

Case Study

Portable Air Monitoring Helps Identify Occupant Health Risk During IAQ Study of Construction Best Practices

NZ's largest tertiary institute of technology deployed a portable air quality monitoring system to explore the impact of different construction techniques on indoor air quality.



Project

Unitec Institute of Technology

Location

New Zealand

Date

2015

Services

Series 500 Portable Indoor Air Monitors

Measurements

VOCs and PID

Sector

Indoor



Portable air monitoring system helps identify occupant health risk during indoor air quality study of construction best practices

New Zealand's largest tertiary institute of technology deployed a portable air quality monitoring system to explore the impact of different construction techniques on indoor air quality. The research aimed to determine whether installing a vapor-check membrane during a new build - an increasingly common practice aimed at improving internal thermoregulation - could increase the level of volatile organic compounds (VOCs) in the home. The study produced credible, real-time data that showed an increase in VOC retention, which could harm occupants. This contributed to important conversations around the construction of healthier homes and establishing the need for further research into best practices.

A robust plan to protect community health and safety

Unitec Institute of Technology offers a range of courses in practical skills across a variety of disciplines to its 20,000-plus enrolled students. As part of a collaboration between the Construction and Building Technology departments, they have built two near-identical research “Whole of House” test houses, allowing performance testing of new materials, alternative construction practices, and emerging innovations.

One such test concerned the effect of vapor-check membranes (installed between the lining and frame of the building) on VOC levels in the home. Volatile organic compounds are a concern to a person’s health as they

become vapor at room temperature. VOCs vary in toxicity. Some are produced by fruit as it ripens, others come from man-made products such as paint or new carpet, or as a result of chemical reactions. They have the potential to cause significant long-term health effects depending on exposure levels.

Vapor-check membranes work by reducing the amount of condensation reaching the frame of the home, restricting the passage of air, and improving thermoregulation while contributing to indoor humidity. The hypothesis was that in disrupting the passage of air, VOCs may be retained at higher levels, impacting

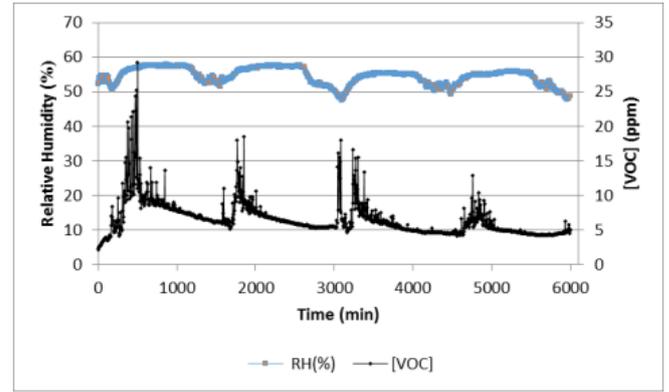
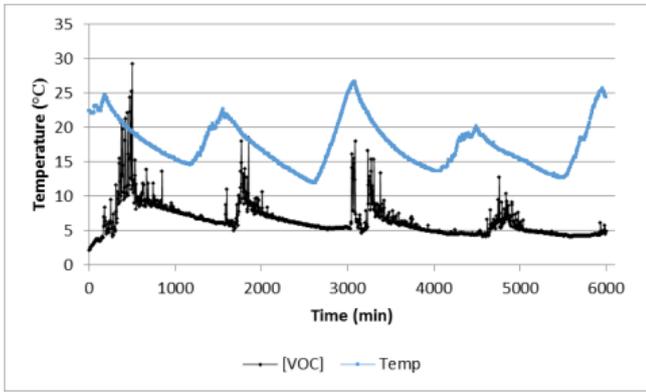
the health of occupants. In a previous study, a temperature increase of 10°C was shown to increase formaldehyde levels by 3.5 times. To test this, Unitec required a realtime monitoring system capable of capturing accurate data on VOCs.

Reliable real-time monitoring drives scientifically credible results

For this study, Unitec selected the Aeroqual Series 500 monitor, an ultraportable system with interchangeable sensor head format. A Photo Ionization Detection (PID) type VOC sensor (accuracy of ± 0.01 ppm) was used to measure the release of a VOC test material (50 ml of varnish) over a 14-day testing period in one of the “Whole of House” test houses. These houses are single-story construction with three bedrooms and without furnishings, carpet, and finishes. To test the effect of the vapor membrane on VOC release, one house had a membrane installed and the other (a control) did not. Results were recorded in real-time by the Series 500’s onboard data logger, with measurements being downloaded and analyzed from there.

The results confirmed that a vapor-check membrane increases the thermal efficiency of the house, but with increased VOC retention. Prior to the varnish installation, background levels of VOCs were identical between the houses. Following release of the VOC test material, significantly higher levels were recorded in the house with the membrane. The membrane-fitted house also maintained higher temperatures, with daily patterns of temperature rises correlated to increases in VOC release. These findings have gone on to be published in International Proceedings of Chemical, Biological and Environmental Engineering.





The data gathered via this study has opened up a dialogue about the distribution of VOCs in a house. The next step in this research is to establish where VOC levels sit throughout the home, expanding beyond the initial 14-day trial and into real-life scenarios. The more we can understand the influence certain construction techniques can have on the quality of our indoor air, the better we'll be able to build happier, healthier homes for the next generation and beyond.

Study Citation: Berry, T., & Chiswell, J.H.D. (2015, November). The Effect of Vapour-Control Membrane Technology on Indoor Air Quality in Buildings In Liu Juan (Ed.), International Proceedings of Chemical, Biological and Environmental Engineering (pp.87-93). 90 (14). 10.7763/IPCBE. <http://hdl.handle.net/10652/3395>

“The Aeroqual Series 500 monitor with VOC sensor allowed scientifically credible data to be captured and analysed in this IAQ study.”

Unitec Institute of Technology

About



Unitec

Unitec is New Zealand's largest institute of technology, offering a wide range of work-oriented programs and short courses. They offer leading employment-focused education across their two Auckland-based campuses in Mt. Albert and Waitākere.

Aeroqual

Aeroqual develops integrated monitoring and software systems underpinned by industry-leading sensor technology to support environmental, health, and safety professionals in protecting people and the planet from the impact of air pollution. That's why governments, industry, researchers, and consultants trust Aeroqual to deliver actionable data for their air quality monitoring projects.

