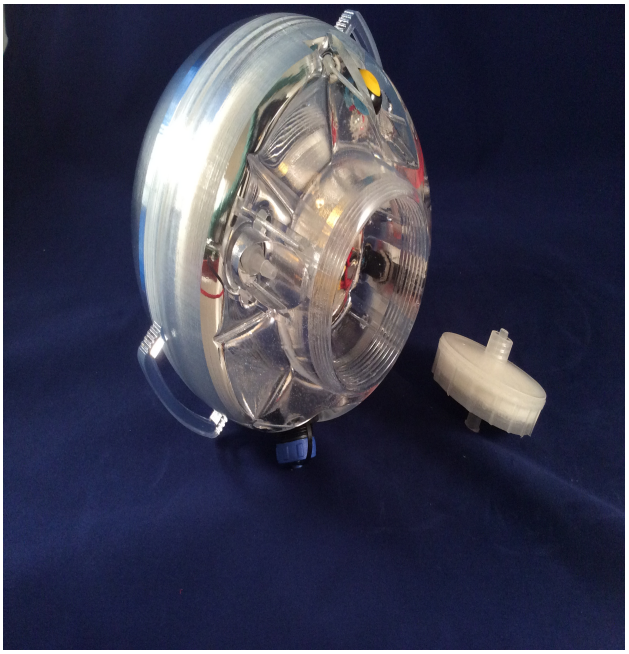
AQUALYTICAL

Retention and Depletion of Integrated Analytes in the CLAM

The CLAM is designed to be a small, submersible, continuous low flow integrated sampler. It uses SPE disks to sequester pollutants from aquatic environments, and will operate up to 36 hours on four AA batteries unattended. Unlike standard grab sampling, it will integrate into the SPE media episodic events, and dynamic changes in the aquatic environment. Since the device can sequester the analytes from up to one hundred liters of water it has sensitivity orders of magnitude greater that a single one liter grab sample.

It is important to determine if these sequestered analytes captured within the SPE media, are resistant to leaching and partitioning off the SPE extraction media while actively deployed in the field. The following bench study was designed to determine the retentive capability of the CLAM while deployed.

Two identical SPE disks containing DVB H20 phobic media were conditioned with methanol, and rinsed with pH 2.0 water. The disks were then spiked with a Pesticide and PAH mixture and rinsed with 100 ml of pH 2.0 water. One of the disks was immediately eluted with DCM into a 40 ml vial, the extract dried with Na2SO4 and the volume adjusted to 10 mls. The second disk was attached to the CLAM, and submersed in a receiving jar with 12 liters of distilled water of pH 5.9. The CLAM was then activated, and drew one hundred liters of water though the SPE disk in 24 hours. The expelled water was replaced with fresh DI water to maintain the initial 12 liter level. The Disk was removed and eluted as was the first disk to a 10 ml extract volume.



The Extracts were analyzed using an Ion Trap GC/MS per method 8270. The first disk extract, was used as a reference standard for relative comparison. The spike amount was 100ul, of 100 ug/ml of a spiking solution per each disk. This yields a 1000 ug/l true value in the 10 ml extract volume. The results are tabulated side by side below allowing comparison of the values.

The comparison table below shows only an instrument bias toward the true value of the first disk. The result of drawing the 100 liters of DI water through the disk for 24 hours, removed no appreciable amount of analyte integrated into the disk.

This gives the CLAM the unique ability with its SPE media disks, to integrate episodic events within the dynamic aquatic environment, and lock those captured analytes in the media until they are eluted by the laboratory. This study was focused on non-polar compounds; other tests will be conducted for polar compounds, and metals using compound specific media disks. Other pump models will also be tested at lower flow rates and third party field validations are scheduled with private and governmental organizations.

PAH Analysis Results in ug/l	Reference Disk	CLAM Disk 100 liters
Naphthalene	1000	948.8
2-Methylnaphthalene	1000	853.7
1-Methylnaphthalene	1000	855.5
Acenaphthylene	1000	886.1
Acenaphthene	1000	797.8
Fluorene	1000	898.0
Phenanthrene	1000	873.7
Anthracene	1000	838.03
Fluoranthene	1000	1029.6
Pyrene	1000	1037.0
Benzo(a)anthracene	1000	1000.4
Chrysene	1000	999.0
Benzofluoranthenes	2000	2075.0
Benzo(a)pyrene	1000	938.7
Indeno(1,2,3-cd)pyrene	1000	938.7
Dibenz(a,h)anthracene	1000	900.3
Benzo(g,h,i)perylene	1000	1051.8
Pesticide Analysis Results in ug/l	**Reference Disk**	**CLAM Disk 100 liters**
alpha-BHC	1000	877.9
beta-BHC	1000	1336.0
delta-BHC	1000	1092.5
gamma-BHC	1000	1182.0
Heptachlor	1000	972.9
Aldrin	1000	947.5
Heptachlor epoxide	1000	1060.2
gamma-Chlordane	1000	1140.1
Endosulfan I	1000	1156.9
DDE	1000	1071.7
Dieldrin	1000	1061.5
Endrin	1000	1262.4
Endosulfan II	1000	1255.5
DDD	1000	1001.9
Endrin aldehyde	1000	801.5
DDT	1000	1044.1
Endosulfan Sulfate	1000	1012.15
Endrin ketone	1000	1083.1
Methoxychlor	1000	1134.4
Permethrin	1000	1120.1