**Case study** 





## Automated thermal desorber doubles productivity, and increases data precision and accuracy in air studies

When studies of volatile organic compounds take several years to complete, how do analysts ensure the same precision and accuracy in the data for each sample for the duration of a project? Dr Rebecca Cordell from Leicester University in the UK relies on Markes International's TD100-xr multi-tube thermal desorber, which delivers fast and consistent results time and time again thanks to its automated internal standard addition feature. It also saves further sampling time with its automated dry-purge feature.

#### Improved accuracy and precision in air quality study

Dr Cordell is studying air quality in hospitals to determine whether healthcare workers are exposed to poor-quality air. For three years, her team has been collecting air samples onto sorbent tubes to analyse their volatile organic compound (VOC) content. So far, the team has collected over 600 samples from two hospitals and analysed each one by thermal desorption-two-dimensional gas chromatography with a flame ionisation detector or mass spectrometer (TD-GC×GC-FID/MS).

The challenge for Dr Cordell and her team in this project, which may last up to five years, is maintaining consistency throughout so that the first batch tested is comparable to the very last batch. They do this by running an internal standard through the entire analytical system. Internal standards allow you to account for instrument variability over time, such as changes in detector response, giving improved precision and accuracy.<sup>1</sup> However, Dr Cordell's team had found in the past that making up standards and injecting them by hand into a manually operated thermal desorber interferred with the accuracy of their results. There was a bias depending on who made up the standards and who injected them. "Making a 10 mL solution should be the same whoever does it, but it's not," said Dr Cordell. "We had to statistically merge out batches to get rid of the batch bias."

# UNIVERSITY OF LEICESTER

### CUSTOMER:

University of Leicester, UK

#### **APPLICATION:**

Indoor air quality

#### CHALLENGE:

Maintaining reliable and reproducible results over long-term studies (lasting several years) and increasing productivity

#### SOLUTION:

TD100-xr<sup>™</sup> thermal desorber (automated internal standard addition and dry-purge)

#### **RESULTS:**

The TD100-xr runs for 24 hours a day, doubling the number of samples obtained on a non-automated system

Without the reliable and reproducible automated sample introduction offered by the TD100-xr, we would not be able to carry out long-term studies on this scale. These issues were overcome using Markes' TD100-xr thermal desorber, which features automated internal standard addition (using a cylinder of ready-made standard). "This helped massively," said Dr Cordell. "Hands-free internal standard addition is extremely valuable as it not only saves researcher time but increases data precision and accuracy."

Indoor hospital air is a complex chemical mixture, and with the TD100-xr, Dr Cordell's team has been able to detect and measure levels of almost a thousand different VOCs without the hassle and time spent making up standards and injecting them by hand into the thermal desorber, enabling them to focus on their data. "Without the reliable and reproducible automated sample introduction offered by the TD100-xr, we would



PhD student, Thiphanie Riveron, loads thermal desorption tubes containing VOC samples into the TD100-xr, which has the capacity to automate the analysis of up to 100 samples at a time.

not be able to carry out long-term studies on this scale," said Dr Cordell, who has certainly put the TD100-xr through its paces. "Being able to run the tubes 24 hours a day for 11.5 months of the year makes studies like ours possible," she said. "The TD100-xr was a revelation."

#### Automated dry-purging speeds up analysis time

The TD100-xr also features automated dry-purging and Dr Cordell's team used this when they analysed samples from a study of pollutants in Kenya and Nigeria.<sup>2</sup> Both are humid areas so the samples had a high water content, which would have masked compounds on the resulting chromatograms. Instead of carrying out the laborious task of manually dry-purging each sample, the team used the automated dry-purging to save time and hassle.

With the automation, Dr Cordell's team can analyse twice the number of samples per day, compared to their previous, non-automated system. "I have always been happy with Markes' systems and I have a very high opinion of Markes. The support team has always been good too," she concluded.

#### References

1. Markes Application Note 007: Preparing and introducing standards using thermal desorption tubes.

2. R.L. Cordell *et al*, Volatile organic compound composition of urban air in Nairobi, Kenya and Lagos, Nigeria, *Atmosphere*, 2021, 12: 1329, <a href="https://www.mdpi.com/2073-4433/12/10/1329">https://www.mdpi.com/2073-4433/12/10/1329</a>.



#### DR REBECCA CORDELL, UNIVERSITY OF LEICESTER, UK

Rebecca Cordell is a senior research scientist in the Atmospheric Chemistry group. She researches atmospheric composition and air quality, with a particular focus on the role of VOCs in health and disease. She specialises in VOC determination using spectrometric techniques, including two-dimensional gas chromatography coupled with mass spectrometry (GC×GC–MS). Dr Cordell leads the indoor air and health project within the Health Protection Research Unit, which is focused on quantifying VOCs within the indoor environment, determining their sources, potential health effects and how to mitigate personal exposure.

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For details on the equipment used in this case study, visit chem.markes.com/CS4