

# A Comparison of Indoor and Outdoor Air Quality



## Executive Summary

The health problems resulting from exposure to air pollution have a high cost to society and business, our health services, and people who suffer from illness and premature death.

ENGIE has a presence in cities and communities across the UK and therefore an opportunity to raise awareness and provide interventions to improve exposure levels for the public and its clients.

ENGIE UK commissioned King's College London, Air Monitors Ltd and Global Action Plan (GAP) to investigate the relationship between indoor and outdoor air quality at a central London building close to Oxford Street London in September 2016.

The findings reveal that indoor air quality can be similar to outdoor levels. This provides an important benchmark in ENGIE UK's roadmap to improving the quality of air for all.

Jamie Quinn. Corporate Responsibility Director, ENGIE UK



## Main Findings

- Indoor nitrogen dioxide (NO<sub>2</sub>) concentrations in the atrium of the building were close to the World Health Organisation's (WHO) Indoor and outdoor air quality guideline.
- Indoor concentrations of NO<sub>2</sub> varied in the building, but were between 57% and 74% of the outdoor concentrations.
- A close correlation between indoor and outdoor NO<sub>2</sub> concentrations trends suggests that indoor exposure was mainly driven by outside concentrations, likely drawn in through the building's mechanical ventilation and also ingressing through the atrium doorway.
- By contrast, indoor particulate concentrations were between 15-22% of the outdoor concentrations and showed a weak association with outdoor concentration trends.

The findings suggest that whilst particulate matter may be effectively removed by building HVAC systems, NO<sub>2</sub> is not.

In urban centres such as London, which suffer from annual NO<sub>2</sub> concentrations many times higher than the ambient UK objective, indoor concentrations could therefore play a significant part of an individual's daily and annual exposure.

These findings have important implications. The UK government has issued draft guidelines on indoor air quality standards for schools. These adopt the WHO recommendation of 40 µg/m<sup>3</sup> as an annual mean for NO<sub>2</sub>. The findings on indoor concentrations of NO<sub>2</sub> in this study and the advent of indoor air quality standards for schools provide an impetus to study this issue in more depth.

## Recommendations

To further understanding in this area, the next stage in this work would be to investigate the efficacy of molecular HVAC filters which are designed to remove NO<sub>2</sub> (amongst other gases) as well as particulates.

Whilst it is common for filters in building HVAC systems to scrub particulate matter, it is less common for them to scrub gases (such as NO<sub>2</sub>). These filters do however exist on the market.

Such an investigation would deepen understanding of the relationship between indoor and outdoor air quality and allow building facilities management companies to make more informed decisions about gaseous scrubber systems.

As the government's draft indoor air quality guidance (Department for Education, 2016) is aimed at schools, a school would be an ideal location to test this in. An experiment, similar in nature to this one, should be able to detect a change in the relationship between indoor and outdoor NO<sub>2</sub> concentrations before and after installing a molecular gas filter.

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The Full report is available upon request from [CRUK@engie.com](mailto:CRUK@engie.com)

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