

# Meeting the high throughput demands of mass spectrometry sample preparation

Independent contract research organization ADPEN Laboratories specializes in residue analysis, and has invested in a Freedom EVO® 100 liquid handling platform for mass spectrometry sample preparation.



ADPEN Laboratories, based in Jacksonville, Florida, USA, provides advanced analytical services to the pharmaceutical, agrochemical and food safety industries, working with multinational companies, government and international organizations worldwide. In 2003, the Company undertook a large-scale water monitoring study requiring automated sample preparation, as Steven Perez, Laboratory Manager, explained: “ADPEN was contracted to analyze between 10,000 and 15,000 samples from agriculturally sensitive areas across the US where there is concern about run-off from the fields contaminating

the water supply. This involved analyzing several hundred surface and drinking water samples each week, which required turnaround times of less than 10 days. The biggest bottleneck in the entire workflow was sample preparation; pipetting samples into a 96-well plate for analysis by mass spectrometry is very time consuming. To resolve this issue we needed to automate the sample preparation process, and required a liquid handling platform that could pipette consistently, accurately and reproducibly, saving time and freeing staff to perform other tasks.”

“When we saw the Freedom EVO, all the pieces of the puzzle came together; we knew that it was a viable option for us,” Steven continued. “Tecan’s long history of automation, combined with the Freedom EVO’s accuracy and flexibility, was ideal. Initially the client was hesitant, believing that an analyst would be more careful and do a better job. However, we ran many method trials to test the system’s robustness and validate the platform, successfully demonstrating that automation on the Freedom EVO was as good as, or better than, manual procedures. Reproducibility was excellent – relative standard deviations of less



The ADPEN team with the Freedom EVO. Left to right; Joshua Kaster, Olga Almaraz, Adelaida LaRosa, Steven Perez, Santina Bryant, Giuseppe Franzeze, Melisa Marshall





than 5 % were achieved – and the need for samples to be re-extracted due to spurious results was all but eliminated. The client was very happy with the results, approving the use of the platform for the study, and so we purchased a Freedom EVO 100 with a four-channel Liquid Handling Arm, which we use with Teflon-coated stainless steel tips. The system is controlled by Freedom EVOware®, with the optional TouchTools™ interface.”

“To prevent microbial activity which may cause any residue to diminish, samples are collected in vials containing sodium omadine solution, which we prepare on the Freedom EVO. We know that if the client requests 3,000 vials by a particular date, it can be done very easily; the analyst just starts the method and leaves the Freedom EVO to prepare 500 vials of preservative. The sample preparation process itself is also quite simple. Samples, blanks and calibration curve standards are pipetted into 96-well plates and 100 µl of internal standard is added. Although we currently pipette microliter volumes, the Freedom EVO gives us the flexibility to dispense precisely up to one milliliter as our requirements change.”

“The elimination of sample carry-over is

absolutely essential when performing residue analysis at levels as low as parts per trillion by liquid chromatography-mass spectrometry, as even trace amounts of a compound will be detected. Despite this, we were able to use stainless steel, rather than disposable, tips for this project due to the efficiency of the tip washing. Including four-second wash steps into our protocols proved very effective; carry-over is not an issue, allowing us to use septa – rather than solid – vial caps, which is a major benefit. The tips pierce the septa, allowing an aliquot of the sample to be withdrawn and transferred to the correct location in a 96-well plate, and the septa reseal as the tip is removed. We no longer need to spend time uncapping and recapping vials and, as the sample is always sealed, the potential for cross-contamination with another substance is effectively eliminated, which is paramount.”

“The Freedom EVOware software is quite intuitive, enabling methods to be easily modified, and gives us confidence that the Freedom EVO will accurately and reproducibly do exactly what it is programmed to do every single time. TouchTools is great too; the analyst simply selects the method, starts the run and walks

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away. It is just so easy. We always knew that automation was going to be very good for us, and would improve productivity, we just needed to demonstrate it to the client. The Freedom EVO did a great job; it just sailed through all the trials, and has alleviated the sample preparation bottleneck, reducing turnaround times from 20 days to less than 10 days. We can now do twice as many sample sets in a day, significantly increasing throughput and helping to reduce turnaround times and increase productivity. The Freedom EVO just works flawlessly,” concluded Steven.

To find out more about Tecan’s LC-MS sample preparation solutions, visit [www.tecan.com/lcms](http://www.tecan.com/lcms)

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