

Where: New Zealand

Product: Series 500 portable indoor air quality monitor

Installed: 2015

Result: Monitor accuracy determines impact on air quality of different construction techniques



Aeroqual IAQ monitor demonstrates effect on air quality from VOCs in membrane-lined buildings

THE CUSTOMER

Unitec Institute of Technology is New Zealand's largest institute in its sector, with close to 20,000 students enrolled in 2014. It offers a range of courses in practical skills across multiple disciplines.

A collaboration between the Construction and Building Technology departments, Unitec has two unique near identical research "[Whole of House](#)" test houses that allow performance testing of new materials, alternative construction practices, and emerging innovations.



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

THE PROBLEM

Almost everything that goes into houses, from construction materials to furnishings and finishes, release gases over time. These gases are collectively called volatile organic compounds (VOCs), volatile because the compounds become vapour at room temperature.



VOCs vary in toxicity; some are produced by fruit as it ripens, others come from man-made products (paint, new carpet) or as a result of chemical reactions. The effect of VOCs on health vary from relatively harmless to significant and can be temporary or long-term depending on exposure.

One new house construction practice is to incorporate a vapour-check membrane between the lining and the frame. The membrane reduces condensation reaching the frame, and restricts outside air passing through and contributing to indoor humidity.

By disrupting the passage of air, the membrane improves a house's thermoregulation. However, because the release of VOCs within a home is related to humidity and temperature, there is concern the membrane will retain VOCs resulting in negative health effects. For example, a temperature increase of 10 °C has been shown to increase formaldehyde 3.5 times.

THE SOLUTION

The "Whole of House" test houses are single storey construction with three bedrooms and without furnishings, carpet and finishes. In order to test the effect of the vapour membrane on VOC release, one house had a membrane installed, and the other (a control) did not.

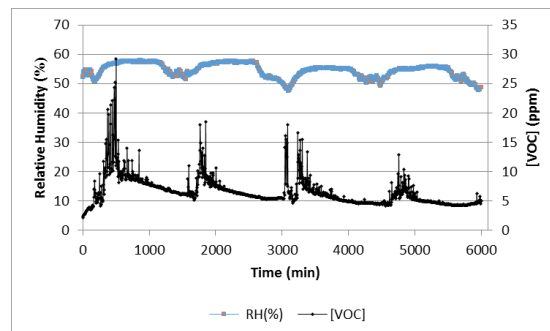
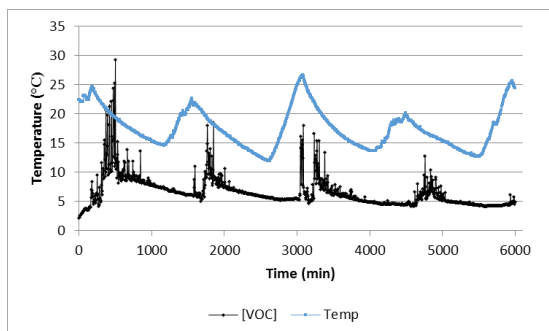
An Aeroqual Series 500 portable indoor air quality monitor with a Photo Ionization Detection (PID) type VOC sensor (accuracy of ± 0.01 ppm) was used to measure the release of a VOC test material (50 ml of varnish) over a 14-day testing period. This was recorded in real time by the Series 500's onboard data logger and measurements were downloaded to a computer and analysed.



EVALUATION

Using the VOC sensor and Series 500 portable indoor air quality monitor from Aeroqual enabled the study team to record meaningful and scientifically credible indoor air quality measurements.

The results were published in International Proceedings of Chemical, Biological and Environmental Engineering. They show that a vapour-check membrane increases the thermal efficiency of the house, but with increased VOC retention. Prior to the varnish installation the background levels of VOCs were the same for both houses. Afterwards there were significantly higher levels of VOCs recorded in the house with the membrane. The membrane-fitted house also maintained higher temperatures. Daily patterns of temperature increase were correlated to increases in VOC release.



The results of this study open an important conversation about the distribution of VOCs in a house. More work needs to be done to establish where those levels sit throughout the home, investigating beyond the 14-day trial and into real-life scenarios.

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>