CWPCA

ANALYST'S NOTEBOOK

****

JUNE 1985

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EDITORS

NORTHERN SECTION

Bev Franza
City of San Mateo
2000 Dale Avenue
San Mateo, CA 94401
(415) 377-4690

SOUTHERN SECTION

Scott Quady
Las Virgenes Municipal District
4232 Las Virgenes Road
Calabasas, CA 91302
(818) 348-1207

NOTE TO ANALYSTS & OTHERS,

I HAVE ASKED OUR EDITOR TO PRINT THIS NOTE IN ITS HAND WRITTEN FORM FOR SEVERAL REASONS. FIRST, I HOPED IT WOULD GET YOUR ATTENTION. IF YOU HAVE READ THIS FAR MAYBE IT HAS WORKED, AND I HOPE YOU WILL STICK WITH ME.

THE MAIN PURPOSE IN PRINTING THE NOTE THIS WAY IS TO MAKE A POINT. THIS PUBLICATION IS NOT A MAJOR TECHNICAL JOURNAL AND IS OPEN TO ARTICLES FROM ANY LEVEL OF LAB WORK. IF YOU WORK IN A SMALL LAB IN A REMOTE CORNER OF THE STATE, PLEASE DO NOT THINK YOU HAVE NOTHING TO CONTRIBUTE, YOU DO! ON THE OTHER HAND, THOSE OF YOU WORKING IN LARGE REGIONAL LABS HAVE ALL THE MORE TO CONTRIBUTE. STEADY INPUT FROM EVERY ONE IN THE BUSINESS WILL HELP MAKE THE NOTEBOOK AN EXCELLENT FORUM FOR THE EXCHANGE OF PRACTICAL INFORMATION.

IN CONSIDERING SUBMISSION OF AN ARTICLE, PLEASE REMEMBER THAT MANY LAB PEOPLE MUST ACT AS "JACKS OF ALL TRADES." DO YOU HAVE TRAINING AS A MICROBIOLOGIST? HOW ABOUT AN ARTICLE ON MICROSCOPE THEORY, USE OR MAINTENANCE. AN ARTICLE ON PROPER TECHNIQUE FOR USING TRANSFER LOOPS OR ANY OTHER DAY TO DAY OPERATION WOULD BE VERY USEFUL FOR THOSE REQUIRED TO DO THEM, BUT LACKING THE TRAINING.

OTHER POSSIBLE TOPICS:

- NEW EQUIPMENT PURCHASES, WHAT & WHY
- COMPUTER APPLICATIONS.
- WORK SCHEDULES.
- BASIC ANALYTICAL THEORY.
- SAMPLE QUESTIONS FOR VCP.
- YOUR UNSOLVED PROBLEM!
- HUMAN INTEREST.
- ETC. ETC.

PLEASE EXTEND A LITTLE EFFORT TO SHARE YOUR EXPERTISE AND EXPERIENCE WITH US, IT WILL BE APPRECIATED.

AS A FINAL NOTE, I LOOK FORWARD TO SERVING AS LTC CHAIR FOR THE NEXT TWO YEARS. PLEASE CONTACT ME IF I CAN BE OF SERVICE

PETER SCHNEEKLOTH
(805) 966-5597

P.S. - ACCOLADES TO KACEY KARMENDY, WINNER OF THE SECOND ANNUAL LAB PERSON OF THE YEAR AWARD.

****PUBLICATIONS****

The Bench Sheet - is published for water and wastewater analysts by the Environmental Training Consultants. They are interested in any articles that would be of interest to the water quality laboratory profession. They pay for articles that are published. Publication is bimonthly plus special theme issuses. Subscriptions are $39/year. The Bench Sheet, Environmental Training Consultants, P.O. Box 2097, Corvallis, Oregon 97339. Telephone: (503) 754-7677.

Operations Forum - is a publication of the WPCF Operations Division, with articles and papers directly related to the daily activities of operations personnel. Membership to the WPCF Operations Division, open to all involved in the daily operation of a wastewater treatment facility, including laboratory personnel, is $15/year and includes a subscription to the Operations Forum. In order to become a member, one must also be a member of the CWPCA, which is $20/year. For $35/year you can receive two informative publications, the Bulletin and the Operations Forum.

AWWA Water Quality Analysis Committee Newsletter - For those of you interested in water treatment, this newsletter will provide you with information on seminars, publications, regulations and articles concerning water treatment. Many of the articles and information found in this newsletter are very helpful to the wastewater analyst as well. If you would like to receive the WQAC Newsletter, send your name and address to Ken Cuneo, Marin Muncipal Water District, 220 Nellen Avenue, Corte Madera, CA 94925 (Northern Section) or George Miller, Coachella Vally Co. Water District, P.O. Box 2058, Coachella, CA 92236 (Southern Section).

16th Edition of Standard Methods for the Examination of Water and Wastewater - is now available, complete with revisions and updates that reflect new methods, modified techniques, and other changes that affect all water laboratories. More than 50 per cent of this industry classic has been revised, updated or completely rewritten. The 16th Edition is available from the WPCF for $72 (members) or $90 (non-members). Use the form in the February Journal or WPCF's new toll-free number to order Standard Methods. Ask for publication SOO25R3. The number is 1-800-556-8700, and has daily service from 8:30am through 4:30pm, Eastern Standard Time. You may now use VISA or MasterCard to charge your order. If your order totals over $50, WPCF will bill you if you prefer. When using the toll-free number, please have ready the following information: Member identification number, the book or number(s), your credit card number and expiration date, and shipping address.

Disposal of Chemicals in the Laboratory - Guidelines for safe and environmentally sound procedures for the disposal of chemical and infectious waste generated in the laboratory. Helps you analyze the scope of your problem and set up disposal procedures. Outlines recovery, recycling and destruction alternatives, legal requirements,etc. Includes a 4-color chart illustrating the current DOT requirements for labeling hazardous materials. This 1983 publication was prepared by the National Research Council's Committee on Hazardous Substances in the Laboratory. Order from Lab Safety, P.O. Box 1368, Janesville, Wisconsin 53547-1368. No. EE2413-2. $25 (postage included).

The following manuals are now available from the CWPCA office:

Laboratory Manual for Wastewater and Water Analysts - Intended for use by the bench level analyst, this manual includes general chapters on management, safety, quality assurance, sample collection and preservation, atomic absorption spectrophotometry and gas chromatgraphy, as well as procedures for BOD, COD, residue and coliform determinations, and fish bioassay. It also contains a chapter of sample Laboratory Certification Exam questions. $10.00 -- CWPCA members; $15.00 --non-members

Voluntary Certification Program Laboratory Analysts Study Manual - This manual is designed to help analysts obtain voluntary certification. It provides information, references and sample questions on many of the areas covered in the VCP exams for all grade levels (I-IV). $5.00 -- CWPCA members; $10.00 -- non-members

Laboratory Procedures and Chemistry for Operators of Water Pollution Control Plants (reprint of Chapter 16, Operation of Wastewater Treatment Plants, Kenneth D. Kerri) - This is a simplified laboratory procedures manual designed for everyday use, also including sections on lab safety, sampling techniques and basic lab terminology. $10.00 -- CWCPA members; $15.00 -- non-members. All publications listed above can be obtained from the CWPCA office: P.O. Box 575, Lafayette, CA 94549 (415) 284-1778

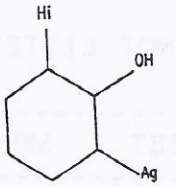
Films: U.S.-E.P.A. has several short films (16mm,sound) available through the film Library in Calabasas, CA (818) 884-3100. . These films are available to Region IX states for educational and organized community group audiences. The scope of E.P.A. subject matter includes Air, Solid Waste, Pesticide, Water, Noise and general environmental (introductory type) subjects.

****SEMINARS AND COURSES****

Toxic and Hazardous Substances Program - The University of California at Davis will be offering seminars and courses this summer in toxic and hazardous substances. The university also offers a certificate program in Hazardous Materials Management. Some of the couses offered include safety for transporters of hazardous materials, equipment selection and use to protect workers who handle hazardous materials, communicating toxics issues to the public, air pollution and toxic chemicals, principals of toxicology, etc. The Toxic and Hazardous Substances Program of the University of California, Davis Extension, can also provide training programs for companies and agencies. For further information about courses or the Certificate Program in Hazardous Materials Management, please contact Deborah Dobin, program coordinator or Cheri Lulofs, program assistant, University Extension, UC Davis, CA 95616; telephone (916) 752-6021.

J.T. Baker Safety Seminars - Provides realistic working seminars addressing all aspects of chemical management and safety. Some topics offered include chemical spills, waste management, electrical and mechanical safety, and even in-office safety practices. For further information contact the J.T. Baker Office of Training Services at (201) 454-2500.

Perkin-Elmer - for a list of seminars and workshops given by Perkin-Elmer, please contact Ellen Picken at (714) 544-6272. Also ask to be put on their mailing so you can receive information about future seminars and workshops.



Hi OH SILVER

****FUTURE EVENTS****

Voluntary Certification Test - The VCT will be held on July 20th. Applications for this exam should have been received by your CWPCA Local Section Chairman by June 1st. There are five disciplines being certified: Laboratory Analyst, Collection Systems Maintenance, Industrial Waste Inspection, Mechanical Technology and Industrial Waste Treatment Plant Operator. Guidelines and application for the VCT are included in this newsletter. The application deadline dates and test dates for future exams can be found in the guidelines.

58th Annual WPCF Conference/Exposition - will be held in the Convention Center, Kansas City, Missouri, on October 6-10. If you need information concerning this conference, contact the Water Pollution Control Federation, 2626 Pennsylvania Ave., N.W., Washington, D.C. 20031 (202) 337-2500

CWPCA Northern Regional Conference - will be held at Caesar's Resort, South Lake Tahoe, September 23rd and 24th. The Laboratory Program Chair is Joe Peel of Kennedy/Jenks Engineers (415) 362-6065. Contact Joe for information on the program schedule for the laboratory session.

CWPCA Southern Regional Conference - will be held at the Anaheim Sheraton on November 7th and 8th. Patty Lee, Orange County Water District, P.O. Box 8300, Fountain Valley, CA 92728 (714) 556-8260 has been named Program Chair. Contact Patty for information about the program schedule for the laboratory session.

****COMPUTERS****

Because of the popularity of using the computer as a tool in the laboratory, we have added this section to the newsletter. This section will give you a chance to share your views about using computers, experiences (including frustrations), or any programs you have written.

In the December 1985 issue, Scott Quady (Las Virgenes Municipal Water District), submitted an equation and table to help calculate the unlisted MPN series in Standard Methods. " Resulting from a basic interest in computer (and a few minutes between BOD readings)", Phil Snyder, Chemist II of Central Contra Costa Sanitary District, has written a microcomputer program for calculating the MPN values for positive tube series not included in Standard Methods.

The following is a print out of Phil's microcomputer program:

MPN INDEX FOR 5-TUBE SERIES NOT LISTED IN STANDARD METHODS

SET	MPN	SET	MPN	SET	MPN	SET	MPN	SET	MPN	SET	MPN
0-0-2	4	1-0-2	6	2-0-2	9	3-0-2	13	4-0-2	21	5-0-3	58
0-0-3	5	1-0-3	8	2-0-3	12	3-0-3	16	4-0-3	25	5-0-4	76
0-0-4	7	1-0-4	10	2-0-4	14	3-0-4	20	4-0-4	30	5-0-5	95
0-0-5	9	1-0-5	12	2-0-5	16	3-0-5	23	4-0-5	36		
0-1-1	4	1-1-2	8	2-1-2	12	3-1-2	17	4-1-3	31	5-1-3	84
0-1-2	5	1-1-3	10	2-1-3	14	3-1-3	20	4-1-4	36	5-1-4	110
0-1-3	7	1-1-4	12	2-1-4	17	3-1-4	22	4-1-5	42	5-1-5	130
0-1-4	9	1-1-5	14	2-1-5	19	3-1-5	27				
0-1-5	11										
0-2-1	6	1-2-1	8	2-2-1	12	3-2-2	20	4-2-2	32	5-2-3	130
0-2-2	7	1-2-2	10	2-2-2	14	3-2-3	24	4-2-3	38	5-2-4	150
0-2-3	9	1-2-3	12	2-2-3	17	3-2-4	27	4-2-4	44	5-2-5	180
0-2-4	11	1-2-4	15	2-2-4	19	3-2-5	31	4-2-5	50		
0-2-5	13	1-2-5	17	2-2-5	22						
0-3-0	6	1-3-0	8	2-3-1	14	3-3-0	17	4-3-2	39	5-3-4	210
0-3-1	7	1-3-1	10	2-3-2	17	3-3-1	21	4-3-3	45	5-3-5	250
0-3-2	9	1-3-2	13	2-3-3	20	3-3-2	24	4-3-4	52		
0-3-3	11	1-3-3	15	2-3-4	22	3-3-3	28	4-3-5	59		
0-3-4	13	1-3-4	17	2-3-5	25	3-3-4	31				
0-3-5	15	1-3-5	19			3-3-5	35				
0-4-0	7	1-4-0	11	2-4-0	15	3-4-0	21	4-4-1	40	5-4-5	430
0-4-1	9	1-4-1	13	2-4-1	17	3-4-1	24	4-4-2	47		
0-4-2	11	1-4-2	15	2-4-2	20	3-4-2	28	4-4-3	54		
0-4-3	13	1-4-3	17	2-4-3	23	3-4-3	32	4-4-4	61		
0-4-4	15	1-4-4	19	2-4-4	25	3-4-4	36	4-4-5	69		
0-4-5	17	1-4-5	22	2-4-5	28	3-4-5	40				
0-5-0	9	1-5-0	13	2-5-0	17	3-5-0	25	4-5-0	41		
0-5-1	11	1-5-1	15	2-5-1	20	3-5-1	29	4-5-1	48		
0-5-2	13	1-5-2	17	2-5-2	23	3-5-2	32	4-5-2	56		
0-5-3	15	1-5-3	19	2-5-3	26	3-5-3	37	4-5-3	64		
0-5-4	17	1-5-4	22	2-5-4	29	3-5-4	41	4-5-4	72		
0-5-5	19	1-5-5	24	2-5-5	32	3-5-5	45	4-5-5	81		

****CERTIFICATION CORNER****
(Trivial Pursuit For The Lab Analyst)

This is the first of a continuing series of sets of sample questions to be used in preparing for the Voluntary Certification Test. To maximize the benefit you gain from using these questions be sure to consult the references listed with the answers. I would also suggest you keep these questions around for future reference. It may be helpful to keep them with your copy of the lab training manual for the VCT (available May 1985, contact the CWPCA office for ordering).

If you disagree with any of the answers, by all means let me know. Be prepared to state your references so they can be placed in the next issue of the Analyst's Notebook. In addition, if you have questions from the last exam you still are not sure about, would like to donate practice questions to the column, or have a real live problem you need help with, please send them along to:

Peter Schneekloth
P.O. Box 33
Santa Barbara, CA 93102
805-966-5597

Grade I

1). The small volume of liquid left in the tip of a volumetric pipet should be blown out to complete a quantitative transfer.

True or False

2). Write the definition for coliform organisms as measured by the multiple tube fermentation technique.

Grade II

3). A series of standards for the total phosphorus test are analyzed by the ascorbic acid method. The concentration values are then plotted on arithmetic graph paper vs. the % transmittance values. This will yield a straight line.

True or False

5). As temperature increases, the solubility of oxygen in water also increases.

True or False

Grade III

6). You have performed a gas chromatographic analysis on a water sample for the pesticide methoxychlor. Given the following information, calculate the concentration of methoxychlor in the original sample. (Assume peak identification has been confirmed on a second column).

1. Nanograms of standard injected = 3 ng
2. Peak area for sample = 24 area counts
3. Original sample volume = 1 liter
4. Volume of sample extract = 10 ml
5. Peak area for standard = 17 area counts
6. Volume of extract injected = 3 microliters

7). List three qualities of a good directive.

Grade IV

8). What is the pH of a solution which is 0.10 formal in HCL and 0.35 formal in NaCN?

9). List three methods of reducing the concentration of ammonia in wastewater (full scale operations, not in the lab).

(ANSWERS ON PAGE 12)

Congradulations

Congradulations to Kacey Kahmendy, Laboratory Supervisor for the City of San Mateo Water Quality Control Plant, for receiving the Laboratory Person of the Year Award from the San Francisco Bay Section and from the CWPCA. To list all her achievements in this newsletter would be impossible. She has dedicated a large amount of her time to the CWPCA, was involved in starting up the Laboratory Training Committee, and in her spare time she managed to put out the Laboratory Manual for Wastewater and Water Analysts. Kacey holds a Grade IV Laboratory Technologists Certificate as well as a Grade III Wastewater Treatment Plant Operator Certificate. At the present time she is the Secretary-Treasurer for the Voluntary Certification Program Committee.

****ANALYST'S LOG****

In this section, each issue will feature a different topic dealing with new techniques, theories, laboratory problems, etc. We encourage analysts to share their views and experiences. Thomas (Tim) K. Mikel, Laboratory Director of Jacobs Environmental, gives us a more understandable version of the California Assessment Manual. Tim has been with Jacobs for eight years, three as Laboratory Director, and has given many talks regarding the testing of hazardous wastes.

THE CALIFORNIA ASSESSMENT MANUAL:

THE DETERMINATION OF HAZARDOUS WASTES

Thomas K. Mikel
Laboratory Director
Jacobs Environmental
Ventura, California

Just the mere mention of hazardous waste testing to a waste generator can cause physiological health symptoms ranging from hives to fainting spells! And rightly so, California hazardous waste regulations have changed dramatically over the past five years, creating considerable confusion to generators, regulators, and analysts alike. Fortunately for all concerned, the relevant document, the California Assessment Manual (CAM), is in the California Department of Health Services' final stages of approval. The CAM is an important, if not complex, document, since it provides to the waste generator, fairly clear-cut guidelines for determining whether a waste is to be considered hazardous or not. At Jacobs Environmental, we have been suffering through these years of the CAM's growing pains and have thus been able to come to a certain "uneasy truce" with the regulations.

During October last year, we were invited by the Ventura County Environmental Health Department to speak at two local workshops on this topic of hazardous waste testing. What I believe we were able to accomplish at these workshops, and what I would hope to accomplish in this article, is to provide a somewhat more digestible and understandable version of the CAM. The best way that I know of how to do this is to create an imaginary "typical" sample and to describe, in a "step-by-step" manner, just how it would be tested in our laboratory for all of the different hazardous waste criteria. Before I begin, however, I have one word of caution, a large amount of money, effort, and time can be saved, if, before testing is started, you contact the California Department of Health Services or their local agent to determine of which criteria you will be required to comply. Each waste type is different, and, in nearly all cases, some of the requirements may be deleted.

A waste can be classified non-hazardous if it meets four basic criteria: 1) Reactivity, 2) Corrosivity, 3) Ignitability, and 4) Toxicity. Beginning with Reactivity, the State seems to be asking the questions, "Will this waste detonate or explode, react violently with water, or create toxic gases when reacting with water?" Under Corrosivity, the question asked is, "Is this waste highly acidic or basic?" Under Ignitability, the question is, "Can this waste be readily ignited and cause a fire?" Under Toxicity, several questions are being asked, "Is this waste highly toxic to living organisms, contain high total concentrations of known toxicants, or contain high concentrations of known toxicants which are readily soluble in water?"

At this time, I would have you meet John Doe, the Chief Chemist (well.....only chemist) of the very small Middleburg Municipal Sanitation District. Mr. Doe has been storing the plant's sludge waste and wants to dispose of it in a non-hazardous (other that Class 1) landfill. Since Mr. Doe does not want to be confronted with any more hassles than are absolutely necessary, he has contacted his local environmental health agency and has described his operation and waste source to them. They tell him that since his sludge is not anticipated to explode, detonate, or generate toxic fumes, the whole criteria of Reactivity can be waived. Also, due to the nature of the local effluent, organic toxicants are not expected in the sludge, so organics testing will not be required. What will be required are: Corrosivity, Ignitability, and non-organic Toxicity.

Mr. Doe has now collected a representative sludge sample and has delivered it to our laboratory. Before leaving, Mr. Doe must fill out a "chain-of-custody". This form is completed in part by a representative from each entity that accepts the sample, and thus helps ensure that it has not been tampered with. Since money is more important to Middleburg than time, Mr. Doe has requested that we analyze the sample sequentially. That is, we will begin with the least expensive analyses and determine passage or failure before continuing on to the more expensive ones. We start, therefore, with Corrosivity testing.

Corrosivity Criteria

A waste is considered hazardous under the criteria of Corrosivity if it is either highly acidic or highly basic. This is determined by the measure of pH. The pH of aqueous solutions range from 0 to 14. Those solutions with pH measurements below 7 are acidic and those above, basic. The further from 7 a solution's pH is, either below or above, the more acidic or basic it is, respectively. Neutral solutions, such as distilled water, yield pH measurements of 7. To be non-hazardous, a waste cannot produce a pH measurement less than 2 or greater that 12.5. Mr. Doe's sample yielded a pH of 5.8. Although this sample is slightly acidic (less than 7), it will not be considered Corrosive (less than 2). The Middleburg sludge has then met the first hazardous waste criteria, and we will begin testing within the other categories.

Ignitability Criteria

Ignitability is the second least difficult criteria to evaluate. Testing for Ignitability requires determination of the sample's flash-point, analyzed (not surprisingly) by a Flash-point Tester. With this device, a small portion of the sample is heated in a closed cup, and, as the temperature rises, a small flame is periodically exposed to it. The temperature at which the sample ignites or "flashes" is defined as the flash-point. Under the criteria of Ignitability, a waste is considered hazardous if it ignites before it reaches 60 degrees

centigrade. The Middleburg sample did not flash below 60 degrees centigrade, in fact (as we might suspect with a sludge), we could not get it to ignite at all. The sample is then considered non-hazardous with respect to Ignitability, and we may go on to the criteria of Toxicity.

Toxicity Criteria I: Hazard to Organisms

In many cases, the only way to really determine a waste's toxicity is to test it directly with living organisms. Fortunately, at least in the case of mammals, the toxicity of most compounds are known, and, if you know the concentrations of your sample's contaminants, you may be required to just fit these results into a relatively straightforward formula found in the CAM. Since hazards to fish are less well known and more easily run, aquatic toxicity testing is commonly required. Under this sub-category of the Toxicity criteria, a waste is considered non-hazardous if its Acute 96-hour LC_{50} is greater than 500 milligrams per liter (mg/l). That means that more than 50% of a test population of fish must survive in a concentration of at least 500 milligrams of waste per liter of dilution water (LC = lethal concentration) for a period of four days (96 hours). This determination is made through acute toxicity bioassays. In a controlled environment, a series of concentrations of waste to dilution water is prepared in six 15 liter aquaria. Ten fathead minnows are added to each tank, and,if after four days, more than half of them are still alive in all concentrations of 500 mg/l or less, the waste is considered non-hazardous under this sub-category. Mr. Doe's sample did not kill any of the fish in any of the aquaria. The result of his test is then reported as $LC_{50} > 750$ mg/l, indicating that the concentration that might kill half of the fish is higher than the highest concentration that we used in our test (750 mg/l). Since this is above 500 mg/l, his waste is non-hazardous under this sub-category.

Toxicity Criteria II: Total Toxicant Concentrations

The CAM has two sets of limits for the concentrations of toxicants in wastes: the Total Toxicant Concentrations and the Soluble Toxicant Concentrations. The CAM limits for these contaminants are listed in the second and fourth columns of Table 1 (only non-organic compounds are listed). In order to analyze for Total Toxicants, a sample must be completely broken down by vigorously digesting it with concentrated nitric acid. This acid removes virtually all toxicants from the sample and puts them into solution. The acid can then be analyzed directly via an atomic absorption spectrophotometer or other instrument. The results of the Total Toxicant analyses of the Middleburg sample are listed in the third column of Table 1. By comparing these results with the Total Limits (second column), it is apparent that all of the contaminant concentrations are well below the CAM requirements. Mr. Doe has then met another de-classifying criteria and has only to determine the levels of Soluble Toxicants in his sample.

Toxicity Criteria III: Soluble Toxicant Concentrations

The last criteria to be met involves the same contaminants that are listed above for Total Toxicants, but the focus is on that portion of the total which is readily soluble in water. The method for determining Soluble Toxicants in waste is called The Waste Extraction Test (WET) and is outlined in the CAM. Basically, a small amount of the sample (50 grams) is mixed with a mildly acidic water solution (500 milliliters) and is agitated for two days on a shaker table or other mixing device. The extract is then filtered and analyzed for the required toxicants. This extraction is far less vigorous than the digestion described above, since only contaminants that might be soluble in water are of interest Rather than requiring re-analysis of the complete toxicant list again, the State Department of Health Services has determined that if the Total Toxicant Concentrations already analyzed (in mg/kg) are no higher than the listed Soluble Limits (in mg/liter, fourth column, Table 1) it is unlikely that the contaminant concentrations in the much weaker WET extract will be either. Determining which toxicants need to be re-analyzed is then simply a matter of comparing the Total Toxicant results directly with the Soluble Limits. In the Middleburg sample, only copper, lead, and zinc exceeded the Soluble Limits, therefore, the extract will only need to be analyzed for these three metals. The results of the post-extraction analyses are listed in the fifth column of Table 1. Since these concentrations are much lower than the Soluble Limits, Mr. Doe's waste has cleared the final testing criteria and may be disposed of at a non-hazardous waste site.

I hope that this somewhat illustrative approach to hazardous waste testing regulations has been helpful in understanding some aspects of the CAM. This field of testing can be both frustrating and confusing, but, armed with a basic understanding of the regulations, a waste producer can get through all of the requirements relatively quickly and inexpensively.

TABLE 1. Total and Soluble Toxicant Concentration Limits as Listed in the California Assessment Manual (CAM) with Results for the "Middleburg Sludge Sample".

Constituent	Total Limits (mg/kg)	Middleburg: Total Results (mg/kg)	Soluble Limits (mg/l)	Middleburg: Soluble Results (mg/l)
Antimony	500	0.5	15	--
Arsenic	500	3.9	5.0	--
Barium	10,000	17.0	100	--
Beryllium	75	0.05	0.75	--
Cadmium	100	0.5	1.0	--
Chromium (6)	500	1.0	5	--
Chromium (3)	2,500	91	560	--
Cobalt	8,000	1.2	80	--
Copper	2,500	47.5	25	0.58

TABLE 1. (cont.) Total and Soluble Toxicant Concentration Limits as Listed in the California Assessment Manual (CAM) with Results for the "Middleburg Sludge Sample".

Constituent	Total Limits (mg/kg)	Middleburg: Total Results (mg/kg)	Soluble Limits (mg/l)	Middleburg: Soluble Results (mg/l)
Fluoride	18,000	5.0	180	--
Lead	1,000	18.0	5.0	0.36
Mercury	20	0.09	0.2	--
Molybdenum	3,500	2.4	350	--
Nickel	2,000	13.7	20	--
Selenium	100	0.17	1.0	--
Silver	500	0.3	5	--
Thallium	700	0.5	7.0	--
Vanadium	2,400	15.5	24	--
Zinc	5,000	410.0	250	13.58

****ANSWERS TO VCT CERIFICATION QUESTIONS****

1). False. Handbook for Analytical Quality Control in Water and Wastewater Laboratories, p 4-3, EPA-600/4-79-019, USEPA, Cincinnati Ohio.

2). The coliform group comprises all aerobic and facultative anaerobic, gram-negative, nospore-forming, rod-shaped bacteria that ferment lactose wikth gas formation within 48 hours at 35 C. See Standard Methods, Method 908.

3). False. The line will be curved. See Standard Methods, 16th ed., p. 11.

4). False. As the temperature increases, solubility decreases. See Standard Methods, 16th ed., table:I.

5). 11 micrograms/liter. See Standard Methods, 16th ed., Method 509.

6). A good directive should be understandable, contain a clear time element, be compatible with organizational goals and should be given with appropriate tone and wording. See Haimann and Hilgert, Supervision, Concepts and Practices of Management, Chapter 15, South-Western Publishing, Cincinnati, Ohio, 1982.

7). pH=9.8. See any good college chemistry text.

8). Ammonia can be removed by air stripping, nitrification-denitrification, ion exchange and breakpoint chlorination. See any good text on advanced wastewater treament, for example, Wastewater Engineering, Treatment/Disposal/Reuse, Metcalf and Eddy Inc., 1979.

****LABORATORY TECHNIQUES****

Patrict Fisher, Laboratory Technician with Central Contra Costa Sanitary District, describes a technique for preparing oil and grease standards.

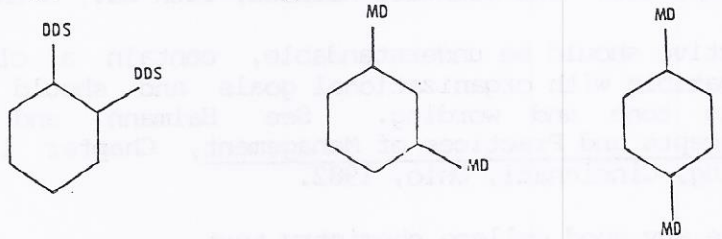
PREPARING OIL AND GREASE STANDARDS

Standard Methods (15 ed.) Oil and Grease Partition - Gravimetric method section does not describe any technique for making standards. In the Precision and Accuracy Section the book states, "...sewage was dosed with 14.0 mg of No. 2 fuel oil and Wesson oil..."

How the "dosing" was performed is not explained. The E.P.A. O & G quality control samples, with true values given, are paraffin oil dissolved in Freon. Five milliliters are pipetted into a separatory funnel with one liter of water (acidified). This makes a poor sample because the Freon with 99+ percent of the oil settles to the bottom. The oil is not dispersed in or on the water sample. A better sample is made by pipetting the EPA concentrate into a clean (Freon rinsed) sample bottle. Evaporate the Freon. Now add the water. This way the oil adheres to the sample bottle, floats on top, and is dispersed in the solution. Increased dispersion can be accomplished by placing the sample bottle in an ultrasonic water bath for one hour. This method yields 98± 5 percent recovery.

On the other hand, it would be even easier if we did not have to evaporate the Freon first but could add the oil sample directly to the water. We can if the solvent not Freon, is miscible with water. Acetone works ideally. It finely disperses the oil in the water. Very little oil adheres to the bottle sides or floats on the water surface. Good recovery with this method is 94± 5 percent. Also, the acetone-oil concentrate is convenient for dosing (spiking) other samples.

Oil and grease samples, including standards, cannot be subdivided because of sample losses on equipment surfaces. So each sample or standard bottle must be prepared separately. The acetone-oil concentrate does not have this limitation because the oil is 100 percent dissolved in the solvent. The acetone-oil concentrate can be made by traditional techniques. Weigh the oil sample and dissolve in acetone in a volumetric flask. This mixture can be pipetted into individual sample bottles. Because the acetone evaporates quickly, the concentrates "true value" changes daily. Oil and grease testers, let me know about your techniques.



ORTHODONTIST METAPHYSICIAN PARAMEDICS PARADOX

******FOR SALE******

Total Organic Carbon Analyzer, Dohrmann DC-50, with manual boat inlet. Purchased 6/78. Contact Kacey Karmendy (415) 377-4690.

Programs

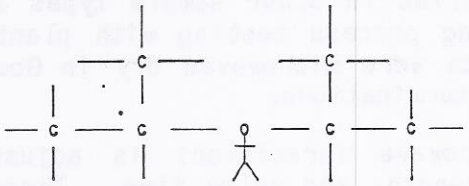
For laboratories using an IBM PC-compatable computer and Lotus 1-2-3, we have some worksheets, graph programs for linear regression and three different quality control charts. The control chart programs include a range and mean control chart for n=2. The programs include a one key entry for calculations and graph functions. If you are interested, please contact Ron Myers, 916-449-5366.

****LABORATORY SAFETY****

The burn center at Augusta, GA. considers the Red Cross First Aid Course to be deficient in the amount of water flushing needed in treating chemical burns. For household chemicals the new recommendations are: immediately flush skin burns with water for at least 20 minutes with removal of contaminated clothing. Medical help is needed after the thorough rinsing. For skin burns by industrial chemicals, such as ammonia or acids, prolong the wash for 30 minutes; the rescue squad then should extend on-site washing when the victim is transported.

When splash accidents with strong industrial chemicals damage critical body parts, such as eyes, the flush period of 15 minutes commonly recommended in the past now should be extended for another 30 minutes after a 20 to 30-minute on-site shower plus flushing during transport.

If temperatures are "frigid", the victim may be quickly moved to a source of tempered water after the eyes are thoroughly flushed and contaminated clothing have been removed. Time of washing should be CLOCKED, not estimated.



ISOPROPYL PEOPLE ETHER

****GENERAL INTEREST****

How many times has a frantic operator come running into the laboratory holding a sludge sample and yelling, " The moisture balance broke, we need per cent soldis on the sludge right now! ". Can you ever forget the look on their face when you reply, " The results won't be ready until tomorrow.". Microwave oven to the rescue!?? The Central Contra Costa Sanitary District has purchased a microwave oven for drying solids. The following is a study done by Patrick Fisher, Laboratory Technician, comparing microwave versus oven drying for solids determination.

MICROWAVE VS. OVEN DRYING FOR SOLIDS DETERMINATION

The Central Contra Costa Sanitary District Laboratory has purchased a microwave oven for drying solids. This allows rapid solids drying (5 to 8 minutes) and good results as compared to the conventional oven.

For process control of our sludge centrifuges the solids data can be ready in about half an hour. The sample is weighed (5 minutes), dried (8 minutes), cooled (15 minutes), and weighed (5 minutes). Before, we had to dry our samples overnight, a necessity for a 20 gram centrifuge cake to dry to a constant weight.

The following data was generated from a sludge centrifuge test and covers a wide range of solids concentrations. A sludge (7 percent), a centrate (1 percent), and a cake (30 percent) sample were individually tested by microwave and oven with ten replicates each. In all of my tests the microwave percentage of solids data is about three percent (2-5) higher than oven values. I presume this is because the "oil and grease" fraction is more vaporized in the oven with the extended heating time. Centrifuge cake dried overnight has almost no odor, but cake microwaved dry has a strong "oil and grease" smell.

DATA SHEET

Wastewater and waste process samples, by their very nature, are variable. The consistent three percent microwave vs. oven difference is insignificant compared to the large sample variability. But the three percent difference was observed in other sample types also. For example, this was confirmed during process testing with plant influent and activated sludge samples which were microwaved dry in Goochi crucibles for total suspended solids determinations.

Central San's microwave (precision) is adjustable for drying time, microwave pulse strength, and pulse time. These are adjusted according to sample type to values found experimentally to dry to constant weight but not burn (watch out) the sample. Here are some suggested microwave settings for drying different sample types.

Sample	Microwave Drying Time	Pulse Strength	Pulse Time
Primary Sludge	5 minutes	100%	Maximum
Primary Sludge	7 minutes	80%	Maximum
Centrifuge Centrate	5 minutes	100%	Maximum
Centrifuge Cake	6.2 minutes	100%	Maximum
Centrifuge Cake	8.0 minutes	80%	Maximum
Goochi Crucibles	6.0 minutes	80%	Maximum

COMPARISON OF OVEN, LAB MICROWAVE AND FIELD MICROWAVE
SLUDGE SOLIDS ANALYSIS
(% SOLIDS)

REPLICATE NO.	FEED		CENTRATE		CAKE	
	OVEN	MICRO	OVEN	MICRO	OVEN	MICRO
1	6.5	6.8	0.73	0.81	31.4	31.8
2	6.5	6.8	0.72	0.77	31.9	31.9
3	6.4	6.7	0.72	0.81	31.3	32.1
4	6.5	6.8	0.79	0.80	31.6	32.2
5	6.5	6.7	0.75	0.75	31.4	32.0
6	6.5	6.7	0.71	0.80	31.5	32.1
7	6.5	6.7	0.77	0.78	31.2	32.2
8	6.6	6.8	0.72	0.78	31.3	32.1
9	6.5	6.8	0.74	0.77	31.2	32.2
10	6.5	6.7	0.72	0.80	31.3	32.0
MEAN	6.50	6.75	0.74	0.79	31.41	32.06
STD. DEV.	0.05	0.05	0.026	0.020	0.21	0.13
AVERAGE SAMPLE SIZE (GRAMS)	27.9	8.3	21.1	7.9	21.3	21.0

ANALYST PAT FISHER DATE FEB 15-16, 1985

******EDITORS'FOOTNOTES*****

The Editors would like to thank everyone who helped assemble, fold, staple, address, and lick stamps for this month's issue. In addition, we would like to thank Phil Snyder, Patrick Fisher, and Tim Mikel for their submittals. Please keep your submittals coming. Because of the lack of my (Bev) typing skills (thank goodness for a word processor), please send in typed articles. If your typing skills equal mine and you do not have access to a word processor, don't worry, send your articles along anyway.

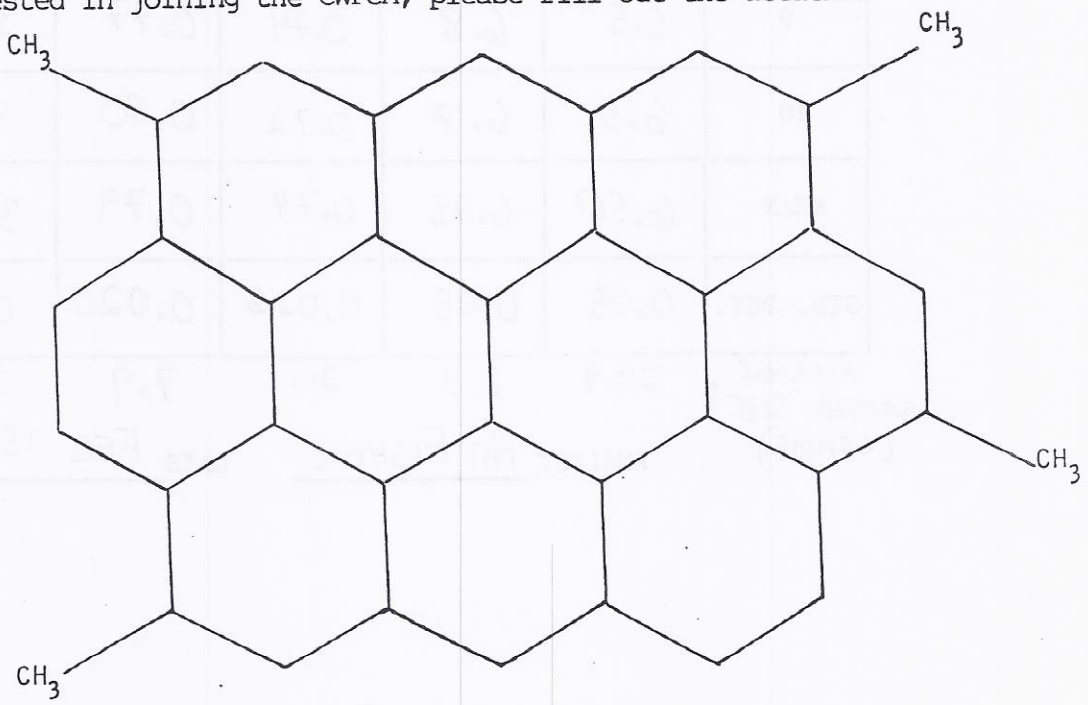
A very special thank you to Ken Cuneo. Ken gave us many helpful hints to get this newsletter started.

We would like this newsletter to serve as an information exchange between analysts. We welcome any comments and ideas on the format and content of this newsletter.

Good luck to all of you who are taking the next Voluntary Certification Exam. Many people ask why they should take this exam because it is not required by the state for advancement in any field. For one reason, some treatment plants and businesses require such programs as a way of measuring a person's time and efforts in those particular fields. Another reason is that it indicates a person's initiative and documents their competency in a particular field. Also, the VCP could help you obtain another job in a different field of interest if you are certified in several disciplines and wanted to relocate or change careers. Guidelines for the VCP are included in this newsletter.

The next mailing of this newsletter will be in December. Please have your submittals to one of the Editors by November 1st.

If you are interested in joining the CWPCA, please fill out the attached application.



TETRAMETHYL CHICKEN WIRE