TEST PROGRAM FOR POLY- BIO- MARINE, INC 's FIN-L-FILTER SYSTEM AND CHEMICAL SORBENT MEDIA

Lead (Pb)		**(Pb) Concentration: ng/ml (ppb)**
filtered tap water (background)	6.19 pH	6.04
spike + buffer 1.5ml 2.5N (Na OH)	7.75pH	116.85
(2) 12/Pk's (2.75" Dia.)	6.65pH	43.87 (62.45%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. Running Time: 34 seconds		
Controls: (75ng/ml) & (150ng/ml)----------		82.61 & 170.90
filtered synthetic seawater	8.21pH	12.34
spike (200ng/ml)	8.12pH	248.38
(1) 12/Pk (2.75" Dia.)	8.39pH	90.72 (63.47%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. Running Time: 14 minutes & 16 seconds		
500ml Resin Mixture *	3.26pH	206.94 (16.68%Reduction)
* commercial mixture designed for heavy metals .		
Lead (Pb) in Synergistic Mixture: Cadmium,Mercury,Lead		
filtered tap water	6.12pH	27.26
spike: 100ng/ml	5.90pH	117.89
(2) 12/Pk's (2.75" Dia.) Regular Grade **		61.94 (47.45%Reduction)
(2) 12/Pk's (2.75"Dia.) Higher Grade **		48.52 (58.84%Reduction)
** **Flow Rate: 3.78 gpm @ 40psig.** Running Time: 65 seconds		
(2) 12/Pk's (2.75" Dia..) ***		28.94 (75.45%Reduction)
(2) 12/Pk's (2.75" Dia.) ***		31.17 (73.56%Reduction)
***Flow Rate: 3.78 gpm @ 40psig.** Running Time:14 minutes & 16 seconds (Recirculating - closed system)		
Controls: 75ng/ml		70.90
150ng/ml		157.05

Filtration Procedure:
System designed for single pass or recirculation.
Tank: 10 gal. Nalgene FDA Approved.
Pump: 4-Stage piston (Flojet)Approved for potable water.
Tubing: PVC (reinforced) nontoxic
Canisters: 2 #10 Clear Ametek (NSF)
Pipe: polypropylene for ultrapure water with teflon tape.
Media Retainer: UMHW polyethylene end caps with cast acrylic tube.

Analysis Method: (Atomic Absorption w/ Graphite Furnace) *Clinical Method for Blood and Urine Analysis under CAP Regulations for Hospitals and Medical Schools. (EPA Method : 7421) CAP: College of American Pathologists*

	A	B	C	D	E	F	G
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2	116.85	Spiked Sample ng/ml					
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22							
23							
24							
25							
26							Filtrate
27							43.87
28							
29							
30							
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36							
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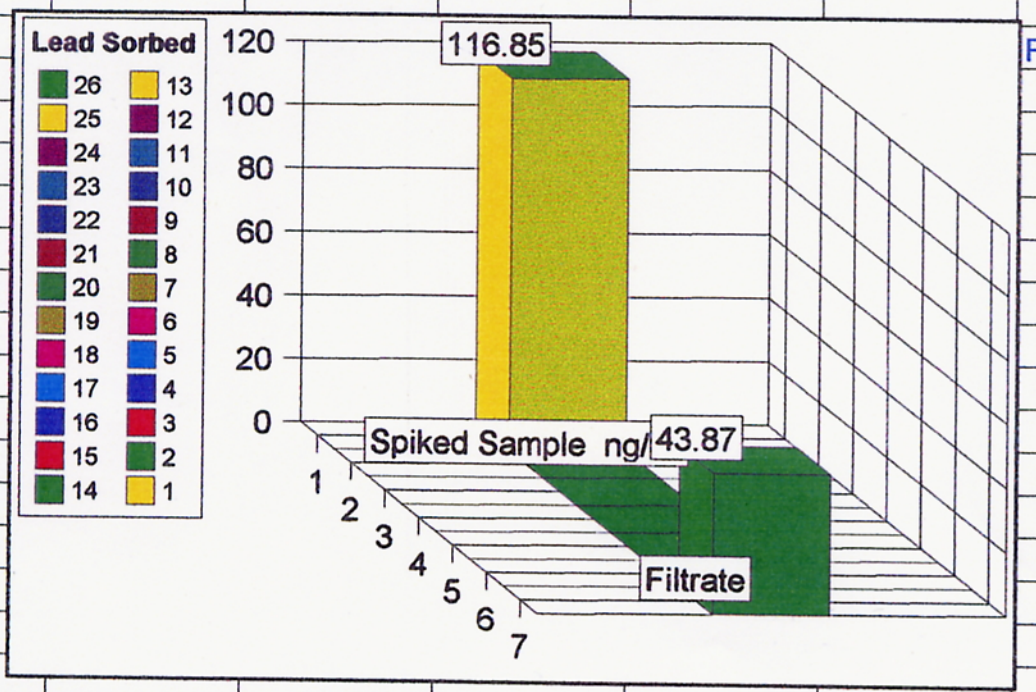
41							
42	0 Seconds						34 Seconds



Mercury (Hg)		**(Hg) Concentration: ng/ml (ppb)**
filtered tapwater	6.12 pH	0.00
spike (573 ul / 990 ug/ml)	7.76 pH	40.09
+ 2 ml Na OH (2.5N)		
(2) PMA 12/Pk's (85seconds)/5 gal.	7.25 pH	25.36 (36.74% Reduction)
(same 12/Pk's 15 minutes)	6.51 pH	22.23 (44.54% Reduction)
synthetic seawater	8.24 pH	3.43
spike (1.728ml /990 ug/ml)	8.16 pH	77.02 *
diluted 1:2 * concentration obtained multiply by # 3		
(22) PMA Discs (Bypass Noted)	8.53 pH	57.28 *
diluted 1:2 *		
extreme amount of -		
media bypass noted test run 16 minutes with muliple stops		
silcon grease used to attempt correction. We discovered		
later, through testing, silicone grease contains mercury.		
control (1) 10ng/ml		10.01
control (2) 20ng/ml		20.35
Mercury (Hg) in Synergistic Mixture:		
Mercury, Cadmium, Lead		
filtered tapwater (background)	6.12 pH	0.00
spike (sample diluted 1:5)	5.90 pH	122.86
(2) PMA-1 12/Pk's (90 seconds/18.925 L)	6.30 pH	44.54 (63.74%Reduc.)
same 12/pk's running 14min.& 16 sec.	5.90 pH	48.04 (60.89%Reduc.)
(2) PMA-1 12/Pk's (90 seconds/18.925 L)	6.40 pH	63.76
(heavy grade /washed in 1.0 microsiemen/cm)		
same 12/pk's running 14min. & 16 sec.	6.46 pH	70.74
(heavy grade/washed in 1.0 microsiemen/cm H20)		
Note: all other samples diluted 1:2		
control (1) 10 ng/ml		11.16
control (2) 20 ng/ml		21.83

Analyis Method : (Atomic Absorption w/Graphite Furnace) *Clinical Method for blood and urine analysis, approved under CAP Regulations for Hospitals and Medical Schools. EPA Method 7471*

Flow Rate :3.78 gpm (14.30 Liters per minute) @ 40 psig.

Filtration Procedure:

10 gal.(37.85 L) Nalgene polyethylene FDA Approved for Food Contact.

System may be used for single pass or recirculation of filtration solution.

Tubing/hose PVC (reinforced) FDA NonToxic Receipe.

Pump: (all plastic) Four piston , Flow Rate (constant) 3.78 gpm @ 40 psig.
(Flojet approved for potable water)

Canister: #10 Clear Ametek (NSF) Two Connected in Series.

Pipe: polypropylene rated for ultra-pure water w/ teflon tape.

Media Retainer: UMHW polyethylene end caps with cast acrylic tube.

	A	B	C	D	E	F	G
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2	122.86	Spiked Sample ng/ml					
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18							
19							
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21							
22							Filtrate
23							44.54
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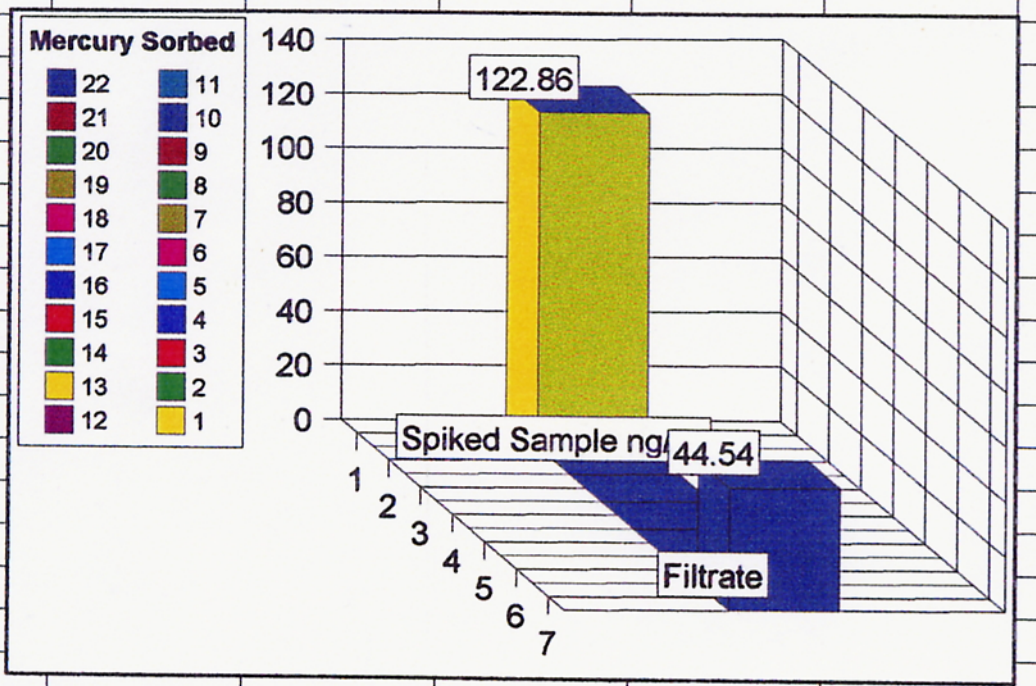
42	0 Seconds						90 Seconds



Cadmium (Cd)		**(Cd) Concentration: ng/ml (ppb)**
filtered tapwater (background)	6.30pH	0.00
spiked sample (50ng/ml)	6.30pH	64.83
(1) PMA-1 12/Pk (34 seconds)	6.44pH	64.64
(2) PMA-1 12/Pk's(34 seconds)	6.20pH	63.98
pH Test Ametek NSF (carbon-resin) (running time: 34 seconds)	9.11pH	n/a
synthetic seawater (background)	8.11pH	0.00
spiked sample (200 ng/ml)	8.11pH	243.20
(2)PMA-1 12/Pk's (used above) (running time:14 minutes)	8.44pH	172.12 (29.33% Reduction)
Ametek NSF (carbon/resin filter) (running time: 14minutes)	9.15pH	29.50 (87.87% Reduction)

Note: Ametek's NSF Filter produced a unacceptable alkaline pH level. If this filter was used o tapwater containing buffers sufficient to produce a moderate alkaline pH level (8.00) it would raise the pH level over 2.91 units. This would produce 8.00 + 2.91 = 10.91 pH (see pH test above) which is far to high for most adult human skin.

Control (1) 15ng/ml 14.86
Control (2) 30ng/ml 30.30
Dilutions: tapwater 1: 1
seawater 1:9

Note: as pH value rises above 8.00pH - Cadmium is sorbed. The next test will show and prove sorbing Cadmium requires addition of a buffer or other metals which form complexes (synergistic reaction).

Cadmium (Cd) in synergistic mixture:
Mercury (Hg), Lead (Pb), Cadmium (Cd)

NSF filtered tapwater (background)	6.12pH	4.12 * (Concentration X 3)
* sample diluted 1: 2		
spike (100ng/ml)	5.90pH	79.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)	6.30pH	36.33 * 54.26%Reduction
(2) PMA-1 12/Pk's (85 seconds/5gal.)**	6.40pH	29.22 *63.27%Reduction
(2) PMA-1 12/Pk's(14minutes &16 seconds)	5.88pH	20.93 *73.65%Reduction
(2) PMA-1 12/Pk's(14minutes &16 seconds)**	6.46pH	27.80 *65.00%Reduction

**(washed in 1.0 microSiemens/cm H20)

Control (1) 15ng/ml 16.14
Control (2) 30ng/ml 29.88

Cadmium (Cd) like Zinc (Zn) is not stable in slightly acidic,neutral or basic solutions. The solute Cadmium , in nature , synergistically bonds Copper,Iron,Lead or Mercury. Therefore, sorbing Cadmium requires either shifting the pH values alkaline ,very slow flow rates, or a synergistic reaction simulation.

Analysis Method: (Atomic Absorption w/Graphite Furnace) *Clinical Method for blood and urine analysis under CAP Regulations for Hospitals and Medical Schools. (EPA Method : 7131)*

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	A	B	C	D	E	F	G
1							
2	79.44	Spiked Sample ng/ml					
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18							Filtrate
19							29.22
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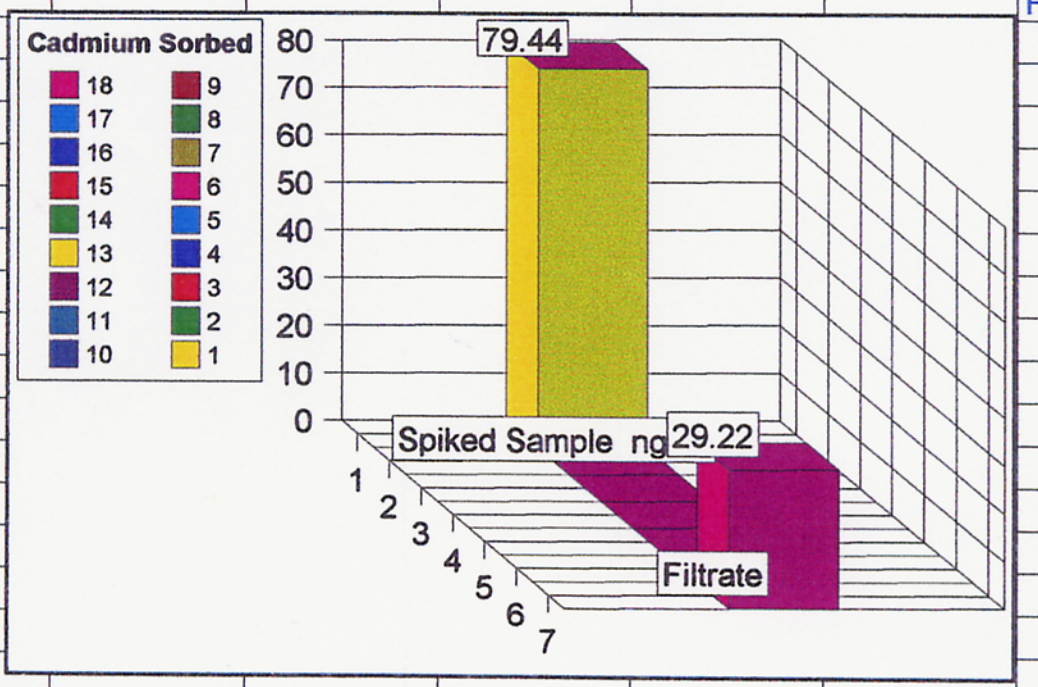
42	0 Seconds						85 Seconds



Copper (Cu) Ionic		**(Cu) Concentration: ng/ml (ppb)**
filtered tapwater NSF	7.78pH	105.866
spike (600ng/ml)	8.00pH	718.951
(1)PMA-1 12/Pk (17seconds)	7.65pH	489.04(31.97%Reduction)
(2)PMA-1 12/Pk's(20seconds)	7.30pH	374.09(47.96%Reduction)
Mega Media (zeolite)(17 seconds)	8.80pH	613.577
Mega Media weight (170 grams)		
Bio-Chem-Zorb(carbon-resin)(30secs.)	7.17pH	575.259
Bio-Chem weight (283 grams)		
Control (1)		96.286
Control (2)		1102.130
Flow Rate: 3.87 gpm (14.30 liters per minute) @ 40 psig.		
Copper (Cu) Reagent Grade (Synergistic)		
synthetic seawater (background)	8.17pH	31.700
spike sample (200 ng/ml)	8.00pH	211.730
(2) PMA-1 12/Pk's (60seconds)	8.06pH	80.80(61.8% Reduc.)
same media reused (14minutes &16secs.)	8.03pH	72.62(65.7%Reduc.)
synthetic seawater (background)	8.20pH	59.052
spike sample	8.35pH	2418.385
(2) PMA-1 12/Pks(14minutes&16seconds)	8.56pH	1860.183
Toxic Metal Sponge(14mins.&16 secs.)	8.31pH	2284.416
Control (1) 650ng/ml		637.270
Control (2)1300ng/ml		1324.660
Copper (Cu) Chelated		
synthetic seawater (background)	8.30pH	13.091
spiked sample (Chleated Copper)	8.35pH	1454.748
(1)PMA-1 12/Pk (20seconds)	8.35pH	1375.098(5.47%Red.)
same 12/Pk (14minutes & 16seconds)	8.50pH	1128.185(22.4%Red.)
Toxic Metal Sponge (20 seconds)	8.40pH	1367.133
Bio-Chem-Zorb (20 seconds)	8.35pH	1375.098
Mega Media (20 seconds)	8.30pH	1391.028
Control (1) 650 ng/ml		642.322
Control (2) 1300 ng/ml		1391.028
synthetic seawater (background)	8.18pH	31.700
spiked sample (1450 ng/ml)	8.19pH	1570.160
(2)PMA-1 12/Pk's(14mins.&16secs.)	8.50pH	841.85(46.38%Rd)
1000ml Toxic Metal Sponge	7.91pH	1365.580
running:14mins.&16secs.		
Control (1) 650ng/ml		637.270
Control (2) 1300ng/ml		1324.660

Analysis Method: ASTM D1688-90 (Test Method B - Chelation/Extraction)
(Atomic Absorption (EPA Method : 7210)
w/chelation/extraction)

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	A	B	C	D	E	F	G
1							
2	718.951	Spiked Sample(ng/ml)					
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16							
17							
18							
19							
20							
21							Filtrate
22							374.09
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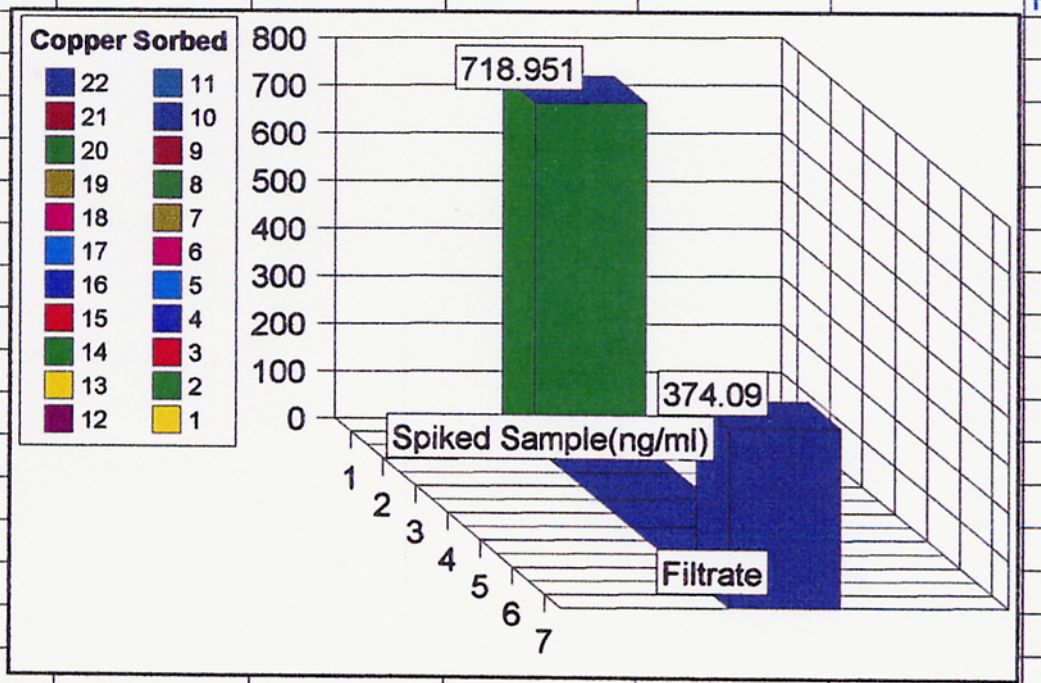
41							
42	0 Seconds						20 Seconds



Iron (Fe)		**(Fe)Concentration: ng/ml (ppb)**
filtered tapwater NSF	6.65pH	42.923
spiked sample + 1ml NaOH(2.5N)	8.00pH	272.136
Poly-Filter Discs 12 (34seconds)	7.86pH	243.485(10.53%Reduction)
Poly-Filter Discs 24 (34seconds)	7.28pH	214.833(21.05%Reduction)
synthetic seawater	8.35pH	358.091
spiked sample	8.30pH	630.282
24 used P.F. Discs(14min.&16sec.)	7.34pH	358.091(100% Sorbed)
Control (1) (450ng/ml)		444.046
Control (2) (1020ng/ml)		1031.405
Iron (Fe) Synergistic Mixture		
Copper,Zinc,Iron 200ng/ml Ea.		
synthetic seawater	8.17pH	306.098
spiked sample	8.00pH	418.424(26%Increase)
(2)PMA-1 12/Pk's (60secs.)	8.06pH	356.02(14.9%Reduction)
same (2)12/Pk's(14min.& 16secs.)	8.03pH	281.136(106.8% Sorbed)
Control (1) 150ng/ml		156.330
Control (2) 300ng/ml		318.578

Analyis Method : *ASTM D1691-90*
(Atomic Absorption *EPA 7380*
Flame emission)

Flow Rate : 3.78 gpm (14.30 liters per minute) @ 40 psig.

Note: *Synthetic seawater mixtures contain large amounts of Iron as a background impurity. Morton Salt Purex (food grade), higher grade than most synthetic seawater mixtures, contains 0.15 mg/L - 0.25 mg/L trace Iron.*

Reference: Morton Salt Literature for Purex and pharmaceutical grade sodium chloride.

	A	B	C	D	E	F	G
1							
2	Spiked Sample ng/ml						
3	272.136						
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10							
11							
12							Filtrate
13							214.136
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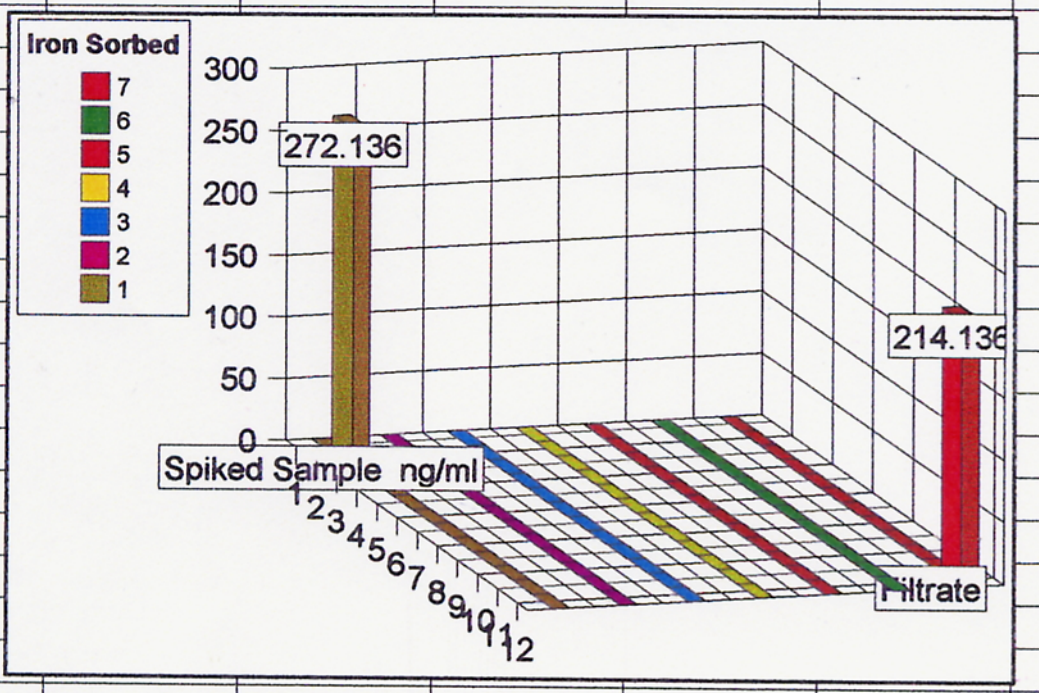
41							
42	0 Seconds						34 Seconds



Zinc (Zn)		**(Zn)Concentration:ng/ml (ppb)**
filtered tapwater NSF	6.11pH	0.00
spiked sample + 2ml NaOH(2.5N)	7.09pH	242.12
Poly-Filter Discs (2) 12/Pk's(34secs.)	6.34pH	200.62(17.14% Reduction)
same (2) 12/Pk's (15 minutes)	6.16pH	150.63(37.78%Reduction)
synthetic seawater	8.17pH	7.65
spiked sample	7.97pH	390.09
Poly-Filter Discs (2) 12/Pk's (running 14mins.& 16 secs.)	8.37pH	386.60(0.8%Reduction)
Purigen (Organic Sorbent Resin) 500ml (running 14mins. & 16 secs.)	7.34pH	321.60
Control (1) 300ng/ml		337.60
Control (2) 600ng/ml		648.56
Zinc (Zn) Synergistic Mixture Copper,Iron,Zinc (200ng/ml Ea..)		
synthetic seawater	8.17pH	0.00
spiked sample	8.00pH	140.72
(2) PMA-1 12/Pk's (60 secs.)	8.06pH	21.57(84.7%Reduc.)
same (2) 12/Pk's (14mins.& 16 secs.)	8.03pH	0.00(100%Reduc.)
Control (1) 150 ng/ml		179.02
Control (2) 300 ng/ml		319.45

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method : ASTM D1691-90
(Atomic Absorption EPA 7950
Flame emission)

Note:

Zinc (Zn) like Cadmium(Cd) is not stable in slightly acidic, neutral or basic solutions. The solute Zinc (Zn), in nature , synergistically bonds Iron,Copper,Lead or Mercury. Synthetic seawater ,a mix of cations and anions in solution, reacts bonding Zinc therby inhibiting removal via chemical filtration. However through the addition of Two new metals (Copper & Iron) our filtration media : sorbs the Zinc quantatively

	A	B	C	D	E	F	G
1							
2	140.12	Spiked Sample ng/ml					
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21							Filtrate
22							21.57
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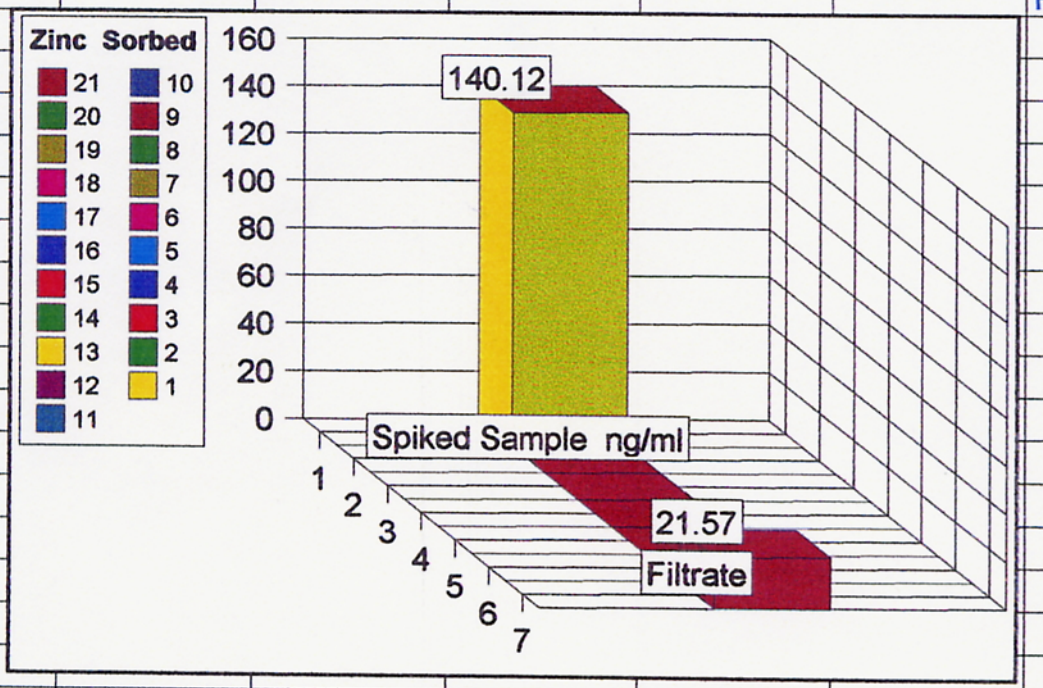
42	0 Seconds						60 Seconds



PHOSPHOROUS

Ortho Phosphate (PO 4)		**(PO 4)Concentration: ng/ml (ppb)**
(Freshwater Tests)		
city tapwater filtered	6.58pH	100.25
spiked sample (125ng/ml	7.35pH	227.82
(monobasic ortho phosphate)		
(1) PMA-1 12/Pk's	7.30pH	99.81(56.2% Reduc.)
running time: 34 seconds		
(2) PMA-1 12/Pk's	7.25pH	140.14(38.48%Reduc.)
(1) 12Pk used + (1)12Pk new		
running time: 34 seconds		
(Synthetic Seawater)		
background syn. seawater	8.10pH	22.66
spiked sample (125ng/ml)	8.12pH	115.59
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	62.99(45.50%Reduc)
running time: 14mins. & 16 secs.)		

TOTAL PHOSPHOROUS

Hydrolyzable Phosphate (PO 3)		**(PO 3) Concentration: ng/ml (ppb)**
(Meta, Hexa, Poly, Tri Poly)		
(Freshwater Test)		
city tapwater filter w/NSF Carbon	6.10pH	280.42
city tapwater filter w/Fin-L-Filter	6.15pH	75.10
spiked sample(250ng/ml)	6.35pH	315.49
(meta phosphoric acid)		
(1) PMA-1 12/Pk's	6.90pH	205.02(35%Red.)
running time: 34 seconds		
(1) PMA-1 12/Pk (used)	6.50pH	203.27(35.6%Red.)
running time: 5 minutes		
(Synthetic Seawater)		
background syn. seawater	8.10pH	52.47
spiked sample (125ng/ml)	8.12pH	124.36
(meta phosphoric acid)		
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	99.81(19.74%Red.)
running time: 14mins. & 16 secs.)		
Control (1) 150 ng/ml		159.43
Control (2) 300 ng/ml		283.93

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method: ASTM D 515 - 88 + Hydrolyzable Phosphorous (Colorimetric:880nm EPA 365.4 w/20mm light path)

	A	B	C	D	E	F	G
1							
2	227.82	Spike Sample ng/ml					
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25							Filtrate
26							99.81
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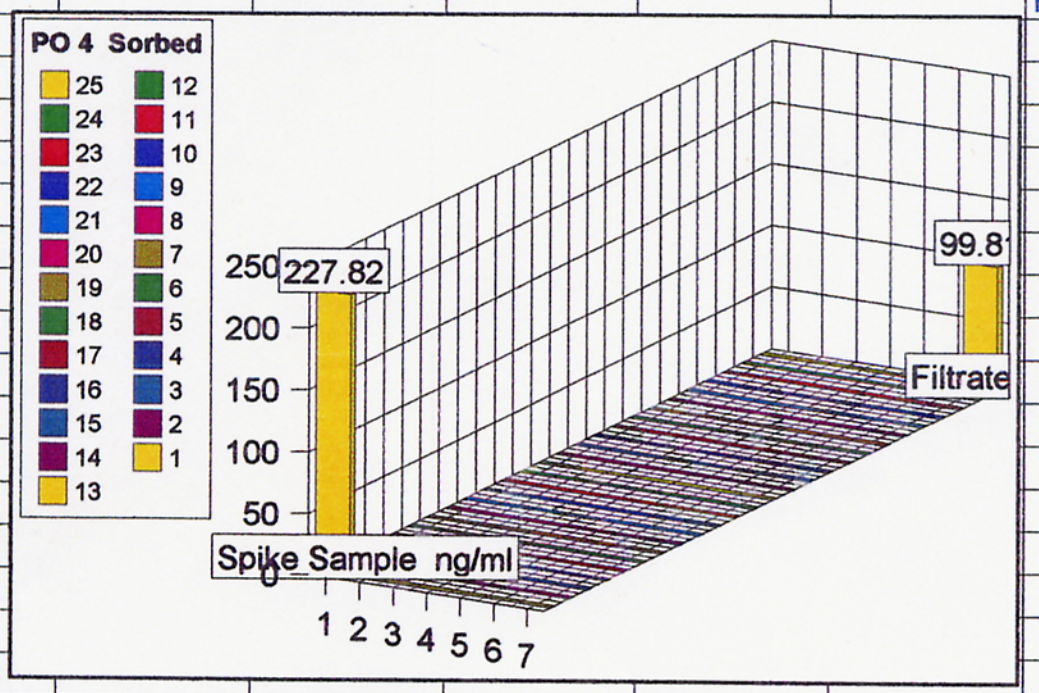
42	0 Seconds						34 Seconds



	A	B	C	D	E	F	G
1							
2	315.49	Spiked Sample ng/ml					
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19							Filtrate
20							205.02
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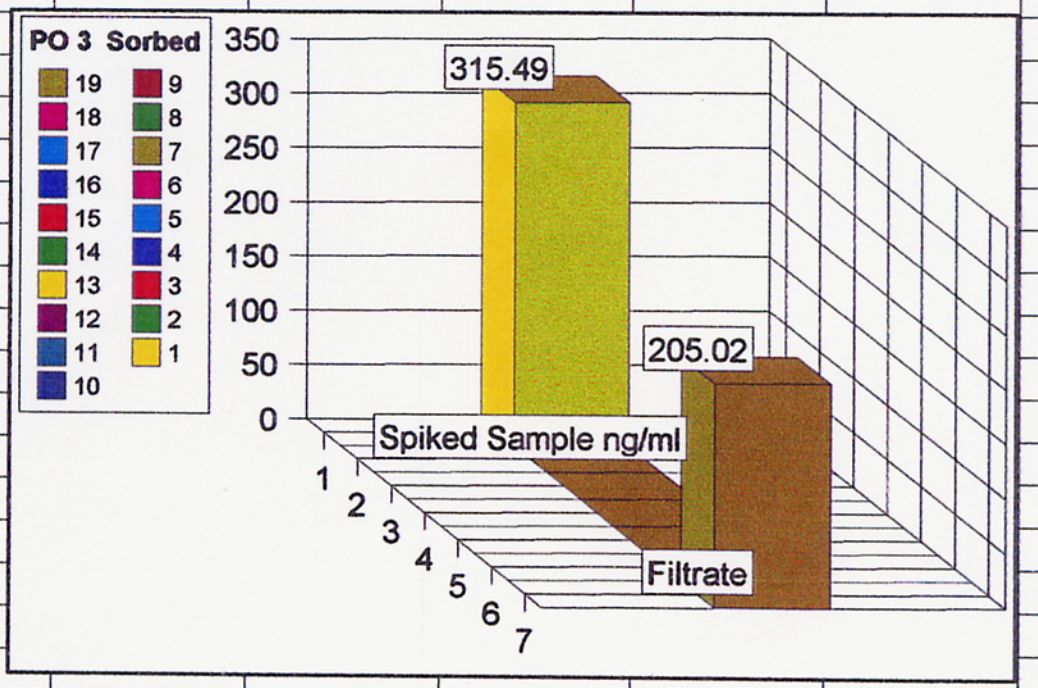
42	0 Seconds						34 Seconds



VOLATILE ORGANIC CHEMICALS (V.O.C.)

Trihalomethanes:

Chloroform (CH CL3)		**(CH CL3)Concentration:ng/ml (ppb)**
water: 5 megohm/cm	n/a pH	6.53
Spike : *30.28ml preparation	8.00pH	347.01
added to 7.57 liters		
(1) PMA-1 12/Pk **		152.45 (56.06% Reduc.)
(2) PMA-1 12/Pk s **		70.13 (79.79%Reduc.)
(1) PMA-1 12/Pk		90.71 (73.85%Reduc.)
(2) PMA-1 12/Pks		66.39 (80.86%Reduc.)
Control (1) 75ng/ml		75.75
Control (2) 150ng/ml		161.80

Flow Rate: 1-2 liters per minute

* Spike Preparation: 68 microliters of spectrograde CH CL3 added to 100ml volumetric flask to make 1mg/ml CH CL3 in ethanol. Take 10ml of the previous solution and add to new 100ml volumetric flask filled with 90ml ethanol (100 micrograms/ml). Take 30.28ml of 100ug/ml mixture and add to 7.57 liters of 5 megohm/cm water Sodium Hydroxide (electronics grade) added to produce 8.00pH solution.. Mixed in closed plastic bottle for Thirty minutes.

** Filter Media prewashed in 1.0 microSiemens/cm water (pH 5.00 - 6.35) pH was not tested to avoid the Chloroform offgassing/volatilizing from filtered samples.

Analysis Method: Microextraction into pentane prior to Gas Chromatography with electron capture detector.

Clinical Method: Journal of Applied Toxicology, Vol.2,NO..3,1982
The Presence of Trihalomethanes in Soft Drinks.
Mohamed S. Abdel-Rahman
UMD Dept. of Pharmacology, Toxicology Lab.
State of New Jersey Medical School

	A	B	C	D	E	F	G
1							
2	347.01	Spiked Sample ng/ml					
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22							
23							
24							
25							Filtrate
26							90.71
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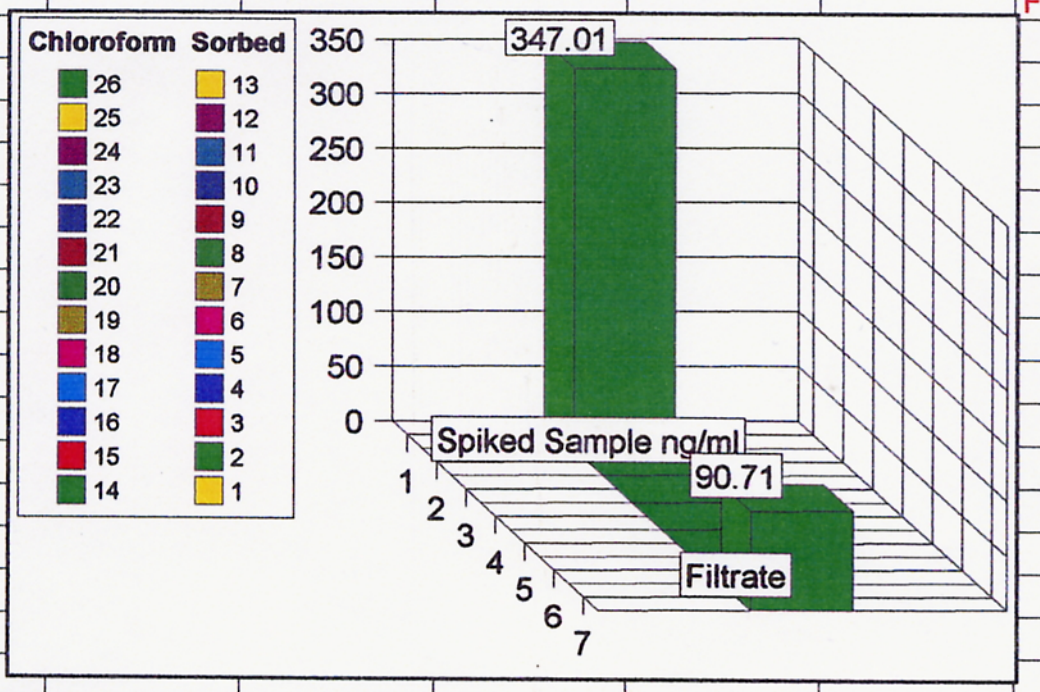
41							
42	0 Seconds						60 Seconds



STANDARDS and FORMULATION of SPIKE SOLUTIONS

Lead (Pb)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 07307PG
Cadmium (Cd)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 995ug/ml Lot No.07823AN
Mercury (Hg)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 990ug/ml Lot No. 04111A
Copper (Cu)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 05224CN
Ionic	*Sea Cure (Copper Sulfate) Aquarium Systems Concentration: 1 drop per 3.785 L. = 0.15mg/l*
Chelated	*Copper Safe (Chelated Copper Sulfate) Mardel Labs Concentration: 4.3ml/37.85 Liters = 500ng/ml*
Zinc (Zn)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 990 ug/ml Lot No. 05313DF
Iron (Fe)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration 1010ug/ml Lot No. 05212BP
Ortho Phosphate (PO 4)	Aldrich Chemical Co. Standard (Potassium phosphate monobasic) 1ml = 0.522mg PO 4 Lot No. 05130LZ
Meta Phosphoric Acid (PO 3)	Aldrich Chemical Co. (ACS) 33.5% -36.5% HPO 3 stabilized with 59.0% -63.0% Na PO 3 Lot No. 07126M2
Chloroform (CH CL 3)	Fisher Scientific Co. Spectrographic Grade Lot No. 933572

SYNERGISTIC MIXTURE
SPIKE METHOD

Copper *Iron* *Zinc*	*7.5ml of Copper Standard 1010ug/ml* *7.6ml of Zinc Standard 990ug/ml* *7.5ml of Iron Standard 1010ug/ml* *added to 37.85 Liters of Premixed Synthetic Seawater (Nalgene Tank)*
Lead *Cadmium* *Mercury*	*3.75ml of Lead Standard 1010ug/ml* *3.80ml of Cadmium Standard 995ug/ml* *3.82ml of Mercury Standard 990ug/ml* *added to 37.85 Liters of Filtered (2) Ametek (CBR 2-10), tapwater. Solution was mixed for seven minutes. The pH adjusted via Na OH (2.5N) sufficient to buffer the 37.85 Liters to 5.90 pH.*
Phosphorous	*9.0ml of Ortho phosphate standard 0.522mg/l + 4.7 mg. of metaphosphoric acid (weighed dry on analytical balance) added to 100ml (5 megaohm/cm H 2 O) beaker. The spike solution was placed on heater/mixer for ten minutes. The spike solution 's pH 8.12 in 100ml beaker. The entire contents of 100ml beaker-spike solution were added to the 37.85 Liters.*

ANALYTICAL EQUIPMENT

pH Meter :	Orion Research digital ion analyzer Model 501 Calibrated daily & electrode maintained in standard solution .(7.000 pH)
Atomic Absorption	Varian AA-875 Recalibrated and certified prior to test program. Graphite Furnace attachment by Varian. Cold Vapor/Hot Vapor collection method for Mercury.
Spectrophotometer	Varian DMS-90 ultraviolet & visible light
Conductivity	Cole-Parmer Model 1481-61 Gold Conductivity cell for low range.
Gas Chromatograph	Varian Model 3700 Flame, ECD Detector
Glassware	Washed in HNO 3 - Rinsed in 5-9 megaohm/cm and oven dried.
Distilled Water	Rainwater collected and run through a pyrogen-free still then piped to lab's Milli - Q Water System. Produces Certified 18 megaohm/cm water.
Tapwater Filtration	**Fin-L-Filter (r) Kold Ster-iL (r) *** (2) Model Pma-1's w/ 12pks (1) Model Psm-1 w/ 0.20micron *** U.S. Patent Pending.** Ametek NSF System: 0.50micron, heavy metals, VOCs & pesticides. (2) Ametek #10 ultrapure canisters w/ (2) CBR 2-10 cartridges.

TEST PROGRAM FOR POLY- BIO- MARINE, INC 's FIN-L-FILTER SYSTEM AND CHEMICAL SORBENT MEDIA

Lead (Pb)		**(Pb) Concentration: ng/ml (ppb)**
filtered tap water (background)	6.19 pH	6.04
spike + buffer 1.5ml 2.5N (Na OH)	7.75pH	116.85
(2) 12/Pk's (2.75" Dia.)	6.65pH	43.87 (62.45%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. Running Time: 34 seconds		
Controls: (75ng/ml) & (150ng/ml)----------		82.61 & 170.90
filtered synthetic seawater	8.21pH	12.34
spike (200ng/ml)	8.12pH	248.38
(1) 12/Pk (2.75" Dia.)	8.39pH	90.72 (63.47%Reduction)
cut from standard resale Poly-Filters		
Flow Rate: 3.78 gpm @ 40 psig. Running Time: 14 minutes & 16 seconds		
500ml Resin Mixture *	3.26pH	206.94 (16.68%Reduction)
* commercial mixture designed for heavy metals .		
Lead (Pb) in Synergistic Mixture: Cadmium,Mercury,Lead		
filtered tap water	6.12pH	27.26
spike: 100ng/ml	5.90pH	117.89
(2) 12/Pk's (2.75" Dia.) Regular Grade **		61.94 (47.45%Reduction)
(2) 12/Pk's (2.75"Dia.) Higher Grade **		48.52 (58.84%Reduction)
** **Flow Rate: 3.78 gpm @ 40psig.** Running Time: 65 seconds		
(2) 12/Pk's (2.75" Dia..) ***		28.94 (75.45%Reduction)
(2) 12/Pk's (2.75" Dia.) ***		31.17 (73.56%Reduction)
***Flow Rate: 3.78 gpm @ 40psig.** Running Time:14 minutes & 16 seconds (Recirculating - closed system)		
Controls: 75ng/ml		70.90
150ng/ml		157.05

Filtration Procedure:
System designed for single pass or recirculation.
Tank: 10 gal. Nalgene FDA Approved.
Pump: 4-Stage piston (Flojet)Approved for potable water.
Tubing: PVC (reinforced) nontoxic
Canisters: 2 #10 Clear Ametek (NSF)
Pipe: polypropylene for ultrapure water with teflon tape.
Media Retainer: UMHW polyethylene end caps with cast acrylic tube.

Analysis Method: (Atomic Absorption w/ Graphite Furnace) *Clinical Method for Blood and Urine Analysis under CAP Regulations for Hospitals and Medical Schools. (EPA Method : 7421) CAP: College of American Pathologists*

	A	B	C	D	E	F	G
1							
2	116.85	Spiked Sample ng/ml					
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20							
21							
22							
23							
24							
25							
26							Filtrate
27							43.87
28							
29							
30							
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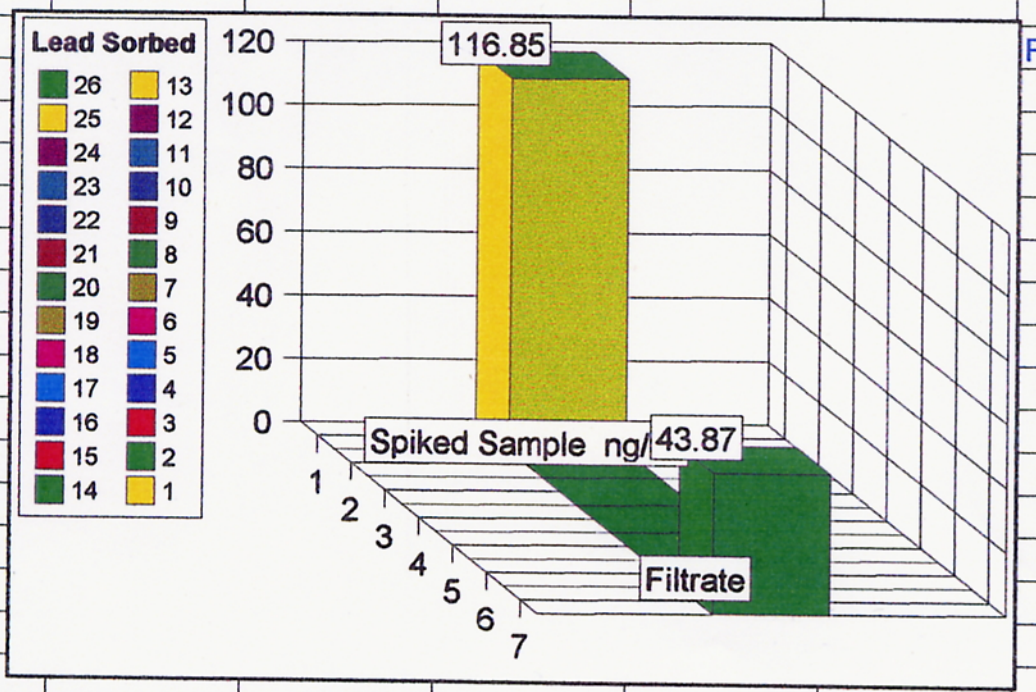
41							
42	0 Seconds						34 Seconds



Mercury (Hg)		**(Hg) Concentration: ng/ml (ppb)**
filtered tapwater	6.12 pH	0.00
spike (573 ul / 990 ug/ml)	7.76 pH	40.09
+ 2 ml Na OH (2.5N)		
(2) PMA 12/Pk's (85seconds)/5 gal.	7.25 pH	25.36 (36.74% Reduction)
(same 12/Pk's 15 minutes)	6.51 pH	22.23 (44.54% Reduction)
synthetic seawater	8.24 pH	3.43
spike (1.728ml /990 ug/ml)	8.16 pH	77.02 *
diluted 1:2 * concentration obtained multiply by # 3		
(22) PMA Discs (Bypass Noted)	8.53 pH	57.28 *
diluted 1:2 *		
extreme amount of -		
media bypass noted test run 16 minutes with muliple stops		
silcon grease used to attempt correction. We discovered		
later, through testing, silicone grease contains mercury.		
control (1) 10ng/ml		10.01
control (2) 20ng/ml		20.35
Mercury (Hg) in Synergistic Mixture:		
Mercury, Cadmium, Lead		
filtered tapwater (background)	6.12 pH	0.00
spike (sample diluted 1:5)	5.90 pH	122.86
(2) PMA-1 12/Pk's (90 seconds/18.925 L)	6.30 pH	44.54 (63.74%Reduc.)
same 12/pk's running 14min.& 16 sec.	5.90 pH	48.04 (60.89%Reduc.)
(2) PMA-1 12/Pk's (90 seconds/18.925 L)	6.40 pH	63.76
(heavy grade /washed in 1.0 microsiemen/cm)		
same 12/pk's running 14min. & 16 sec.	6.46 pH	70.74
(heavy grade/washed in 1.0 microsiemen/cm H20)		
Note: all other samples diluted 1:2		
control (1) 10 ng/ml		11.16
control (2) 20 ng/ml		21.83

Analyis Method : (Atomic Absorption w/Graphite Furnace) *Clinical Method for blood and urine analysis, approved under CAP Regulations for Hospitals and Medical Schools. EPA Method 7471*

Flow Rate :3.78 gpm (14.30 Liters per minute) @ 40 psig.

Filtration Procedure:

10 gal.(37.85 L) Nalgene polyethylene FDA Approved for Food Contact.

System may be used for single pass or recirculation of filtration solution.

Tubing/hose PVC (reinforced) FDA NonToxic Receipe.

Pump: (all plastic) Four piston , Flow Rate (constant) 3.78 gpm @ 40 psig.
(Flojet approved for potable water)

Canister: #10 Clear Ametek (NSF) Two Connected in Series.

Pipe: polypropylene rated for ultra-pure water w/ teflon tape.

Media Retainer: UMHW polyethylene end caps with cast acrylic tube.

	A	B	C	D	E	F	G
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2	122.86	Spiked Sample ng/ml					
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21							
22							Filtrate
23							44.54
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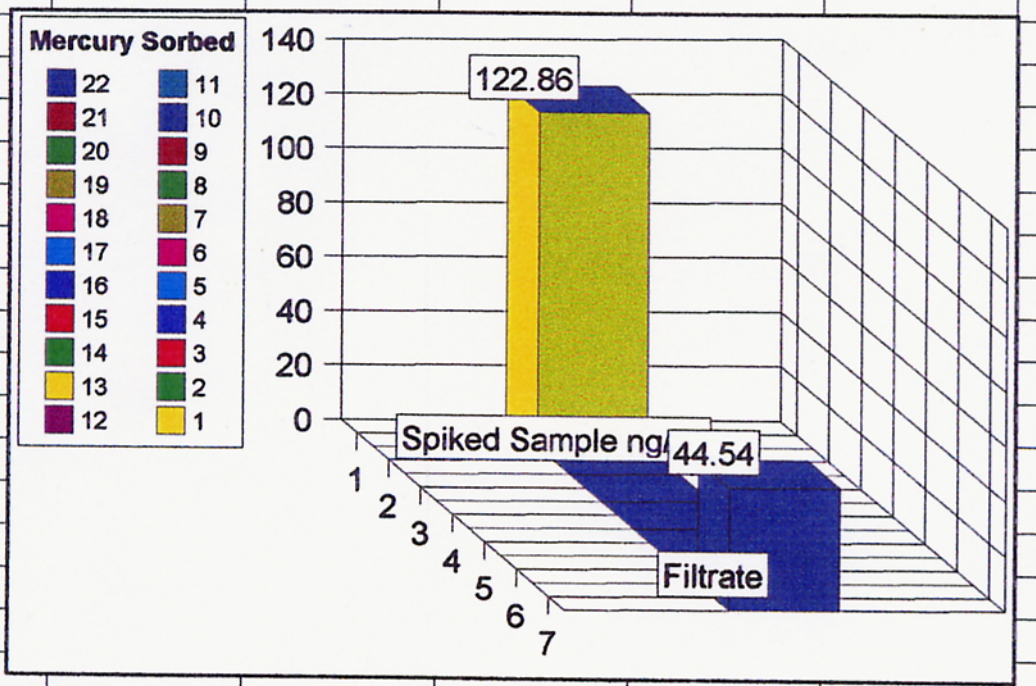
42	0 Seconds						90 Seconds



Cadmium (Cd)		**(Cd) Concentration: ng/ml (ppb)**
filtered tapwater (background)	6.30pH	0.00
spiked sample (50ng/ml)	6.30pH	64.83
(1) PMA-1 12/Pk (34 seconds)	6.44pH	64.64
(2) PMA-1 12/Pk's(34 seconds)	6.20pH	63.98
pH Test Ametek NSF (carbon-resin) (running time: 34 seconds)	9.11pH	n/a
synthetic seawater (background)	8.11pH	0.00
spiked sample (200 ng/ml)	8.11pH	243.20
(2)PMA-1 12/Pk's (used above) (running time:14 minutes)	8.44pH	172.12 (29.33% Reduction)
Ametek NSF (carbon/resin filter) (running time: 14minutes)	9.15pH	29.50 (87.87% Reduction)

Note: Ametek's NSF Filter produced a unacceptable alkaline pH level. If this filter was used o tapwater containing buffers sufficient to produce a moderate alkaline pH level (8.00) it would raise the pH level over 2.91 units. This would produce 8.00 + 2.91 = 10.91 pH (see pH test above) which is far to high for most adult human skin.

Control (1) 15ng/ml 14.86
Control (2) 30ng/ml 30.30
Dilutions: tapwater 1: 1
seawater 1:9

Note: as pH value rises above 8.00pH - Cadmium is sorbed. The next test will show and prove sorbing Cadmium requires addition of a buffer or other metals which form complexes (synergistic reaction).

Cadmium (Cd) in synergistic mixture:
Mercury (Hg), Lead (Pb), Cadmium (Cd)

NSF filtered tapwater (background)	6.12pH	4.12 * (Concentration X 3)
* sample diluted 1: 2		
spike (100ng/ml)	5.90pH	79.44 *
(2) PMA-1 12/Pk's (85 seconds/5gal.)	6.30pH	36.33 * 54.26%Reduction
(2) PMA-1 12/Pk's (85 seconds/5gal.)**	6.40pH	29.22 *63.27%Reduction
(2) PMA-1 12/Pk's(14minutes &16 seconds)	5.88pH	20.93 *73.65%Reduction
(2) PMA-1 12/Pk's(14minutes &16 seconds)**	6.46pH	27.80 *65.00%Reduction

**(washed in 1.0 microSiemens/cm H20)

Control (1) 15ng/ml 16.14
Control (2) 30ng/ml 29.88

Cadmium (Cd) like Zinc (Zn) is not stable in slightly acidic,neutral or basic solutions. The solute Cadmium , in nature , synergistically bonds Copper,Iron,Lead or Mercury. Therefore, sorbing Cadmium requires either shifting the pH values alkaline ,very slow flow rates, or a synergistic reaction simulation.

Analysis Method: (Atomic Absorption w/Graphite Furnace) *Clinical Method for blood and urine analysis under CAP Regulations for Hospitals and Medical Schools. (EPA Method : 7131)*

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	A	B	C	D	E	F	G
1							
2	79.44	Spiked Sample ng/ml					
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17							
18							Filtrate
19							29.22
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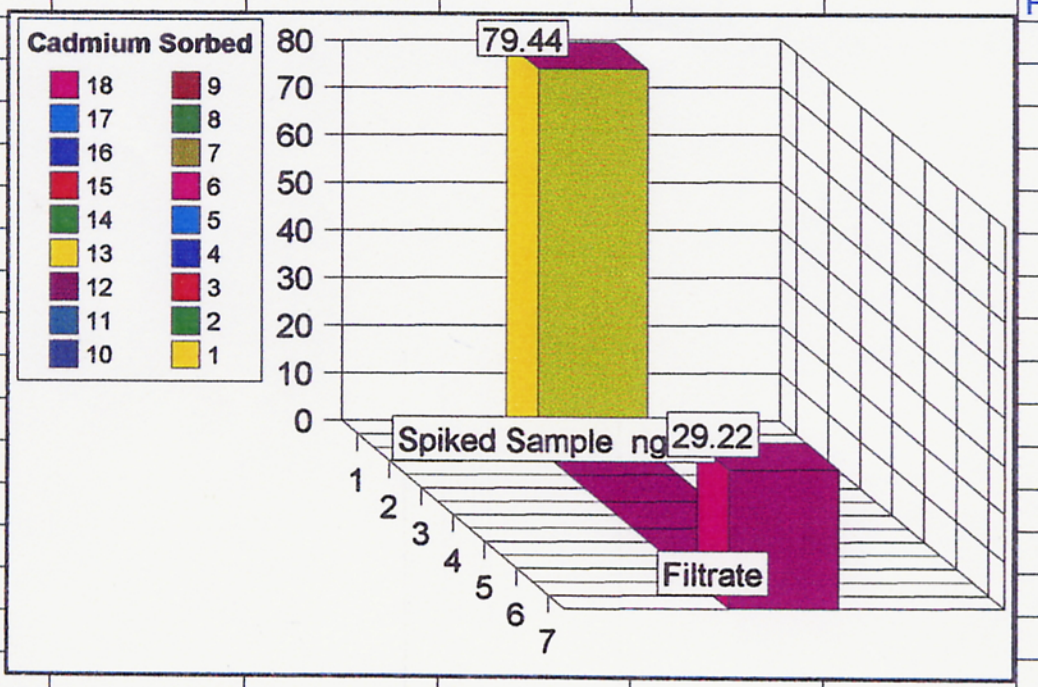
42	0 Seconds						85 Seconds



Copper (Cu) Ionic		**(Cu) Concentration: ng/ml (ppb)**
filtered tapwater NSF	7.78pH	105.866
spike (600ng/ml)	8.00pH	718.951
(1)PMA-1 12/Pk (17seconds)	7.65pH	489.04(31.97%Reduction)
(2)PMA-1 12/Pk's(20seconds)	7.30pH	374.09(47.96%Reduction)
Mega Media (zeolite)(17 seconds)	8.80pH	613.577
Mega Media weight (170 grams)		
Bio-Chem-Zorb(carbon-resin)(30secs.)	7.17pH	575.259
Bio-Chem weight (283 grams)		
Control (1)		96.286
Control (2)		1102.130
Flow Rate: 3.87 gpm (14.30 liters per minute) @ 40 psig.		
Copper (Cu) Reagent Grade (Synergistic)		
synthetic seawater (background)	8.17pH	31.700
spike sample (200 ng/ml)	8.00pH	211.730
(2) PMA-1 12/Pk's (60seconds)	8.06pH	80.80(61.8% Reduc.)
same media reused (14minutes &16secs.)	8.03pH	72.62(65.7%Reduc.)
synthetic seawater (background)	8.20pH	59.052
spike sample	8.35pH	2418.385
(2) PMA-1 12/Pks(14minutes&16seconds)	8.56pH	1860.183
Toxic Metal Sponge(14mins.&16 secs.)	8.31pH	2284.416
Control (1) 650ng/ml		637.270
Control (2)1300ng/ml		1324.660
Copper (Cu) Chelated		
synthetic seawater (background)	8.30pH	13.091
spiked sample (Chleated Copper)	8.35pH	1454.748
(1)PMA-1 12/Pk (20seconds)	8.35pH	1375.098(5.47%Red.)
same 12/Pk (14minutes & 16seconds)	8.50pH	1128.185(22.4%Red.)
Toxic Metal Sponge (20 seconds)	8.40pH	1367.133
Bio-Chem-Zorb (20 seconds)	8.35pH	1375.098
Mega Media (20 seconds)	8.30pH	1391.028
Control (1) 650 ng/ml		642.322
Control (2) 1300 ng/ml		1391.028
synthetic seawater (background)	8.18pH	31.700
spiked sample (1450 ng/ml)	8.19pH	1570.160
(2)PMA-1 12/Pk's(14mins.&16secs.)	8.50pH	841.85(46.38%Rd)
1000ml Toxic Metal Sponge	7.91pH	1365.580
running:14mins.&16secs.		
Control (1) 650ng/ml		637.270
Control (2) 1300ng/ml		1324.660

Analysis Method: ASTM D1688-90 (Test Method B - Chelation/Extraction)
(Atomic Absorption (EPA Method : 7210)
w/chelation/extraction)

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

	A	B	C	D	E	F	G
1							
2	718.951	Spiked Sample(ng/ml)					
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18							
19							
20							
21							Filtrate
22							374.09
23							
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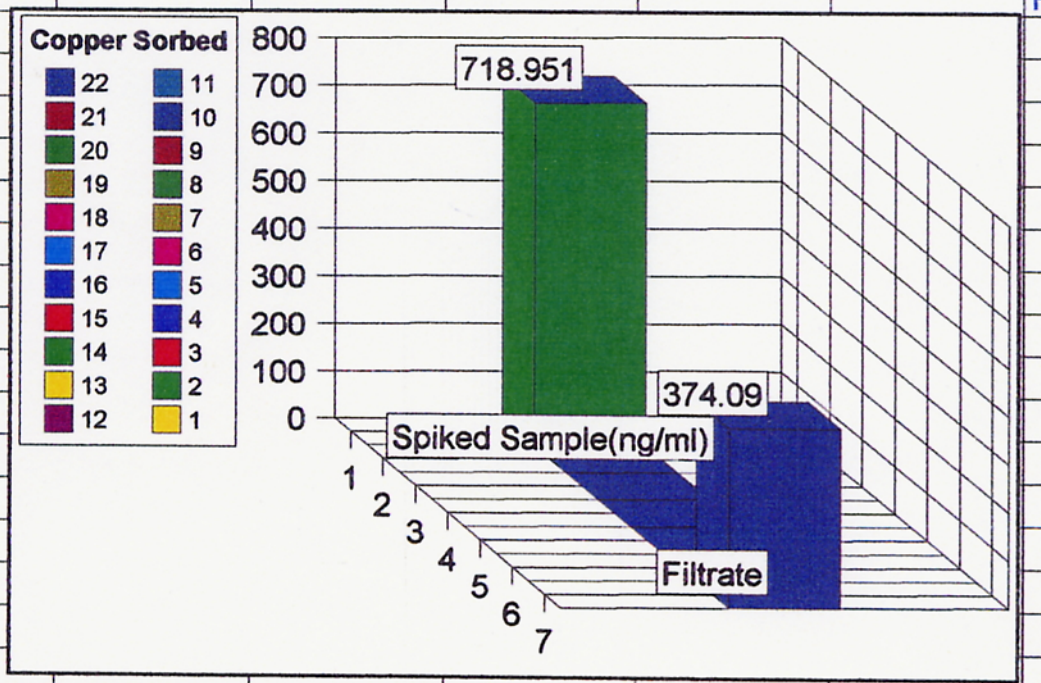
41							
42	0 Seconds						20 Seconds



Iron (Fe)		**(Fe)Concentration: ng/ml (ppb)**
filtered tapwater NSF	6.65pH	42.923
spiked sample + 1ml NaOH(2.5N)	8.00pH	272.136
Poly-Filter Discs 12 (34seconds)	7.86pH	243.485(10.53%Reduction)
Poly-Filter Discs 24 (34seconds)	7.28pH	214.833(21.05%Reduction)
synthetic seawater	8.35pH	358.091
spiked sample	8.30pH	630.282
24 used P.F. Discs(14min.&16sec.)	7.34pH	358.091(100% Sorbed)
Control (1) (450ng/ml)		444.046
Control (2) (1020ng/ml)		1031.405
Iron (Fe) Synergistic Mixture		
Copper,Zinc,Iron 200ng/ml Ea.		
synthetic seawater	8.17pH	306.098
spiked sample	8.00pH	418.424(26%Increase)
(2)PMA-1 12/Pk's (60secs.)	8.06pH	356.02(14.9%Reduction)
same (2)12/Pk's(14min.& 16secs.)	8.03pH	281.136(106.8% Sorbed)
Control (1) 150ng/ml		156.330
Control (2) 300ng/ml		318.578

Analyis Method : *ASTM D1691-90*
(Atomic Absorption *EPA 7380*
Flame emission)

Flow Rate : 3.78 gpm (14.30 liters per minute) @ 40 psig.

Note: *Synthetic seawater mixtures contain large amounts of Iron as a background impurity. Morton Salt Purex (food grade), higher grade than most synthetic seawater mixtures, contains 0.15 mg/L - 0.25 mg/L trace Iron.*

Reference: Morton Salt Literature for Purex and pharmaceutical grade sodium chloride.

	A	B	C	D	E	F	G
1							
2	Spiked Sample ng/ml						
3	272.136						
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6							
7							
8							
9							
10							
11							
12							Filtrate
13							214.136
14							
15							
16							
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22							
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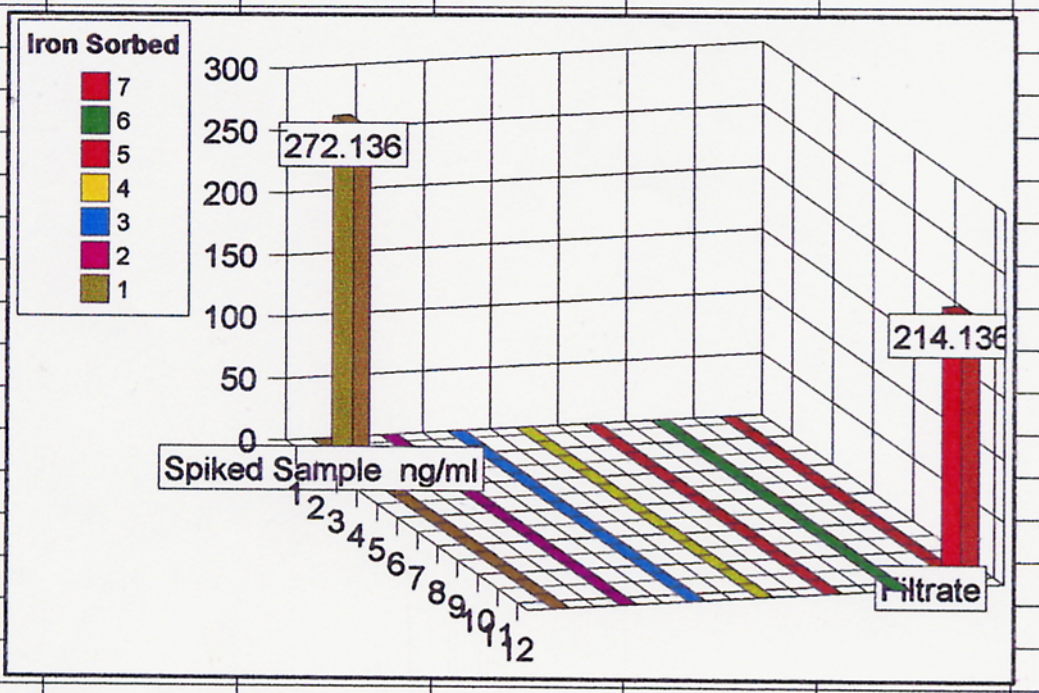
41							
42	0 Seconds						34 Seconds



Zinc (Zn)		**(Zn)Concentration:ng/ml (ppb)**
filtered tapwater NSF	6.11pH	0.00
spiked sample + 2ml NaOH(2.5N)	7.09pH	242.12
Poly-Filter Discs (2) 12/Pk's(34secs.)	6.34pH	200.62(17.14% Reduction)
same (2) 12/Pk's (15 minutes)	6.16pH	150.63(37.78%Reduction)
synthetic seawater	8.17pH	7.65
spiked sample	7.97pH	390.09
Poly-Filter Discs (2) 12/Pk's (running 14mins.& 16 secs.)	8.37pH	386.60(0.8%Reduction)
Purigen (Organic Sorbent Resin) 500ml (running 14mins. & 16 secs.)	7.34pH	321.60
Control (1) 300ng/ml		337.60
Control (2) 600ng/ml		648.56
Zinc (Zn) Synergistic Mixture Copper,Iron,Zinc (200ng/ml Ea..)		
synthetic seawater	8.17pH	0.00
spiked sample	8.00pH	140.72
(2) PMA-1 12/Pk's (60 secs.)	8.06pH	21.57(84.7%Reduc.)
same (2) 12/Pk's (14mins.& 16 secs.)	8.03pH	0.00(100%Reduc.)
Control (1) 150 ng/ml		179.02
Control (2) 300 ng/ml		319.45

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method : ASTM D1691-90
(Atomic Absorption EPA 7950
Flame emission)

Note:

Zinc (Zn) like Cadmium(Cd) is not stable in slightly acidic, neutral or basic solutions. The solute Zinc (Zn), in nature , synergistically bonds Iron,Copper,Lead or Mercury. Synthetic seawater ,a mix of cations and anions in solution, reacts bonding Zinc therby inhibiting removal via chemical filtration. However through the addition of Two new metals (Copper & Iron) our filtration media : sorbs the Zinc quantatively

	A	B	C	D	E	F	G
1							
2	140.12	Spiked Sample ng/ml					
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21							Filtrate
22							21.57
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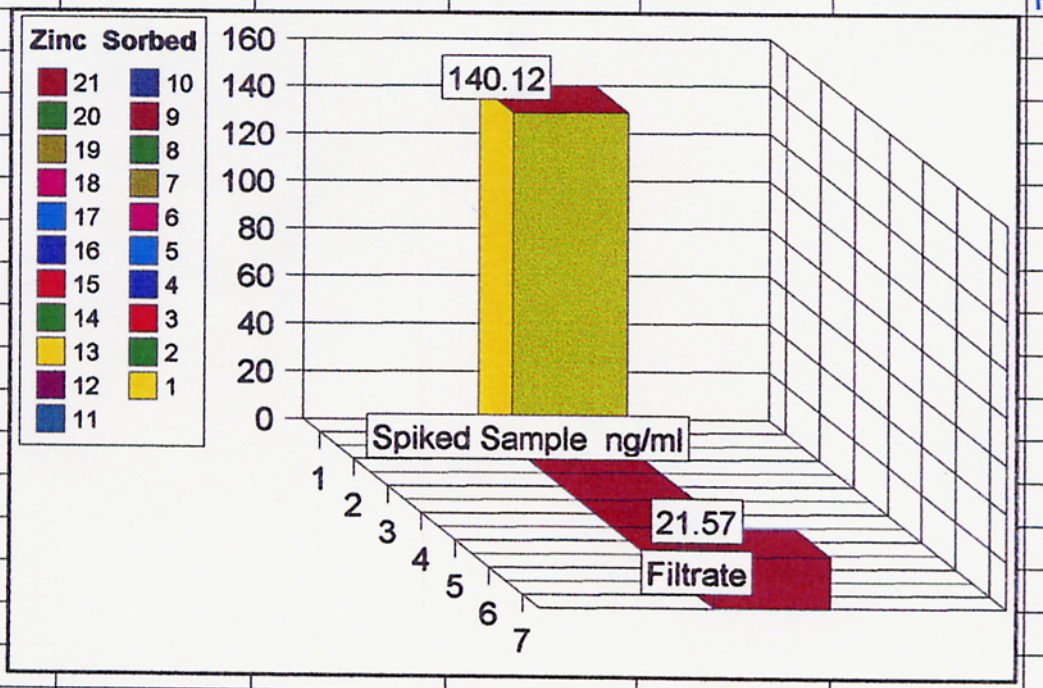
42	0 Seconds						60 Seconds



PHOSPHOROUS

Ortho Phosphate (PO 4)		**(PO 4)Concentration: ng/ml (ppb)**
(Freshwater Tests)		
city tapwater filtered	6.58pH	100.25
spiked sample (125ng/ml	7.35pH	227.82
(monobasic ortho phosphate)		
(1) PMA-1 12/Pk's	7.30pH	99.81(56.2% Reduc.)
running time: 34 seconds		
(2) PMA-1 12/Pk's	7.25pH	140.14(38.48%Reduc.)
(1) 12Pk used + (1)12Pk new		
running time: 34 seconds		
(Synthetic Seawater)		
background syn. seawater	8.10pH	22.66
spiked sample (125ng/ml)	8.12pH	115.59
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	62.99(45.50%Reduc)
running time: 14mins. & 16 secs.)		

TOTAL PHOSPHOROUS

Hydrolyzable Phosphate (PO 3)		**(PO 3) Concentration: ng/ml (ppb)**
(Meta, Hexa, Poly, Tri Poly)		
(Freshwater Test)		
city tapwater filter w/NSF Carbon	6.10pH	280.42
city tapwater filter w/Fin-L-Filter	6.15pH	75.10
spiked sample(250ng/ml)	6.35pH	315.49
(meta phosphoric acid)		
(1) PMA-1 12/Pk's	6.90pH	205.02(35%Red.)
running time: 34 seconds		
(1) PMA-1 12/Pk (used)	6.50pH	203.27(35.6%Red.)
running time: 5 minutes		
(Synthetic Seawater)		
background syn. seawater	8.10pH	52.47
spiked sample (125ng/ml)	8.12pH	124.36
(meta phosphoric acid)		
(1) PMA-1 12/Pk w/0.20um Disc	8.28pH	99.81(19.74%Red.)
running time: 14mins. & 16 secs.)		
Control (1) 150 ng/ml		159.43
Control (2) 300 ng/ml		283.93

Flow Rate: 3.78 gpm (14.30 liters per minute) @ 40 psig.

Analysis Method: ASTM D 515 - 88 + Hydrolyzable Phosphorous (Colorimetric:880nm EPA 365.4 w/20mm light path)

	A	B	C	D	E	F	G
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2	227.82	Spike Sample ng/ml					
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23							
24							
25							Filtrate
26							99.81
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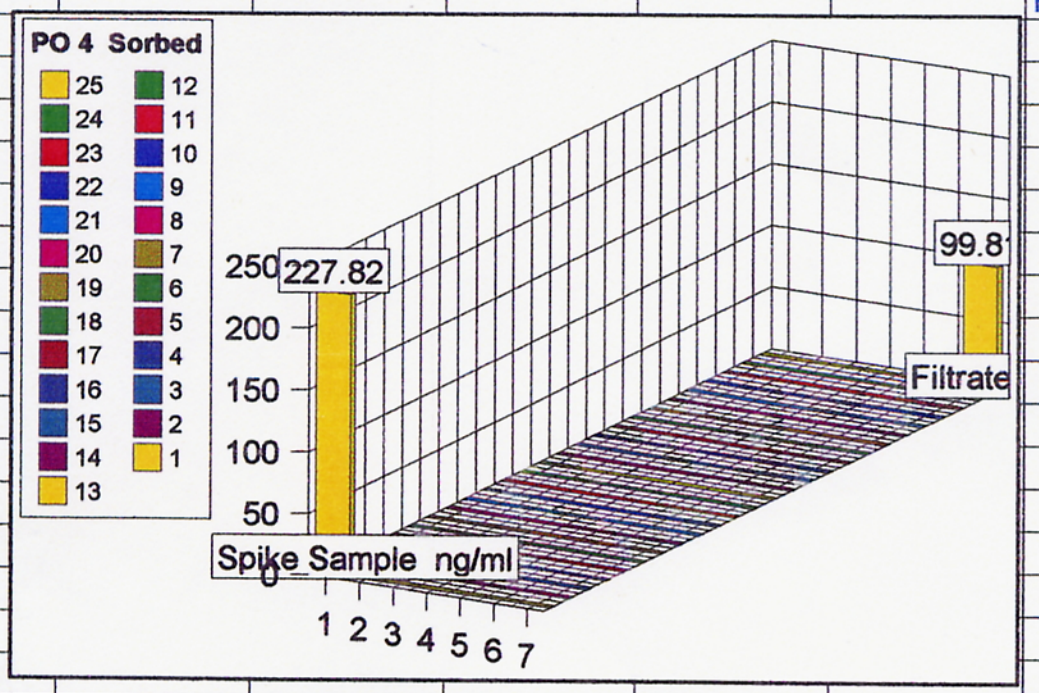
41							
42	0 Seconds						34 Seconds



	A	B	C	D	E	F	G
1							
2	315.49	Spiked Sample ng/ml					
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18							
19							Filtrate
20							205.02
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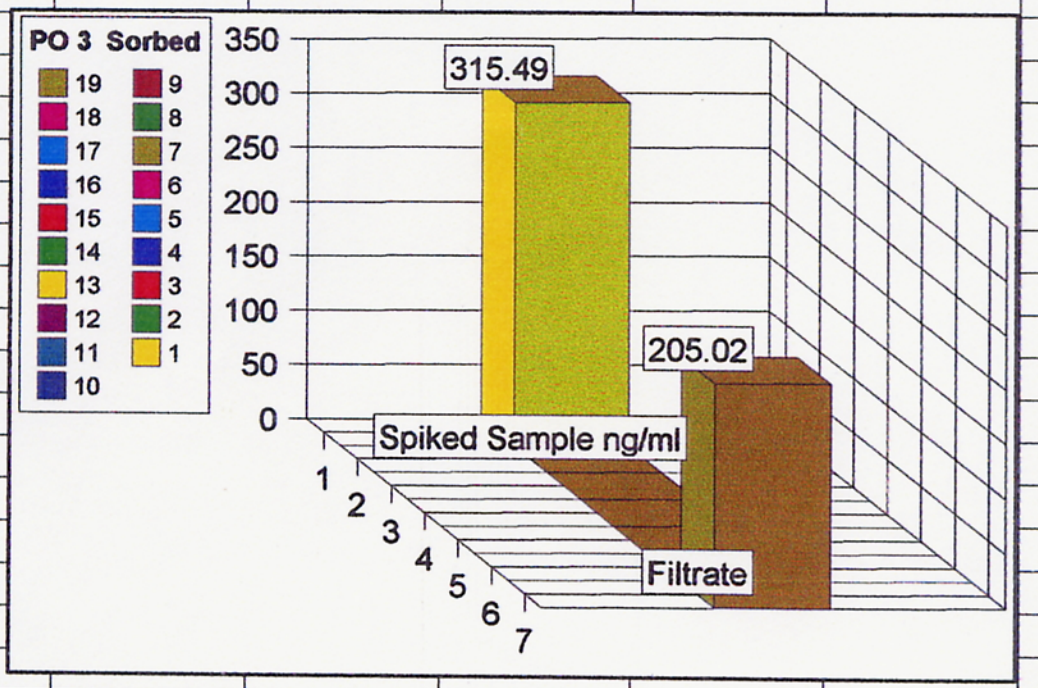
42	0 Seconds						34 Seconds



VOLATILE ORGANIC CHEMICALS (V.O.C.)

Trihalomethanes:

Chloroform (CH CL3)		**(CH CL3)Concentration:ng/ml (ppb)**
water: 5 megohm/cm	n/a pH	6.53
Spike : *30.28ml preparation	8.00pH	347.01
added to 7.57 liters		
(1) PMA-1 12/Pk **		152.45 (56.06% Reduc.)
(2) PMA-1 12/Pk s **		70.13 (79.79%Reduc.)
(1) PMA-1 12/Pk		90.71 (73.85%Reduc.)
(2) PMA-1 12/Pks		66.39 (80.86%Reduc.)
Control (1) 75ng/ml		75.75
Control (2) 150ng/ml		161.80

Flow Rate: 1-2 liters per minute

* Spike Preparation: 68 microliters of spectrograde CH CL3 added to 100ml volumetric flask to make 1mg/ml CH CL3 in ethanol. Take 10ml of the previous solution and add to new 100ml volumetric flask filled with 90ml ethanol (100 micrograms/ml). Take 30.28ml of 100ug/ml mixture and add to 7.57 liters of 5 megohm/cm water Sodium Hydroxide (electronics grade) added to produce 8.00pH solution.. Mixed in closed plastic bottle for Thirty minutes.

** Filter Media prewashed in 1.0 microSiemens/cm water (pH 5.00 - 6.35) pH was not tested to avoid the Chloroform offgassing/volatilizing from filtered samples.

Analysis Method: Microextraction into pentane prior to Gas Chromatography with electron capture detector.

Clinical Method: Journal of Applied Toxicology, Vol.2,NO..3,1982
The Presence of Trihalomethanes in Soft Drinks.
Mohamed S. Abdel-Rahman
UMD Dept. of Pharmacology, Toxicology Lab.
State of New Jersey Medical School

	A	B	C	D	E	F	G
1							
2	347.01	Spiked Sample ng/ml					
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25							Filtrate
26							90.71
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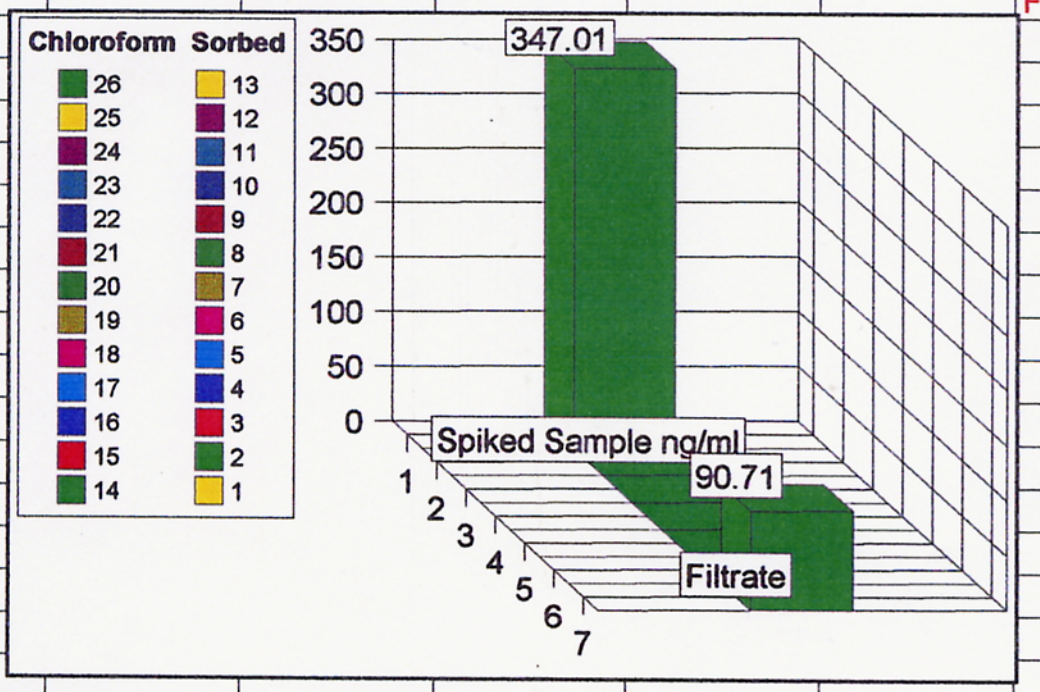
42	0 Seconds						60 Seconds



STANDARDS and FORMULATION of SPIKE SOLUTIONS

Lead (Pb)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 07307PG
Cadmium (Cd)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 995ug/ml Lot No.07823AN
Mercury (Hg)	Aldrich Chemical Co AA/ICP Calibration/Check Standard Concentration: 990ug/ml Lot No. 04111A
Copper (Cu)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 1010ug/ml Lot No. 05224CN
Ionic	*Sea Cure (Copper Sulfate) Aquarium Systems Concentration: 1 drop per 3.785 L. = 0.15mg/l*
Chelated	*Copper Safe (Chelated Copper Sulfate) Mardel Labs Concentration: 4.3ml/37.85 Liters = 500ng/ml*
Zinc (Zn)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration: 990 ug/ml Lot No. 05313DF
Iron (Fe)	Aldrich Chemical Co. AA/ICP Calibration/Check Standard Concentration 1010ug/ml Lot No. 05212BP
Ortho Phosphate (PO 4)	Aldrich Chemical Co. Standard (Potassium phosphate monobasic) 1ml = 0.522mg PO 4 Lot No. 05130LZ
Meta Phosphoric Acid (PO 3)	Aldrich Chemical Co. (ACS) 33.5% -36.5% HPO 3 stabilized with 59.0% -63.0% Na PO 3 Lot No. 07126M2
Chloroform (CH CL 3)	Fisher Scientific Co. Spectrographic Grade Lot No. 933572

SYNERGISTIC MIXTURE
SPIKE METHOD

Copper *Iron* *Zinc*	*7.5ml of Copper Standard 1010ug/ml* *7.6ml of Zinc Standard 990ug/ml* *7.5ml of Iron Standard 1010ug/ml* *added to 37.85 Liters of Premixed Synthetic Seawater (Nalgene Tank)*
Lead *Cadmium* *Mercury*	*3.75ml of Lead Standard 1010ug/ml* *3.80ml of Cadmium Standard 995ug/ml* *3.82ml of Mercury Standard 990ug/ml* *added to 37.85 Liters of Filtered (2) Ametek (CBR 2-10), tapwater. Solution was mixed for seven minutes. The pH adjusted via Na OH (2.5N) sufficient to buffer the 37.85 Liters to 5.90 pH.*
Phosphorous	*9.0ml of Ortho phosphate standard 0.522mg/l + 4.7 mg. of metaphosphoric acid (weighed dry on analytical balance) added to 100ml (5 megaohm/cm H 2 O) beaker. The spike solution was placed on heater/mixer for ten minutes. The spike solution 's pH 8.12 in 100ml beaker. The entire contents of 100ml beaker-spike solution were added to the 37.85 Liters.*

ANALYTICAL EQUIPMENT

pH Meter :	Orion Research digital ion analyzer Model 501 Calibrated daily & electrode maintained in standard solution .(7.000 pH)
Atomic Absorption	Varian AA-875 Recalibrated and certified prior to test program. Graphite Furnace attachment by Varian. Cold Vapor/Hot Vapor collection method for Mercury.
Spectrophotometer	Varian DMS-90 ultraviolet & visible light
Conductivity	Cole-Parmer Model 1481-61 Gold Conductivity cell for low range.
Gas Chromatograph	Varian Model 3700 Flame, ECD Detector
Glassware	Washed in HNO 3 - Rinsed in 5-9 megaohm/cm and oven dried.
Distilled Water	Rainwater collected and run through a pyrogen-free still then piped to lab's Milli - Q Water System. Produces Certified 18 megaohm/cm water.
Tapwater Filtration	**Fin-L-Filter (r) Kold Ster-iL (r) *** (2) Model Pma-1's w/ 12pks (1) Model Psm-1 w/ 0.20micron *** U.S. Patent Pending.** Ametek NSF System: 0.50micron, heavy metals, VOCs & pesticides. (2) Ametek #10 ultrapure canisters w/ (2) CBR 2-10 cartridges.