

## Application Note

### Introduction

Organochlorine Pesticides (OCPs) are a group of persistent organic pollutants (POPs). In which most of these have been prohibited from use. OCPs are grouped into three groups: dichlorodiphenyl ethane (DDT, DDD, and DDE), cyclodiene (aldrin, dieldrin, heptachlor and endosulfan) and chlorocyclohexane ( $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$ -HCH).

The QuEChERS extraction method is applicable for OCPs in fruits and vegetables. In this application Teledyne Tekmar wanted to apply a modified QuEChERS extraction for determination of OCPs in water instead of doing a traditional Liquid-Liquid Extraction (LLE).

The goal of this project is to evaluate the performance and versatility of the AutoMate-Q40 for the extraction of OCPs in water by a modified QuEChERS extraction. Gas Chromatograph coupled to a Mass Spectrometer (GC-MS) was employed for the detection of OCPs in water. Quantification was based on matrix-matched calibration curves using linear regression with 1/x weighting.

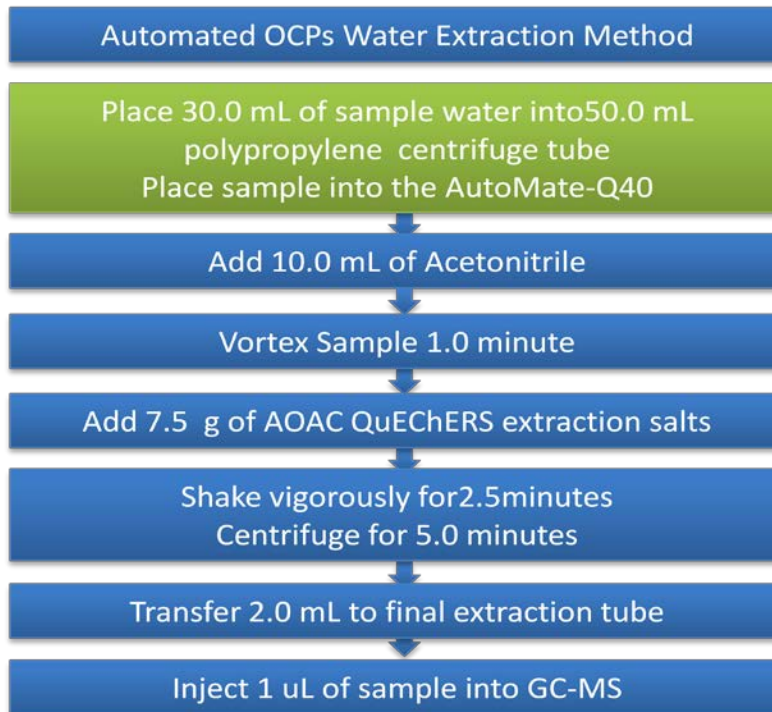


### Sample Preparation/Results

Figure 1 shows the sample preparation and extraction steps that are needed to extract OCPs from water. Automating the water extraction enables fast, easy, reliable and highly reproducible extractions. The AutoMate-Q40 improves the repeatability and consistency between samples.

Table 1 shows that when using the AutoMate-Q40 to extract OCPs from water the recoveries range from 78% to 110%. Table 1 also shows that the results have excellent precision ranging from 4.18% to 8.02%. Figure 2 shows a SIM chromatogram of the low level (10ppb) QC samples overlay.

**Figure 1** AutoMate-Q40 Organochlorine Pesticides Water Extraction Method



**Figure 2** GC/MS SIM Chromatogram overlay of 10 replicate Low Level QC standards

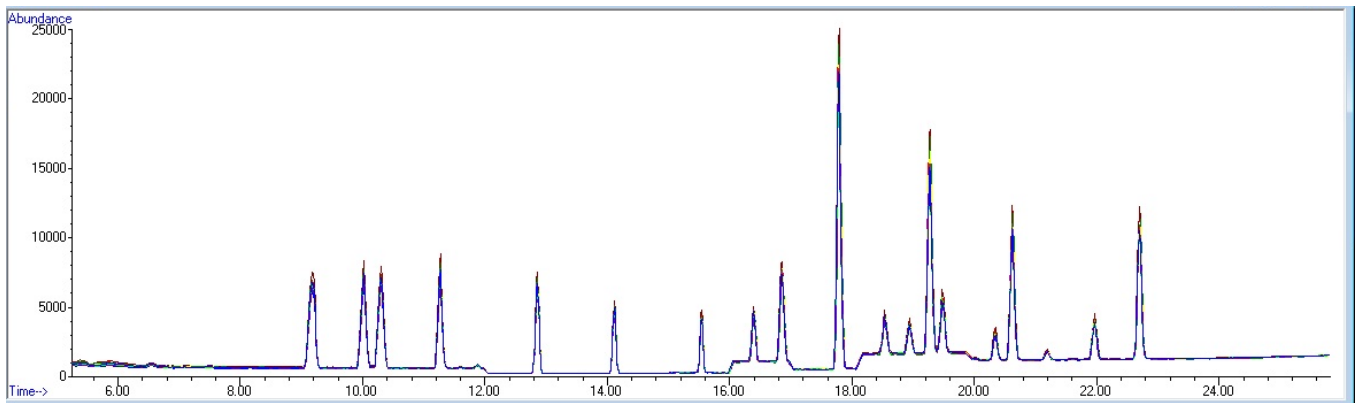


Table I QC Analytical Results OCPs in Water					
Compounds	Calibration	Low QC Spike 10ppb		High QC Spike 20ppb	
	10-400 pg/ul	%Recovery	%RSD	%Recovery	%RSD
α-BHC	1.000	107.13	5.95	97.26	6.09
γ-BHC	1.000	108.30	5.59	94.96	5.65
β-BHC	1.000	105.41	6.48	95.31	5.73
δ-BHC	1.000	105.21	6.53	91.59	5.97
Heptachlor	1.000	95.84	5.40	90.45	3.94
aldrin	1.000	97.52	5.22	92.81	4.55
Heptachlor expoxide	1.000	104.63	4.58	97.52	5.15
δ-chlordane	1.000	100.52	6.41	92.34	5.00
α-chlordane	0.997	101.15	4.63	95.56	6.56
Endosulfan I	0.998	86.15	7.85	90.09	4.80
4,4'-DDE	1.000	97.85	5.34	87.97	5.76
Dieldrin	1.000	106.52	5.63	93.18	6.58
Endrin	1.000	104.93	5.53	95.74	6.37
4,4'-DDD	0.999	96.94	5.02	78.69	5.68
Endosulfan II	0.999	106.81	5.24	92.62	6.45
4,4'-DDT	0.999	100.65	5.22	81.96	6.19
Endrin Aldehyde	0.999	110.85	4.18	95.16	6.31
Endosulfan Sulfate	1.000	100.25	8.02	87.59	7.01
Methoxychlor	0.997	106.04	4.00	80.41	6.03
Endrin Ketone	0.999	105.27	6.22	92.84	7.69
average		102.40	5.65	91.20	5.88

## Conclusion

Automation of this OCPs water extraction method produced reliable results for the spiked samples. Automating this extraction shows the versatility of the AutoMate-Q40 and how it can be adapted to other extractions. The AutoMate-Q40 led to improved repeatability, a reduction in the likelihood of human error and the potential for significant labor savings.

Precision and accuracy were assessed for the water samples analyzed for OCPs. Results for the automated procedure were well within the criteria set forth in this study: Average recoveries for the range of commodities were between 91.2% and 102.4% with good precision (ca. 5.5% RSD).