SEDDIKI, M., CHAWLA, V. and DEVECI, G. 2024. *Analysing the benefits of a photovoltaic-powered passive ventilation system on the indoor air quality*. Presented at the 2024 Annual conference and annual general meeting of the UK Indoor Environments Group (UKIEG 2024): monitoring and big data as drivers of research and the policy agenda for indoor environmental quality and health, 6 June 2024, Glasgow, UK.

Analysing the benefits of a photovoltaic-powered passive ventilation system on the indoor air quality.

SEDDIKI, M., CHAWLA, V. and DEVECI, G.

2024

This document was downloaded from
https://openair.rgu.ac.uk

UK IEG Indoor Environments Group

Analysing the Benefits of a Photovoltaic-Powered Passive Ventilation System on the Indoor Air Quality

Mohammed Seddiki, Vishakha Chawla, Gokay Deveci
Robert Gordon University, Aberdeen, United Kingdom

Background:

This research was conducted as part of a project between a team at the Scott Sutherland School of Architecture & Built Environment (Robert Gordon University) and Kishorn Insulations. The project was funded by Interface.

It has been proven that improving the airtightness of existing dwellings to reduce space heating demand without considering an adequate ventilation strategy can lead to poor indoor air quality. The UK's standard for retrofitting dwellings, PAS 2035, specifies that the choice of ventilation strategy for a domestic retrofit project depends on the number and nature of retrofit measures. These include strategies based on passive ventilation, such as Intermittent Extract Ventilation (IEV) systems and background ventilators in all rooms in the dwelling, as well as Mechanical Extract Ventilation and Mechanical Ventilation with Heat Recovery (MEV and MVHR, respectively).

Originality :

Many studies analysed the impact of mechanical and natural ventilation on indoor air quality in domestic buildings. Conversely, there is a lack of research that has looked at the impact of humidity-sensitive passive ventilation on indoor air quality in retrofit projects for domestic buildings.

Aim of the study:

The study aimed to investigate the impacts of installing an innovative humidity-sensitive passive wall vent on indoor air quality in UK domestic buildings.

Methodology:

The study compared the indoor environment before and after the installation of the humidity-sensitive passive wall vent in terms of temperature, relative humidity, and CO2 concentration. A single-point sampling methodology was adopted wherein Testo 160 IAQ sensors were installed in the living room and bedroom of the case study.

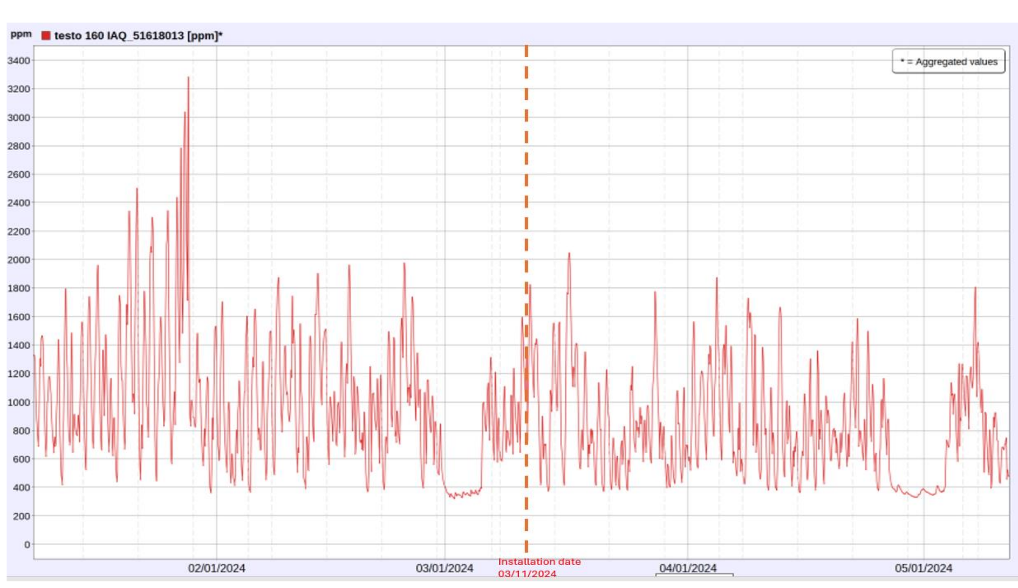
Results :

The results revealed that there was no significant alteration in temperatures, and the relative humidity levels remained within the recommended range of 30 to 60% following the installation of the new passive ventilation system. However, there was a noticeable 19% decrease in average CO2 levels in both the living room and the bedroom. Additionally, the introduction of the passive humidity-sensitive wall vent led to a marked improvement in CO2 concentration peaks, with levels dropping from 3285 ppm to 2161 ppm in the living room and from 10169 ppm to 1776 ppm in the bedroom. These findings confirm that the ventilation system enhanced air quality. Nevertheless, it's important to note that the current system configuration was not consistently able to keep CO2 concentrations below 1000 ppm at all times.

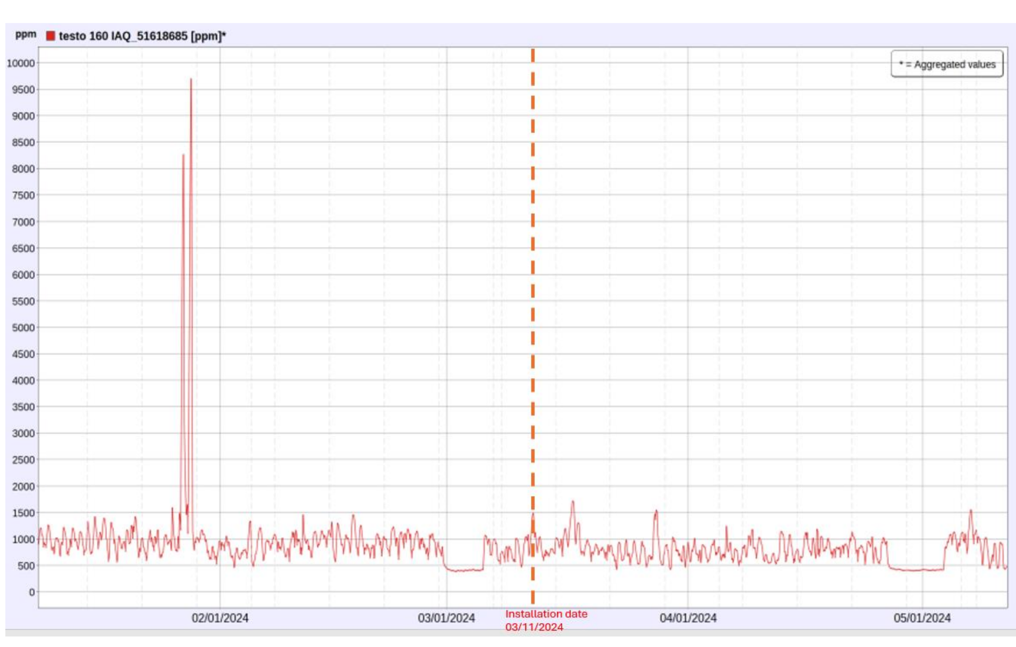
Kishorn Insulations has developed a new humidity-sensitive passive wall vent to tackle mold, condensation, and improve indoor air quality.

Installation of the passive wall vent from the inside

Installation of the passive wall vent from the outside



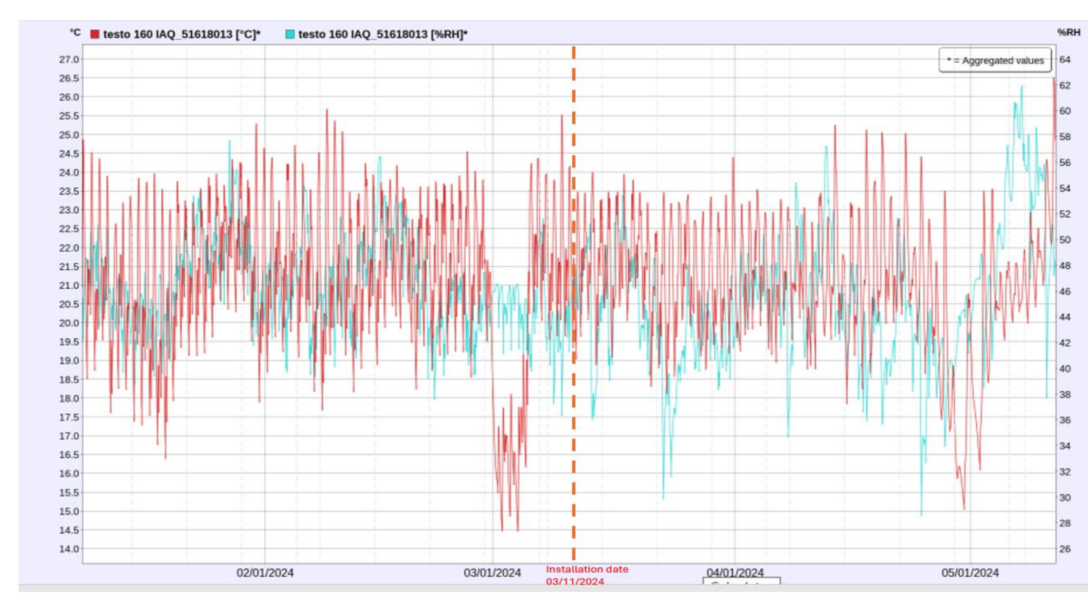
CO_2 concentration in the living room (ppm)



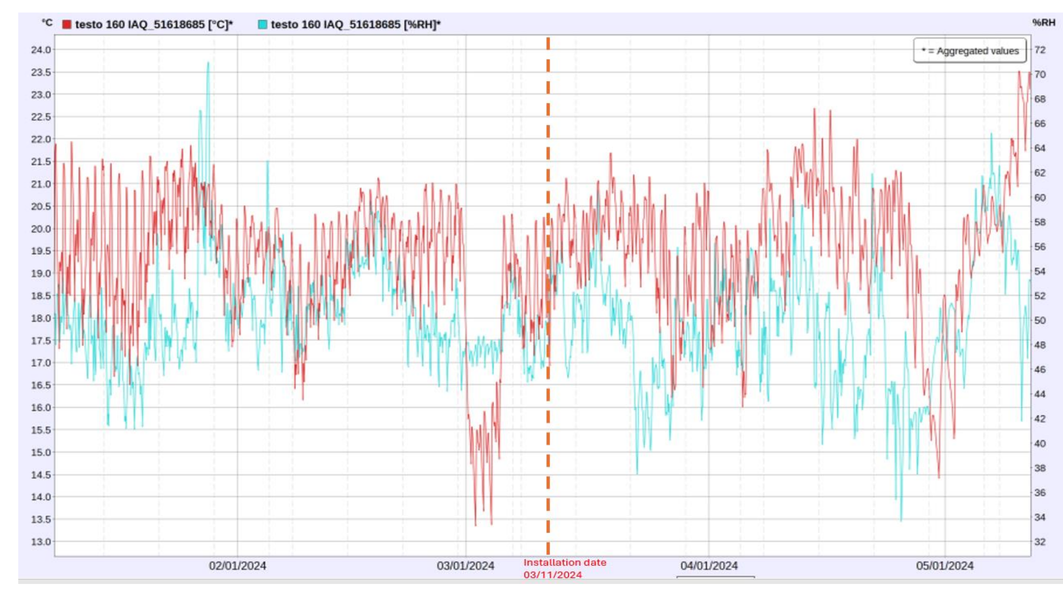
CO_2 concentration in the bedroom (ppm)

IAQ data collected before and after the installation of the humidity sensitive passive wall vent

	Before installation (08/01/2024 to10/03/2024)			After installation (11/03/2024 to 11/05/2024)		
	Mean value	Maximum value	Minimum value	Mean value	Maximum value	Minimum value
Temperature (living room)	20.9	26.2	14.1	20.9	27.3	15
Temperature (bedroom)	19.2	22.1	13.3	19.6	23.6	14.3
RH (living room)	46.3	58	35.6	45	62.5	27.8
RH (bedroom)	50.3	71	40.5	49.3	67.9	32.5
CO2 (ppm) (living room)	969	3285	314	783	2161	323
CO2 (ppm) (bedroom)	938	10169	374	761	1776	383



Temperatures and relative humidity in the bedroom



Temperatures and relative humidity in the living room

ROBERT GORDON UNIVERSITY ABERDEEN

Interface The knowledge connection for business

KISHORN Insulations