

How Does the Biotage® Horizon 5000 Perform?

(Previously known as SPE-DEX 5000)

Michael Ebitson, Alicia Cannon, and Melissa Lever

Key Words

SPE-DEX 5000, Solid Phase Extraction, SPE



Introduction

When a new piece of equipment is introduced the question is always raised about performance. Does it perform as well as its predecessor? What about the performance over time? This technical note will provide data to describe the performance of the SPE-DEX 5000, providing solid phase disk extraction (SPE), compared to standards required by environmental methods.

One of the most important factors is if the system has low background so that samples with low concentration levels can be measured with confidence. Figure 1 shows the measurement of phthalate compounds in blanks over the course of approximately 3 months of normal operation. Phthalate compounds are prevalent everywhere and keeping any system clean of these compounds is a challenge. The level of phthalates observed is extremely low, close to the method detection limit (MDL) for many measurements. In all cases the level is below the 0.1 µg/L (red line in Figure 1) specified in US EPA Method 525.2 for drinking water. Some disturbances are seen, but usually brought about by small changes in the hardware, such as a new disk holder. This shows that extracts obtained using this system will be free from contamination if routine cleaning is applied. Therefore low concentration samples are very likely to be extracted and measured with success.

Figure 2 shows selected analyte recoveries from different types of compounds measured in a full suite of approximately 100 compounds generally monitored in drinking water. The recoveries of a low-level spike were measured multiple times in replicate prepared samples to show both equipment robustness and performance. The recoveries over the course of a month are consistent and well within the 70-130 limit criterion for pre-extraction spiking generally specified in environmental methodology (US EPA Methods 525.2 or 508.1 for example). The extractions were on the same piece of equipment which operated without error for the month time frame, indicating durability.

The next figure (Figure 3) demonstrates the precision between replicates measured over the course of the month on freshly prepared replicates. In all cases the relative standard deviation of the spike recoveries is less than the 30% criterion applied to low level concentrations in methods, such as US EPA 525.2 and 508.1.

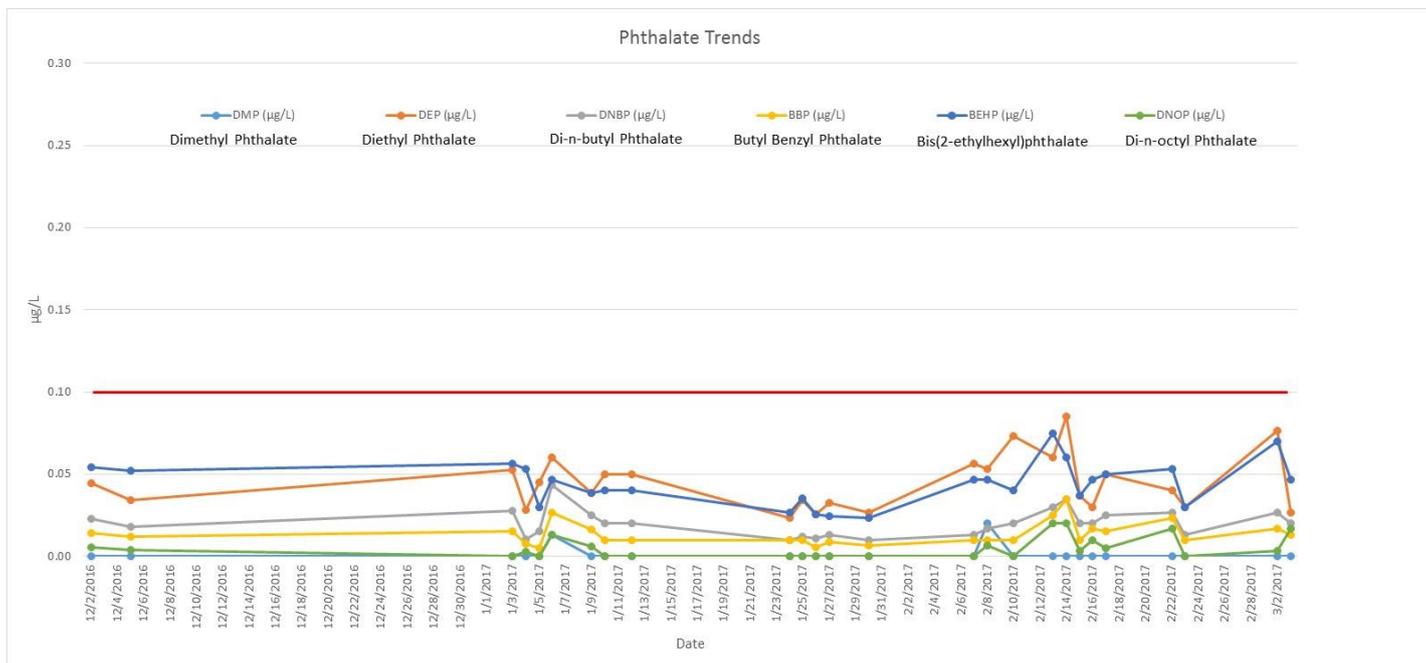


Figure 1. Low phthalate concentrations in the SPE-DEX 5000 over the course of three months.

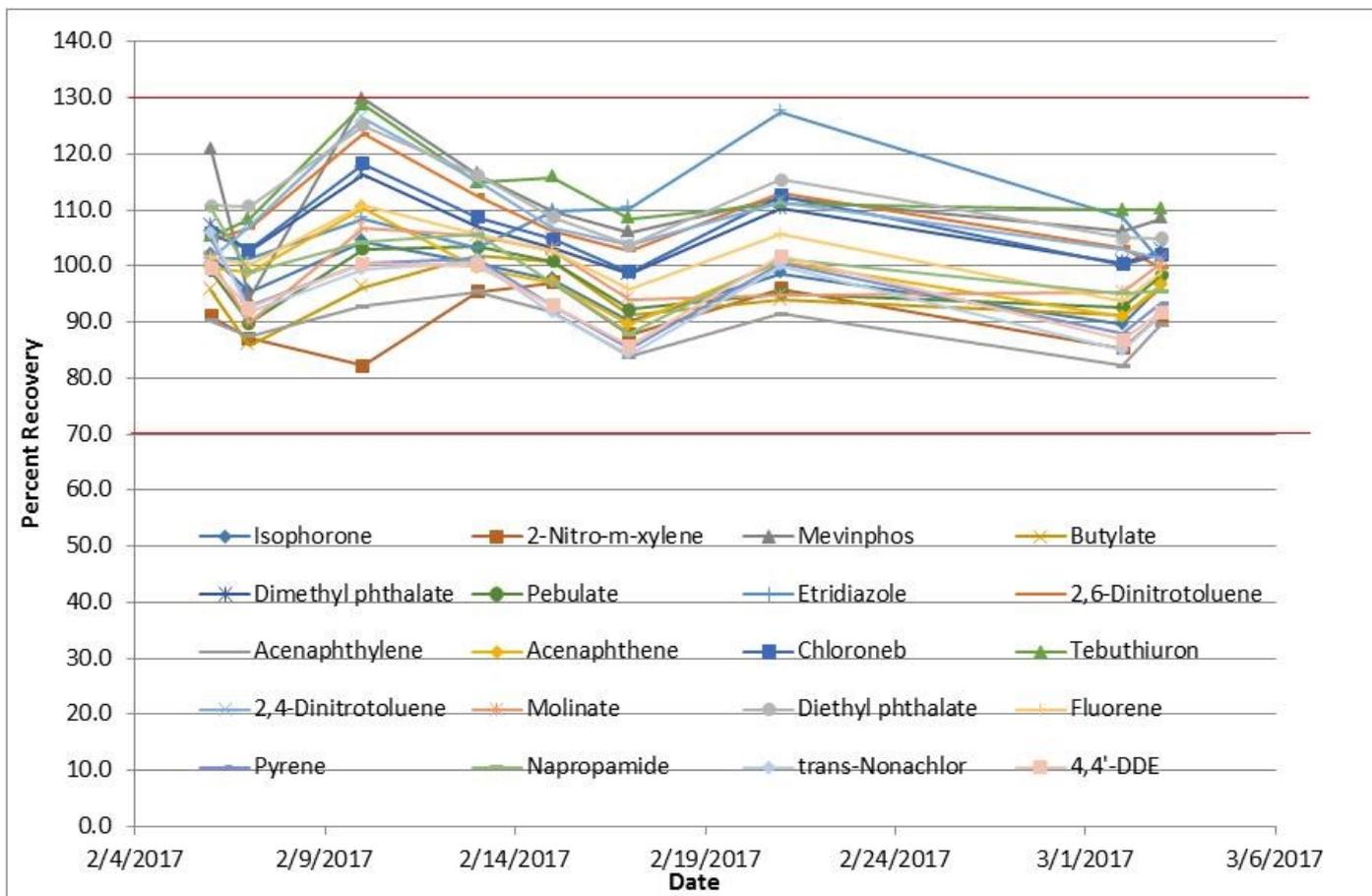


Figure 2. Recoveries of selected compounds over one month

Figure 5 shows various compounds and recoveries, sorted by their spiking mix classification. The spiking mixes are not completely different types of compounds, but do show some difference such as nitrogen/phosphorus pesticide mix vs. organochlorine mix. The supplemental spike mix contained things such as caffeine, which is a good marker compound. The recoveries over the various standard mixes are excellent, showing that the SPE-DEX 5000 is well suited to a variety of analytes of interest. See Reference 1 for a full list of analytes.

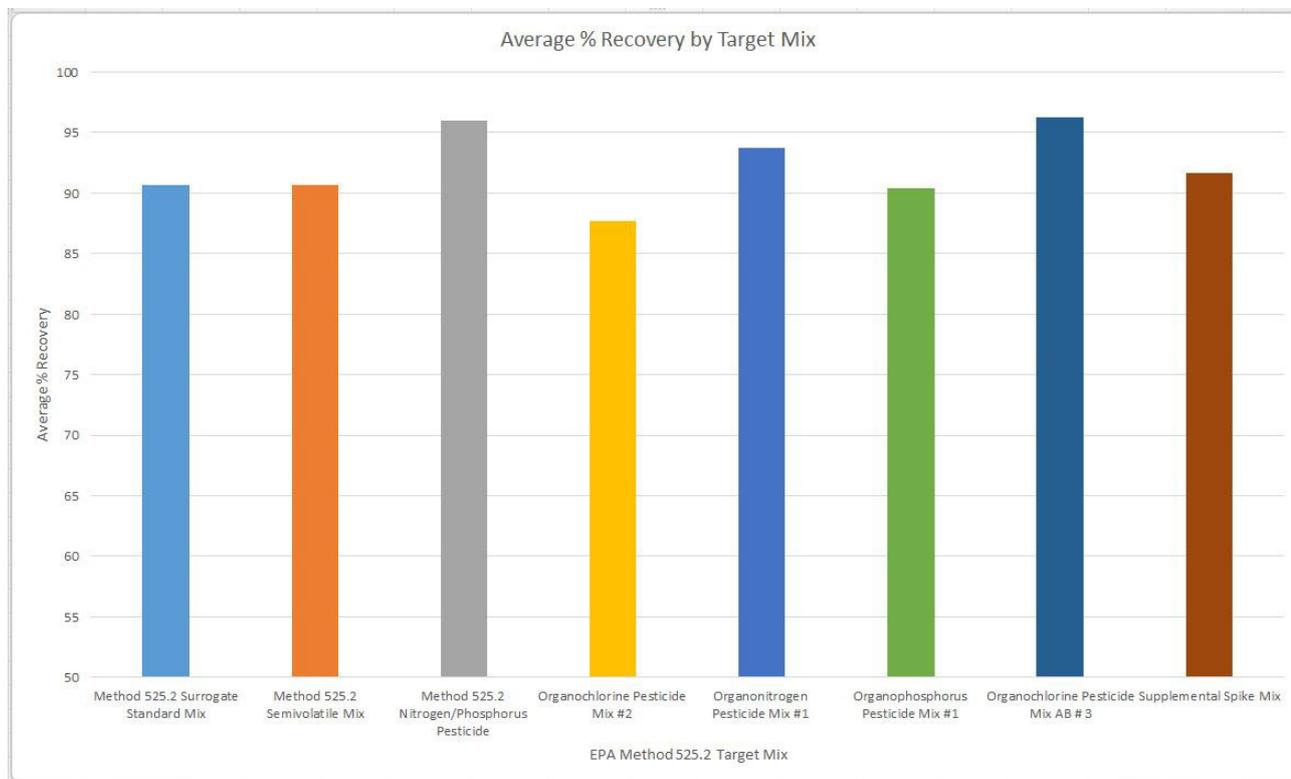


Figure 5. Average percent recovery by compound class in a suite of over 100 compounds measured

Figure 6 compares the performance of the new model SPE-DEX 5000 with the model SPE-DEX 4790. The performance should be equivalent or better since it is automating the chemistry of solid phase extraction and contributing the same or better precision to the extraction process. This figure shows that the systems are virtually equivalent when comparing the average recovery over time of more than 100 low-level spikes of a full suite of analytes.

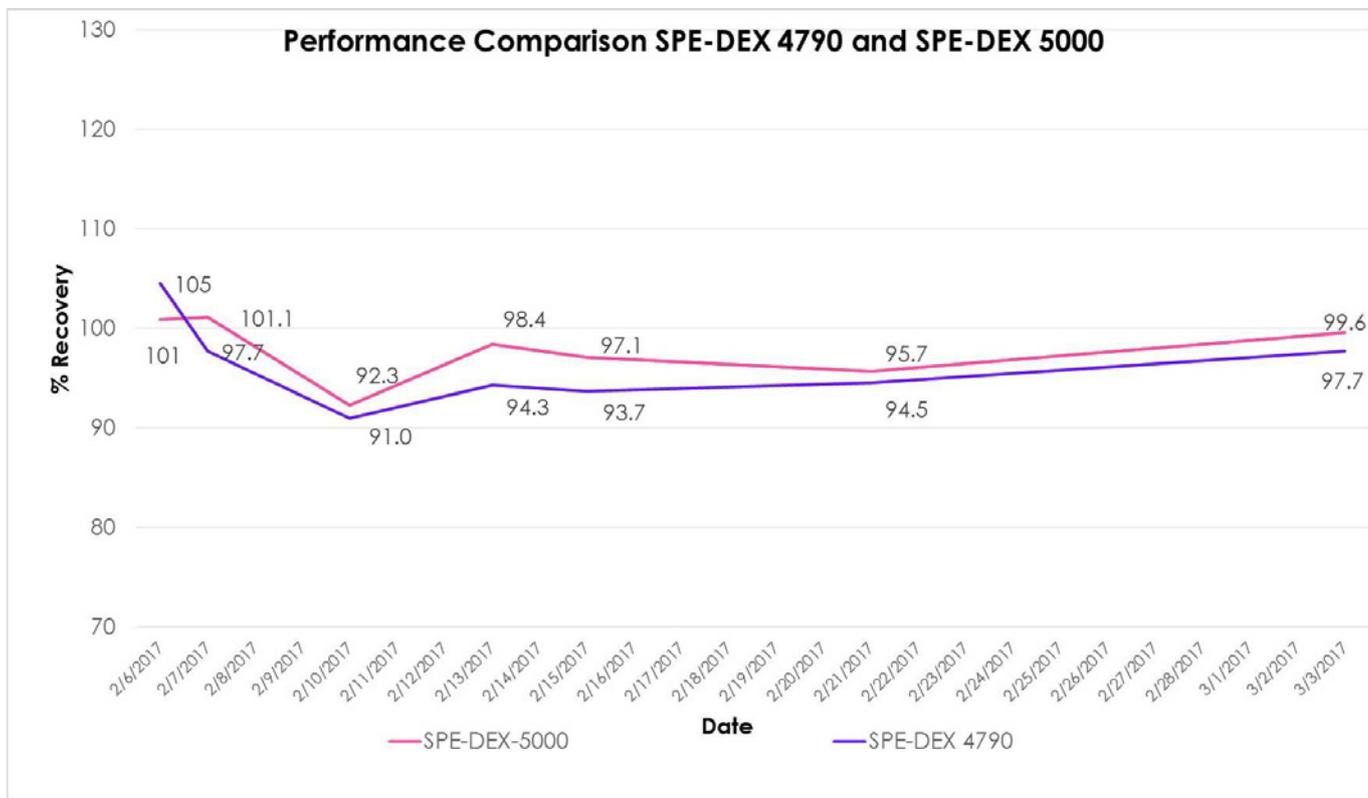


Figure 6. Daily recovery averages over the course of a month compared for the SPE-DEX 4790 and SPE-DEX 5000. (GC maintenance performed on 2/8/2017)

Conclusion

The performance of the SPE-DEX 5000 was demonstrated for low contamination and ability to be easily cleaned over the course of many analyses. A full suite of varied analytes was recovered with excellent accuracy and precision. The work was handled reliably by the equipment and the system performed flawlessly over the course of several months.

The SPE-DEX 5000 compared well with the SPE-DEX 4790, demonstrating that laboratories currently using the 4790 will achieve the same performance and have the added benefit of additional software and hardware features and increased ruggedness.

References

1. Extraction of a Full Suite of Semivolatile Compounds from Drinking Water using Automated Solid Phase Extraction, AN1141703_01, (2017) available from www.horizontechnic.com.