55284

The Commonwealth of Massachusetts
HOUSE OF REPRESENTATIVES
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ROGER R. GOYETTE
REPRESENTATIVE
11TH BRISTOL DISTRICT
2767 ACUSHNET AVENUE
NEW BEDFORD, MA 02745
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80

Special Commission on
Solid and Hazardous Waste
(Chairman)

• • •

Committees:
Ways and Means
Public Service

Mr. Frank Ciavettieri
JFK Federal Building
Waste Management Division
Rm. 1903
Boston, MA 02202

December 8, 1986

Dear Frank:

Enclosed please find information pertaining to our discussion on the telephone last week.

Please keep me apprised of the progress of this matter.

In addition, I would like to meet with you soon to continue our discussions regarding the Acushnet River Clean-up project.

Sincerely,

R. R. Goyette

Roger R. Goyette
State Representative

HOWDI
HAZARDOUS ORGANIC WASTE DISPOSAL, INC.
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REP. ROGER R. GOYETTE
Room 489
State House
Boston, MA 02133
12/1/86

Dear Roger,

Now that my company has finished its contractual obligations with Westinghouse Electric, we are in a position to talk to you seriously about the hazardous waste problems in Massachusetts.

As you are well aware, through our many conversations and meetings over the last three and a half years, we feel we are well ahead of the industry in the fields of biodegradation of wastes and chemical separation processes. Our microbial strains have been bred to work in situ on most organic wastes. They have been adapted and perfected for over 25 years so we know we have the best stock to start with. Then through our further adaption we can ensure the results others only dream about. Our bugs are naturally occurring and cannot hurt or effect the environment in any way. We also breakdown the intermediates for total degradation.

Our results with Westinghouse showed biodegradation of PCB's in sewerage sludge from 120 ppm down to 6 ppm, and, of course, we could reduce that to under 2 ppm if necessary. We have also had our "bugs" used successfully on other PCB tests with GE material well over 30,000 ppm. Not to mention tests done on New Bedford material in 1985 degrading 1242's from 41.8 ppm to 4.6 ppm.

At the moment we are doing a two part test for a large chemical company with a mixed waste problem in Ohio. Our initial 4 week test was on a mix of 20 volatile and semi-volatile compounds in soil and, if we had continued the test, results would have improved to fall well within EPA guidelines. This we will be doing in the second, longer test. I have listed some of the results below from the initial short test

VOLATILE COMPOUNDS

1,1,2,2, Tetrachloroethene	14000 ppb	50 ppb
1,1,1, Tetrachloroethene	1500 ppb	7 ppb
Chlorobenzene	285 ppb	2 ppb
Benzene	820 ppb	2 ppb
Chloroform	885 ppb	trace
Toluene	285 ppb	6 ppb
Xylenes	430 ppb	19 ppb

SEMIVOLATILE COMPOUNDS

Methoxychlor	23 ppm	4.9ppm
Mirex [pesticide]	480 ppm	155 ppm
Diphenyl Sulphone	5420 ppm	1800 ppm

Naturally, with pentachlorophenol and creosote, such as found in woodtreating facilities and various other hydrocarbon problems in refineries, manufacturing etc., we can not only employ our bugs but also our advanced chemical separation and recycling processes.

We have working with us, one of the top three men in the world in the field of separation technologies. His expertise has not been fully utilized as his chemicals make (eg) oil\water separation, an economical procedure even at todays prices.

When dealing with, for example, a woodtreating facility, he has worked on creosote sludge pits to release:total hydrocarbon recovery.....20% total solids.....20%, clear water.....60%.

At a chemical cost of around 6/7c per gallon, the clients were able to treat the waste themselves and save substantially.

Removing heavy metals from waste oil is also quite easily achieveable at around 8c per gallon.

Reiterating our many conversations, we have the technologies that can do most of the work. They are highly cost effective. We are willing to do all the tests necessary to prove our abilities. We are willing to work with you and the State to clean up your many waste problems at a price that will be far better than available through other methods.

There is much I can say about our abilities but I would rather enclose some data for your perusal. I would like to meet with you again as soon as possible and see if we could work out an arrangement beneficial to both the State and ourselves. We would not be opposed to setting up an R & D lab, bug plant and oil and chemical recovery system using our proprietary bugs and chemicals within Massachusetts.

Again, Roger, I thank you for all your time and patience and as a "rough diamond" you have no peers.

Kindest regards,

Ron

Ron J. Browning-Nash

RBN\rla

-Dear Pat:

Below is a summary of test results and recommendations for the variety of samples sent recently As you see, most "sludges" (high-water/high-solids emulsions) respond to ECO 3NH, with or without cutter stock. If added upstream of the centrifuge, ECO 3NH will yield clean oil and virtually oil-free, non-sludging solids.

SAMPLE	ANALYSIS (CENTRIFUGE)	TEMP.	DEMULSIFIER	RESULTS
Composite A Composite B	20 solids, 66% water 20 solids, 60% water	170°F	ECO 3NH @ 3000 ppm	Immed. fluidisation; Complete oil recover
Tank 6A Tank 6B	30% solids, 56% water 30% solids, 62% water pH 6-7	140°F	ECO 3NH @ 1000 ppm followed by ECA 6-3 @ 2000 ppm.	Immediate fluidisatic and solids release; Rapid settling of solids & clear water.
T3	Sour-smelling, black water. pH 8 35% solids, 56% water	Ambient	ECO 3NH @ 1000 ppm, followed by ECA 6-3 @ 2000 ppm.	Rapid solids dewetting and settling. Oil-free solids and clear water.
Centrate Sample #3	23% solids, 74% water	Ambient	as for T3	Rapid solids release as above, but little gravity settling. Centrifuges into compact solids and clear water.

Dear John:

Below is a summary of our test reulst on samples provided by Desmond on September 4th.

SAMPLE	DESCRIPTION/ANALYSIS	RECOMMENDATION	RESULTS
12265	Oily Emulsion 6% water 3% solids	ECO 14 @ 1000 ppm, followed by 1500 ppm caustic soda, at 140°F.	Separation of water and solids from clear, red oil within 5 hours. Oil analyzed at 0.3% BS&W (Suitable for re-refining)
12264	Separates readily into: A) Top Oily Emulsion 66% water 16% solids Oil-laden solids	ECO 3NH @ 1500 ppm, followed by 2500 ppm caustic soda, at 140°F.	42% clear water drop within 5 hours. 16% oil after overnight settling. Good water drop, but slow deoiling at ambient temp.
	B) Bottom Water Layer Orange color, turbid High in soluble metals pH 5.5	ECA 10 @ 1500-2000 ppm followed by pH adjustment to 9.	Rapid flocculation and settling of dark green floc from very clear water. Sludge volume 15% in 3 hrs. and 10% after overnight settling.

From: R&D Center
WIN: 236-2250
Date: November 10, 1986
Subject: Analyses of Samples from WTSD Biodegradation Tests

To: WALTZ MILL-WTSD
G. B. Levin

cc: D. L. Keairns
R. M. Chamberlin
P. M. Castle
T. D. Kacsmarek

Sample analyses from the biodegradation tests recently conducted by R. Browning-Nash at your site have been completed.

The results of the gas chromatography (with electron capture detector) analyses are summarized in Table 1. Results are reported on a ppm by weight basis, with reference to dried sample weight. Samples from early weeks were used for development of sample extraction procedures that could extract all PCBs from the samples and eliminate interfering substances also present in the samples. The results shown in Table 1 are for later samples using the finalized procedure. This procedure consisted of the following steps:

- extraction of the dry sample with hexane for four hours in a sonic bath (3 ml hexane to 0.6 g sample)
- clean-up of the extract with mercury, concentrated sulfuric acid, and Florisil column chromatography
- injection of the cleaned extract into the gas chromatograph for comparison with standard PCB solutions. Aroclor 1242 (42 wt % chlorine) was used as the standard for all reported data. This was meant to provide an approximation useful for examining gross changes in PCB concentration.

Mass spectrometry was performed on several samples for the purposes of examining PCB loss as a function of chlorine number and of identifying intermediate products of metabolism. Results are summarized in Table 2. Mass spectrometry was also used to identify the major interfering substance present in the Winston-Thomas samples, sulfur.

Steelco sludge samples were analyzed for organic content. Results are summarized in Table 3.

The results for the various materials are summarized as follows:

Neal's Landfill. The original material contained about 32 ppm PCBs. The mean concentration reduction rate was about 1.3 ppm per week. This could reflect a physical loss mechanism (adsorption or evaporation) or a biological mechanism.

Winston-Thomas Dry Sludge. The original material contained about 164 ppm PCBs. The mean concentration reduction rate was about 2.8 ppm per week. Mass spectrometry results show losses to increase with chlorine number, contrary to expected biological behavior and supporting the hypothesis of a physical loss mechanism, perhaps adsorption onto container surfaces.

Winston-Thomas Liquid Sludge. The initial concentration was about 120 ppm. By the second week, concentration had fallen dramatically, to about 30 ppm. Therefore, concentration did not change much with data noise. At the beginning of the ninth week, Browning-Nash added a heavy extra dose of organisms. At the end of that week concentration had fallen dramatically again, to 6 ppm, and remained at that level into the tenth week. Mass spectrometry results indicated greater loss rates for PCB congeners with less chlorine atoms. This is consistent with expected biological destruction patterns. The mass spec data and the higher loss rates than achieved with the other materials support a hypothesized biological destruction mechanism.

The identification of the metabolite dichlorobenzoic acid by GC/MS also supports a biological destruction mechanism. This metabolite was present in the treated Winston-Thomas liquid sludge week 7 sample at eight times its concentration in the untreated material.

Examination of the Winston-Thomas liquid sludge for chloride was inconclusive because of the high levels of chloride found in both the untreated (223 ppm) and treated week 9 (1,661 ppm) samples. The latter figure is in excess of that which would have been produced by total mineralization of PCB in the sample (50 to 70 ppm Cl from 120 ppm PCB), and may have been introduced with nutrients during biological treatment.

Steelco sludge. No mineralization of the sludge grease and oil was evident.

D. M. Bachovchin
Energy Systems

G. R. Marshall
Analytical Chemistry

Table 1 - Results of Gas Chromatography Analyses

Sample	PCB Concentration, ppmw
Neal's Landfill	
untreated material	
individual	26,33,32,37
mean	32
treated material	
week 3	18
4	27
5	33
6	20
6	25
7	35
8	14
9	17
Winston-Thomas Dry Sludge	
untreated material	
individual	165,147,155,223,173,122
mean	164
treated material	
week 6	122
6	161
7	168
8	174
9	105
Winston-Thomas Liquid Sludge	
untreated material	
individual	126,116,117
mean	120
treated material	
week 2	29
5	19
6	32
7	41
8	35
9	20
"super-innoculated"	
9	8
10	6

Table 2 - Results of Mass Spectrometry Analyses of Winston-Thomas Sludges

congener group	percent decrease from untreated material	
	Dry sludge, week 6	Liq. sludge, week 7
dichloro	26.4	77.0
trichloro	23.1	47.2
tetrachloro	32.0	32.8
pentachloro	41.8	11.2

Table 3 - Results of Steelco Sludge Analyses

Sample	Wt % organic
untreated material	
individual	13,10,15
mean	13
treated material	
week 1	14
3	13
4	13

ECO 3NH - UNIQUE REFINERY SLOP TREATER

INTRODUCTION:

A large West Coast refinery was experiencing problems in the treatment of "Slop Oil", due to the poor performance of the demulsifier used, and the complicated process recommended.

The refinery generates large volumes of slop oil (in excess of 2000 bbl. per day), recovered at API separators and from other process waste streams. A number of tanks is allocated for oil recovery with a total capacity exceeding 100,000 bbls. Adequate heating, pumping and transfer are also available.

PROBLEM #1:

The chemical company treating the slop oil had recommended the addition of demulsifier to one of 4 tanks allocated for heat treating (150-160°F). The demulsifier was injected at 700-1000 ppm while circulating the emulsion for 24 hours.

This overmixing, coupled with the addition of excessive amounts of chemical (often exceeding 1000 ppm), created large volumes of reverse emulsion. The mixture of oil and solids stabilized within the aqueous phase, analyzed at 60% BS&W, and resisted heating/circulating for several days.

SOLUTION:

ECA 6-3, a blend of reverse demulsifier and polyelectrolyte, was injected during transfer of the emulsion to a settling tank. Within hours, water and solids were separating in the tank. After overnight settling, virtually complete oil recovery was achieved.

Success Story: ECO 3NH - Unique Refinery Slop Treater

PROBLEM #2: The previously recommended procedure of extended heating/mixing required continuous operator supervision, gave inconsistent oil recovery and demanded high heating costs. The build-up of "rag layer" or unresolved emulsion, was reaching serious proportions.

SOLUTION: Working closely with refinery personnel, a stream-lined operation was designed, whereby natural settling of waste oil streams permitted some dehydration and oil recovery.

The emulsion layers from these settling tanks are transferred to one holding tank, from which the emulsion is pumped continously to one of 2 settling tanks. RECOVEROL ECO 3NH is injected at 300-500 ppm, at the discharge side of the transfer pump, and usually shows immediate water drop.

In the settling tanks, oil of the highest quality is recovered, and water, loaded with coke and other fines, is drained off. After several months of continuous operation, there is no evidence of interface build-up.

Although ECO 3NH was demonstrated to be effective at ambient temperature, refinery personnel maintain a temperature of 130-140°F in the settling tanks, to speed up dehydration and minimize the deposition of fines.

BENEFITS: As a result of the correct application of ECO 3NH, the refinery lists the following as primary advantages of the ECI treatment program:

1. Continuous and consistent recovery of clean oil.
2. Negligible loss of oil in the water phase improves the performance of the waste water treatment system.
3. Minimum strain on operator schedules, and fewer supervision requirements.
4. Fewer desalter upsets.
5. Reduced fouling in the crude unit preheater.
6. Significantly reduced rate of "mud" build-up in the settling tanks. Mud was non-sludging and pumpable.

ECO 3NH - COST EFFECTIVE TREATMENT OF REFINERY SLUDGE

PROBLEM: A major West Coast Refinery was faced with a deadline for cleaning up an API separator. 20,000 bbl of sludge deposited in the separator basin consisted primarily of API sludge and DAF skimmings. The mixture resisted separation with a centrifuge provided by a contractor, even at high polymer concentrations.

LAB RECOMMENDATION: A sample composited from several locations in the basin and analyzed by centrifuge gave the following results:

	Heavy Solids	Water	Light Solids	Oil
Solvent Only:	40%	40%	15%	5%
With ECO 3NH:	50%	28%	4%	18%

In the bottle test, ECO 3NH mixed with 10-15% jet fuel (or other light material) released oil-free solids and recovered clean oil within a few hours. The bottoms layer was non-sludgy and contained only 1-2% oil.

RESULTS: The sludge was pumped from the separator basin into a series of Baker tanks, from which it was transported by vacuum trucks and transferred to a settling tank. During the transfer, jet fuel and ECO 3NH were added at a T-junction upstream of the transfer pump. Samples of sludge taken just downstream of the pump showed immediate emulsion destabilization, solids dewetting, and oil release. The treated mixture separated into 3 layers within a few days.

Clean oil/jet fuel	30%
Fairly clear water	60%
Floating solids	10%

Oil recovery was in excess of 90%, and oil quality greater than 99.5%.

ECO 100Y - WILL CLEAN UP YOUR WASTE LUBES

PROBLEM:

A major treater of waste engine oil with plants in the South East was experiencing problems in achieving adequate dehydration of crankcase oils. The chemicals used were added at 2000-3000 ppm, required several days for settling, and left high levels of unresolved emulsion.

LAB RECOMMENDATION:

RECOVEROL ECO 100Y, blended specifically for complete dehydration and solids removal, was found to work on numerous batches of crankcase oil. Added at 1000-1500 ppm to the oil at 170-180°F, it showed virtually complete removal of impurities within 8-10 hours.

RESULTS:

The client embarked on a program of optimizing the conditions for ideal recovery. He now heats the oil to 190°F, mixes ECO 100Y at 1 gal. per 1000 gal., (1½ gal. for the worst emulsions)by circulation over a period of one hour and continued pump-around for another hour. After settling overnight in an insulated tank, the treated oil contains less than 1% BS&W, and often less than 0.5% BS&W. The partial removal of additives gives the recovered oil a bright, deep red color. After draining the separated water and solids, the client is left with less than 5%"rag" layer, which is treated with the next batch of oil. After several months of continuous processing, there is no evidence of interface build-up in the treatment tanks.

Chemical treatment costs are estimated at 1.5-2 cents per gallon.

SUCCESS HINT:

The high initial temperature assures instant and uniform mixing of the chemical. The reduced viscosity also allows for rapid water drop, in spite of the high levels of finely dispersed solid particles, common in waste crankcase oil. The inclusion of a unique component in ECO 100Y,guarantees complete solids removal, which other chemials either leave dispersed in the oil, or tightly bound in the unresolved emulsion.

ECA 10 - A SIMPLE AND RELIABLE SOLUTION FOR INDUSTRIAL WASTEWATER

PROBLEM: The increasing cost of disposing oily wastewater, coupled with the tightening of regulations governing the manner of its disposal, have forced many generators in a variety of industries to find their own solutions for treating daily-generated waste streams.

Treaters and generators must now confront the challenges caused by variations in emulsion type, the high cost of residual sludge disposal, and the complexity and high cost of existing mechanical systems.

CASE I: A Southern California manufacturer of household appliances generated wastewater containing approximately 2500 ppm oil. Disposal cost was quoted at 30 cents per gallon.

ECA 10 at 1000 ppm is now mixed, using pump-circulation, into 500 gallon batches and allowed to settle overnight. This results in the formation of a compact top oil and clear sewerable water. Treatment cost is 1.5 cents per gallon.

CASE II: A Southern California waste treatment facility received oily wastewater from industrial, oilfield, and marine sources. The unsegregated streams responded to ECA 10 at 1500-2000 ppm.

ECA 10 is now transfer-injected, followed by caustic addition to pH 9, and the treated water settled overnight. The compact oily floc is recovered (5% of the original volume) and the clarified water is sewered. Treatment cost less than 2 cents per gallon.

ECO 6N50 - FOR MANY TYPES OF WASTE OIL

PROBLEM: A waste oil reclaimer in the South East was treating a wide range of automotive and industrial oily wastes, but was unable to recover the high-quality oil demanded by his customers. Extended heating and non-proprietary chemicals produced excessive sludge, proved costly, and failed to yield the desired product.

LAB RECOMMENDATIONS: Tests were conducted on serveral samples of oil composited from waste streams of motor oil, fuel oil, and industrial sludge. It was determined that ECO 6N50 at 1500 ppm consistently removed water and solids to less than 1% BS&W at 180°F.

RESULTS: CASE I 5000 gallon batches are heated to 180°F, treated with 6 to 7 gallons of ECO 6N50, and mixed via pump circulation for 30 to 60 minutes. After overnight settling, BS&W is reduced from an original 5-20% to 0.3-1%.

CASE II 30,000 gallon batches are now heated in a horizontal tank equipped with heating coils and a flash-mixer. 35 to 45 gallons of ECO 6N50 are mixed using blade propellers and allowed to settle for 1 to 2 days. BS&W is reduced to less than 0.5%.

MORE TESTS WITH OUR BUGS.

gical degradation of the bioreactor contents.

Since beginning the project on September 22, 1983, samples from the bioreactor were delivered to NUS Corporation laboratories for analysis. Total PCBs were reported in ug/l (ppb) for water and mg/k (ppm) for sediment. Below is a summary of analyses of the samples taken on the dates indicated for which copies are also attached on Exhibit "C":

SAMPLE DATE	MATERIAL	PCB CONCENTRATION
9/22/83 Untreated	Water	29,000 & 44,000 ug/l (ppb)
9/30/83 Treated	Water	3,300 & 2,000 ug/l (ppb)
10/7/83 "	Sediment	1,800 & 2,010 mg/k (ppm)
10/14/83 "	Water	36 & 72 ug/l (ppb)
10/21/83 "	Water	40 & 61 ug/l (ppb)
10/28/83 "	Water	*VOID & 252 ug/l (ppb)
11/4/83 "	Water	137 & 190 ug/l (ppb)
11/11/83 "	Water	118 & 137 ug/l (ppb)
11/29/83 "	Water	349 & 123 ug/l (ppb)
12/16/83 "	Water	7,360 & 8,760 ug/l (ppb)
12/23/83 "	Water	5,980 & 2,970 ug/l (ppb)
"	Sediment	7 & 9 mg/k (ppm)
1/16/84 "	Water	571 & 851 ug/l (ppb)
"	Sediment	4 & 4 mg/k (ppm)

An examination of the above data shows an initial concentration of 29,000 and 44,000 ppb of PCBs in water on 9/22/83 reduced to 571 and 851 ppb on 1/16/84. This is an average reduction in PCB concentration in water of 98.06% in less than four months.

A similar examination of the above data shows an initial concentration of 1800 and 2010 ppm of PCBs in sediment reduced to 4 and 4 ppm on 1/16/84. This is an average reduction in PCB concentration in sediment of 99.8% in less than four months.

Upon review of the test data, it is obvious that our process of biodegradation has successfully and dramatically reduced the PCB concentration of the demonstration sample from high

* Lab reported that the sample was accidentally destroyed.

TESTS AT ROCKY MOUNTAIN ARSENAL USING OUR BUGS.

RESULTS

Attachment 1 shows the results from analyses A.-D. of samples F-1 and F-2. The following table shows results of the 1ml sample of untreated Lake F run for chlorinated pesticides compared with the treated(F-1) sample done for the same compounds:

Cmpd.	Untreated Lake F ppb	Treated Lake F(F-1) ppb
Aldrin	562,075	341
Isodrin	38,030	141
Dieldrin	154,366	450
Endrin	90,804	420

Excellent

Area printouts of sample and typical standards for this are shown at Attachment 2.

Varian GC Results

The Varian GC results on overall compound Survey in the samples should be considered only semi-quantitative at best. Only a few standards with some of the compounds in Lake F were run. There were no multi-leveled sets of standards run with these as with analyses in A-D where standards are regularly interspersed with samples.

Cmpd.	Area Cts (Millions) Untreated	*Area Cts(Millions) F-1 Trea
DMMP	37.46	13.64
Xylene	3.08	2.1
Dithiane (organosulfur)	27.0	4.76
p-cpm sulfoxide "	4.95	1.81

Excellent

* Since 100 ml was taken of the F-1 treated and 200 ml of the treated the F-1 counts were multiplied by 2 to make direct comparison of the samples.

GC/Mass Spec. Results

Attachments 3,4, and 5 are copies of the GC/MS chromatograms run of the untreated, and treated F-1 and F-2 samples. Areas (total ion counts) are included on these traces next to the identified compounds. Fragmentation patterns for peaks in the F-1 sample were especially incomplete--hence the number of peaks labeled "mixed spectra" or"incomplete spectra". There were also a number of incomplete or mixed spectra near the end of the untreated Lake F trace.

RECOMMENDATION

It would be very helpful to have a sample of the untreated Lake F that was bacterial treated. If this could be run as described in procedures A.-D. in the preceeding pages it would give a good "control" sample to compare the treated samples with. A sample of Lake F collected in the future would probably serve adequately but a sample of the actual Lake F aliquot taken by Biotechnology Unltd, Inc. would be best.