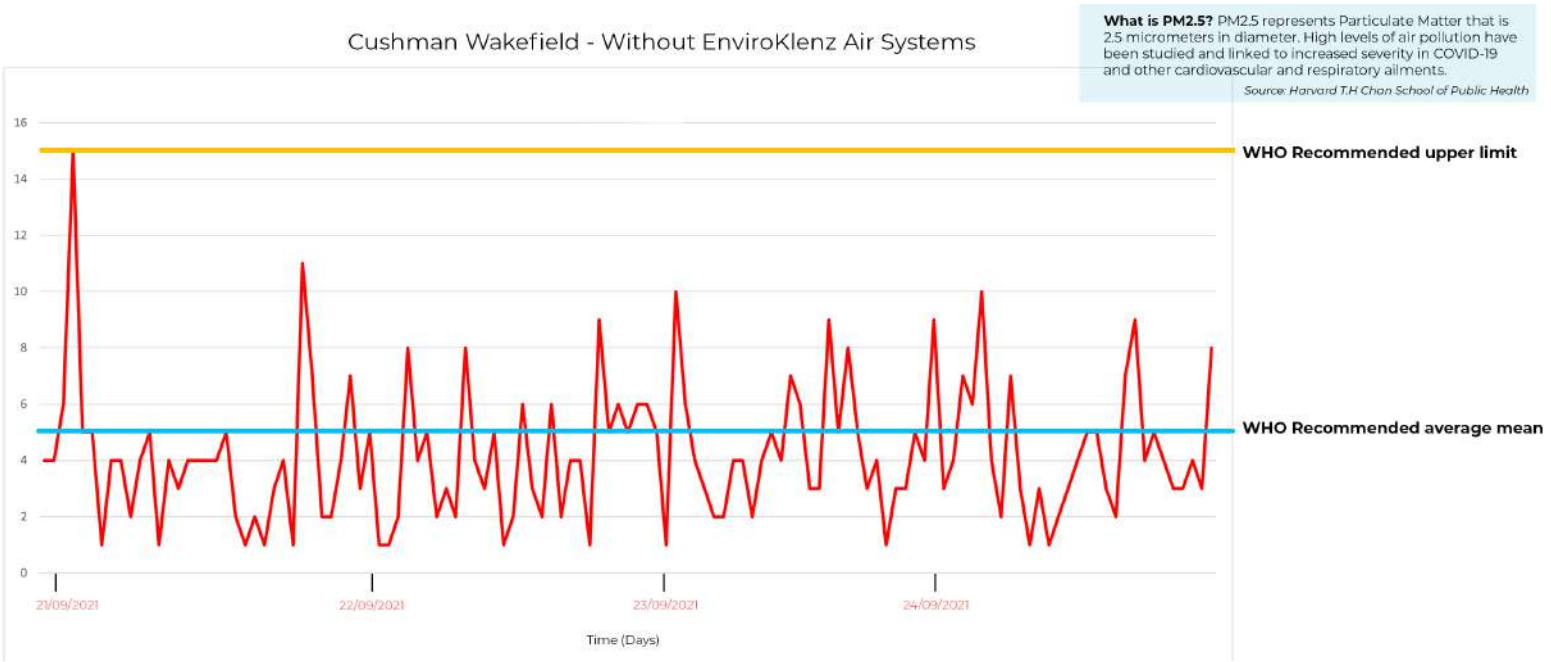
Running Time:

The EnviroKlenz Air System Plus was operational in the conference room between 30/09/21 and 07/10/21; data is pulled from within this date range and compared with the collected base-line air quality readings.

OBSERVATIONS

Conference Room

Without EnviroKlenz Air System Plus



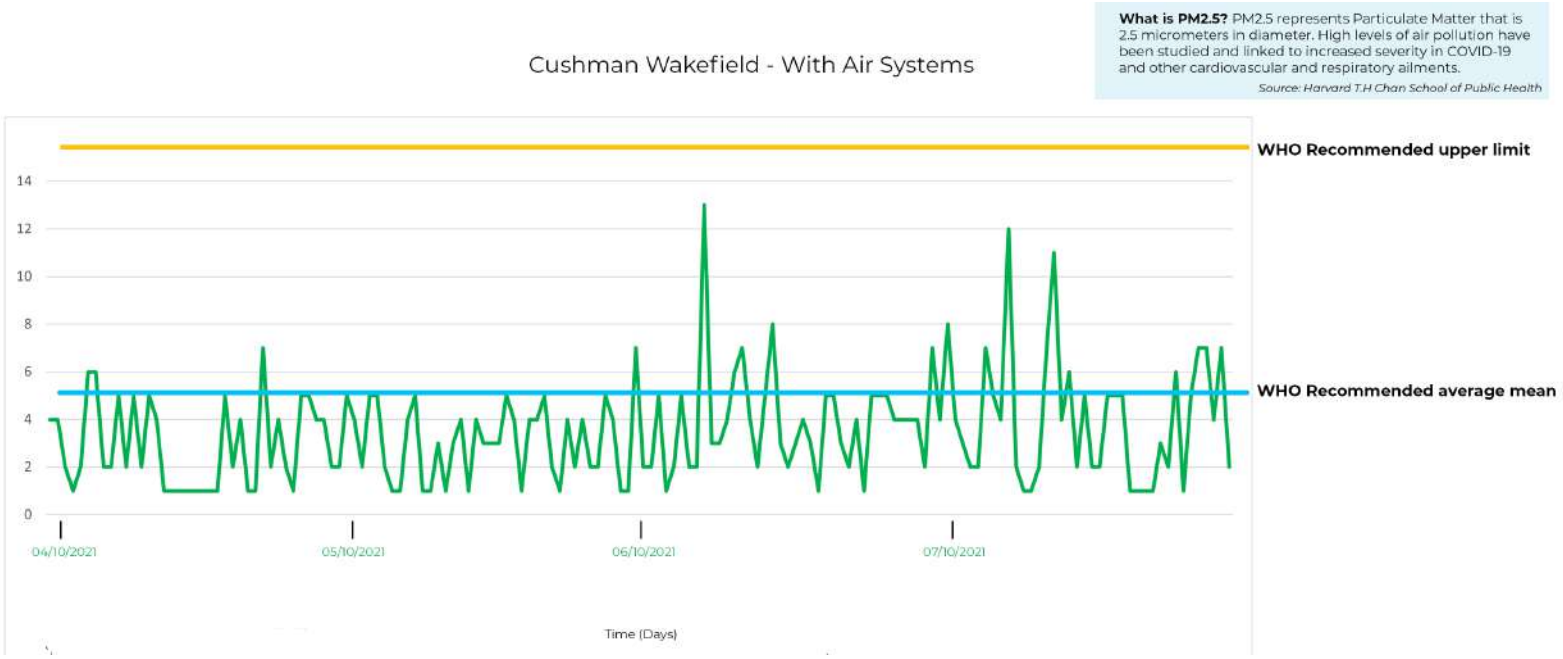
The above data is depicting air quality readings taken between 21/09/21 and 24/09/21, collecting base-line PM2.5 readings with the EnviroKlenz Air System Plus turned off.

- Initial base-line measurements were taken when the EnviroKlenz Air System Plus was turned off. During this period, spikes in PM2.5 are measures at two to three times greater than the WHO recommended annual average mean of 5 ug/m3 for air quality guidelines.
- With an existing natural ventilation system, PM2.5 measurements are very inconsistent throughout the day. The use of open windows and doors during operational hours did not demonstrate the ability to keep PM2.5 at a consistent level within the recommend annual average mean of 5 ug/m3.
- The spikes above the recommended average mean for air quality indicate inadequate levels of particulate matter while workers are present, which is when the conference room's occupants are most vulnerable to illness transmission and airborne pollution exposure.

OBSERVATIONS

Conference Room

With EnviroKlenz Air System Plus



The above data is depicting air quality readings taken between 04/10/21 and 07/10/21, collecting PM2.5 readings with the EnviroKlenz Air System Plus turned on.

- With the EnviroKlenz Air System Plus turned on, PM2.5 levels were consistently kept within the WHO's recommended annual average mean of air quality, aside from minor spikes towards the middle of the week.
- Spikes were quickly reduced to below the recommended annual average mean, and no spikes in PM2.5 exceeded the WHO's recommended upper limit of 15 ug/m3.
- This demonstrates reduction in PM2.5 due to the added filtration of the EnviroKlenz Air System Plus, and its efficiency at capturing and retaining particulates in a given environment.

DATA SUMMARY

High-Level Analysis

- The air quality measurements from the case study revealed significant spikes in PM2.5 throughout the day, showing how typical indoor air quality conditions are inadequate with the current ventilation system. As shown by the data collected while the EnviroKlenz Air System Plus was turned off, spikes throughout the corporate office measure particulate matter at levels two to three times greater than the recommended annual average mean by the WHO's air quality guidelines, representing 5 ug/m3 of PM2.5.

- This data indicates that the current use of natural ventilation did not demonstrate control or reduction of these influxes of dangerous air pollution during all hours of the day, increasing the corporate office's overall vulnerability to illnesses and transmission, as well as health risks associated with short and long-term exposure to indoor air pollution.

- Comparing these base-line readings to the data collected when the EnviroKlenz Air System Plus was turned on shows how the additional filtration and added air exchanges provide more consistent control of particulate matter within the WHO's recommended annual average mean of 5 ug/m3. Spikes remained under the WHO's recommended upper limit, and they were quickly remediated to below the recommended annual average mean. The EnviroKlenz Air System Plus was able to capture and retain the particulate matter during all hours of the day, and provided greater reliability in PM2.5 reduction that existing ventilation.

EnviroKlenz®
Timilon Corporation | 24301 Walden Center Drive Suite 101
Bonita Springs, Florida 34134 | +44 2031 481800 | cstahl@timilon.com

DATA SUMMARY

Expert Recommendation

- Based on the findings, it is shown that the indoor air quality is improved with the additional filtration of the EnviroKlenz Air System Plus. In order to comply with the updated WHO air quality guidelines and address concerns with inadequate indoor air quality, EnviroKlenz recommends the addition of its air purifiers within conference rooms throughout the corporate office.

- This additional filtration will enhance the level of ventilation and particulate reduction that is currently achieved by natural means, as well as reduce outdoor air pollution that could be affecting indoor air quality. This is also an improvement that is highly applicable to the upcoming winter months, where natural ventilation is less attainable due to colder weather. When windows cannot be kept open, the EnviroKlenz Air System Plus can provide additional air exchanges, filtration, and ventilation to reduce particulate matter and other sources of airborne pollution or illness. This allows for on-demand control of ventilation and filtration when it is most needed to replace the lack of natural air exchanges.

- Benefits of implementing the EnviroKlenz Air System Plus throughout crucial areas of the facility can include:
  - On-demand control and adjustability of added filtration
  - Cost-effective solution to address inadequate air quality
  - Added air exchanges for greater particulate removal and retention
  - Greater consistency in overall air quality
  - Reduction of outdoor air pollution that comes from natural ventilation

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