

FINAL REPORT

Crude MCHM

HAEL No.: 97-0216

EAN: 972790

PM No. : 18717-00

CAS: Not Available

BIOCHEMICAL OXYGEN DEMAND DETERMINATION

AUTHOR

M. Steinbugler

TEST GUIDELINE

“Environmental Laboratory Certification Manual”, New York State Department of Health,
January 1987.

“OECD Principles of Good Laboratory Practice”, [C(81)30(Final)], Annex 2.

TESTING FACILITY

Environmental Analytical Services
Chemicals Quality Services Division
Manufacturing Quality Assurance Organization
Eastman Kodak Company
Rochester, New York 14652-6276
USA

STUDY SPONSOR

Eastman Chemical Company

Report No. BOD-00774

STUDY COMPLETION DATE

September 30, 1997

ANALYTICAL QUALITY ASSURANCE INSPECTION STATEMENT
(CFR 58.35(B)(7) 792.35(B)(7) 160.35(B)(7))

STUDY: 97-0216 STUDY DIRECTOR: BISHOPP, M.
ANALYTICAL DIRECTOR:
KAN : 972790
CQS JOB NUMBER:

STUDY TYPE: BIOCHEMICAL OXYGEN DEMAND DETERMINATION

Kenn H. Patterson
(AUDITOR, QUALITY ASSURANCE UNIT)

September 26, 1997
DATE

THE FOLLOWING PHASES OF THIS STUDY WERE INSPECTED BY ONE OR MORE PERSONS OF THE QUALITY ASSURANCE UNIT ON THE DATES LISTED BELOW. WRITTEN STATUS REPORTS WERE SUBMITTED TO THE STUDY DIRECTOR AND APPROPRIATE MANAGEMENT.

INSPECT DATES	REQUEST NUMBER	PHASE(S) INSPECTED	STATUS REPORT DATES

08/06/97		PROTOCOL SUBMISSION ECHEM	08/06/97
09/26/97		TEST REPORT INSPECTION ECHEM	09/26/97

GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

This study was conducted according to:

United States Food and Drug Administration, Good Laboratory Practice for Nonclinical Laboratory Studies, 21 CFR Part 58;

United States Environmental Protection Agency, Toxic Substances Control Act, Good Laboratory Practice Standards, 40 CFR Part 792;

Annex 2, Organization for Economic Cooperation and Development, Guidelines for the Testing of Chemicals [C(81)30(Final)].

Mary Lee Bishopp September 30, 1997
Mary Lee Bishopp Month/Day/Year
Study Director

Karen R. Miller October 9, 1997
Karen R. Miller Month/Day/Year
Eastman Contact Representative

SIGNATURE PAGE

Mary Steinbugler September 26, 1997
Mary Steinbugler Month/Day/Year

Report Author

Mary Lee Bishopp September 30, 1997
Mary Lee Bishopp Month/Day/Year

Study Director

Karen R. Miller October 9, 1997
Karen R. Miller Month/Day/Year

Eastman Contact Representative

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Crude MCHM

HAEL No.: 97-0216

EAN: 972790

PM No. : 18717-00

CAS : Not Available

ABSTRACT

The biochemical oxygen demand (BOD) of the test substance was measured in compliance with "OECD Principles of Good Laboratory Practice", [C(81) 30(Final)], Annex 2. The method of measurement used was Method C.5., "Degradation, Biochemical Oxygen Demand", Official Journal of the European Communities, No. L 251/212, 19.9.84. The results of the 5-day BOD for the test substance at 0.0020 % and 0.0030 % were 0.074 and 0.066 grams BOD / gram of test substance, respectively. The average result for the 5-day BOD was 0.070 grams BOD / gram of test substance. The test substance exhibited inhibitory effects in the 5-day BOD test. An inhibitory BOD result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The result of the 20-day BOD for the test substance at 0.0030 % was 1.30 grams BOD / gram of test substance. The test substance exhibited inhibitory effects in the 20-day BOD test, therefore only the most dilute solution was used to calculate the final 20-day BOD. An inhibitory BOD result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The result of the BOD5/COD was 0.028.

The density was determined by weighing the test substance contained in a 1 milliliter volumetric flask on a Mettler AT261 balance. The density was done in triplicate. The mean of the three density results was found to be 0.91 grams per milliliter.

STUDY AND TEST SUBSTANCE INFORMATION

Testing Facility

Environmental Analytical Services
Chemicals Quality Services Division
Eastman Kodak Company
Rochester, New York 14652-6276
USA

Sponsor

Eastman Chemical Company
P.O. Box 431
Kingsport, Tennessee 37662-5280
U.S.A.

Sponsor Representative

Karen Miller
P.O. Box 431
Kingsport, Tennessee 37662-5280
U.S.A.

Study Dates

Study Start Date: August 6, 1997
Experimental Start Date: August 6, 1997
Experimental Completion Date: August 26, 1997

Project Participants

Study Director	Mary Lee Bishopp	
Principal Investigators	Margaret Brazwell	Tammy Kleiber
	Joseph Donnelly	Tracey Sanford
	Deltris Dunn	Mary Steinbugler
Report Author	Mary Steinbugler	

Test Substance Characterization

Name: Crude MCHM
EAN: 972790
HAEL No. : 97-0216
PM# : 18717-00

Test Substance Storage

The test substance was stored at room temperature in a locked cabinet before and after each analysis was performed.

PURPOSE

The purpose of this study was to determine the biodegradability of the test substance under standard conditions of the test.

MATERIALS AND METHODS

The method and material can be found in "Determination of Biochemical Oxygen Demand of Solid and Liquid Organic Chemicals". Method No. KPCQ-A-EA-G-M-3-1, Eastman Kodak Company.

Calculations

The 5-day BOD was calculated by subtracting the final D.O. (dissolved oxygen) reading and the 5-day SDW (seedwater) drop from the initial D.O. This is then multiplied by 100. The resulting answer is then divided by the percent concentration of the sample being analyzed and 1,000,000. The result is a value in units of grams of BOD per gram of test substance for a 5-day incubation.

The 20-day BOD was calculated by subtracting the final D.O. (dissolved oxygen) reading and the 20-day SDW (seedwater) drop from the initial D.O. This then multiplied by 100. The resulting answer is then divided by the percent concentration of the sample being analyzed and 1,000,000. The result is a value in units of grams of BOD per gram of test substance for a 20-day incubation.

The BOD/COD ratio was calculated by dividing the average 5-day BOD value in units of grams per gram by the mean of the COD results in units of grams per gram. The result is a value without units.

The density was calculated by dividing the weight of the test substance by the volume. The result is a value of grams per milliliter.

Protocol And Standard Operating Procedure Deviations

The 5-day BOD result was calculated on dilutions that exhibited a dissolved oxygen drop less than the required drop of two milligrams per liter. This was necessary due to the inhibitory effects of this test substance. An inhibitory BOD result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The dissolved oxygen drop of the dilution water and the seeded dilution water was outside of the method requirements. The reference sample was within the accuracy requirements for the method. Therefore, this will not adversely affect the result of the test.

Data Storage And Record Retention

All original protocols, raw data, and reports will be stored for at least ten years by the Chemicals Quality Services Division, Building 320 of the Eastman Kodak Company, Kodak Park, Rochester, New York 14652-6276.

RESULTS

The results of the 5-day BOD analysis are as follows:

Replicate 1 = 0.074 grams of BOD/ gram of test substance (at 0.0020% concentration).

Replicate 2 = 0.066 grams of BOD/ gram of test substance (at 0.0030% concentration).

mean = 0.070 grams of BOD/ gram of test substance.

The test substance exhibited inhibitory effects in the 5-day BOD test and should be interpreted as an estimated result due to decreased activity of the microorganisms.

The results of the 20-day BOD analysis are as follows:

Replicate 1 = 1.30 grams of BOD/ gram of test substance (at 0.0030% concentration).

The test substance exhibited inhibitory effects in the 20-day BOD test, therefore only the most dilute solution was used to calculate the final 20-day BOD and the result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The result of BOD5/COD ratio is 0.028.

CALCULATIONS

5-day BOD

$$\text{BOD grams/gram} = \frac{(DO_1 - DO_2 - C) (100)}{(\% \text{ concentration})(\text{density})(1,000,000)}$$

Where: C = DO drop of seeded dilution water after 5 days.
DO₁ = initial DO of sample solution, mg/L.
DO₂ = Total DO drop after 5 days, mg/L.
% concentration = concentration of the incubated sample.
density = density of the incubated sample

Example Calculation:

Replicate One:

$$\text{BOD grams / gram} = \frac{(7.60 - 6.15 - 0.10)(100)}{(0.0020)(0.91)(1,000,000)} = 0.074$$

20-Day BOD

$$\text{BOD grams/gram} = \frac{(DO_{\text{Total } 20} - C_{20}) (100)}{(\% \text{ conc.})(\text{density})(1,000,000)}$$

Where:

DO_{Total20} = Total DO drop over 20days.
C₂₀ = Average seed water DO drop after 20 days.
% conc. = concentration of incubated sample.
1,000,000 = conversion factor mg/L to g/g.
density = density of the incubated sample

Example Calculation:

Replicate One:

$$\text{BOD grams/gram} = \frac{(38.85 - 3.23)(100)}{(0.0030)(0.91)(1,000,000)} = 1.30$$

BOD/COD Ratio

$$\text{BOD5/COD Ratio} = \frac{\text{Average BOD 5 day concentration}}{\text{Average COD concentration}} = \frac{0.070 \text{ grams/ gram}}{2.54 \text{ grams/ gram}} = 0.028$$

Density

$$\text{Density grams/milliliter} = \frac{\text{grams test substance}}{\text{milliliters test substance}}$$

Example Calculation:

Replicate One:

$$\text{Density grams/milliliter} = \frac{0.9084}{1} = 0.9084$$

DISCUSSION

The results of the 5-day BOD for the test substance at 0.0020 % and 0.0030 % were 0.074 and 0.066 grams BOD / gram of test substance, respectively. The average result for the 5-day BOD was 0.070 grams BOD / gram of test substance. The test substance exhibited inhibitory effects in the 5-day BOD test. An inhibitory BOD result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The result of the 20-day BOD for the test substance at 0.0030 % was 1.30 grams BOD / gram of test substance. The test substance exhibited inhibitory effects in the 20-day BOD test, therefore only the most dilute solution was used to calculate the final 20-day BOD and the result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The result of the BOD5/COD was 0.028.

CONCLUSION

The biochemical oxygen demand (BOD) of the test substance was measured in compliance with "OECD Principles of Good Laboratory Practice", [C(81) 30(Final)], Annex 2. The method of measurement used was Method C.5., "Degradation, Biochemical Oxygen Demand", Official Journal of the European Communities, No. L 251/212, 19.9.84. The mean of the two 5-day BOD results was found to be 0.070 grams per gram of the test substance. The 20-day BOD result was found to be 1.30 grams per gram of test substance. The test substance exhibited inhibitory effects in both the 5-day and 20-day BOD tests. An inhibitory BOD result should be interpreted as an estimated result due to decreased activity of the microorganisms.

The BOD5/COD ratio was found to be 0.028.

REFERENCES

1. "Biochemical Oxygen Demand", Method 405.1, U.S. Environmental Protection Agency, EPA-600/4-79-020, March 1979.
2. "Degradation, Biochemical Oxygen Demand", Method C.5., Official Journal of the European Communities, No. L 251/212, 19.9.84.

FIGURE I

5-day BOD Worksheet

BIOCHEMICAL OXYGEN DEMAND

Chemical HAEL #: 97-0216

EAN: 972 790

Concentration of Solution: 1 mL/1L

pH prior to adjustment:

5-DAY - Standards, DW & SDW: Date Setup: 8-6-97
Date Read: 8-11-97

20-DAY - SDW: Date Setup: 8-6-97
Date Read: 8-26-97

	1.50%	1.50%	2.00%	2.00%	
Bottle #	64	337	59	339	
Initial DO	7.45	7.70	7.65	7.65	
Final DO	3.90	4.45	3.45	3.50	
SDW Drop	0.10	0.10	0.10	0.10	
Adj. Drop	3.75	3.15	4.10	4.05	
BOD, mg/L	230.0	210.0	205.0	202.5	Average = 211.9

Bottle #	5-Day				20-Day	
	DW	DW	SDW	SDW	SDW	SDW
5	40	2	38	5	60	
Initial DO	7.65	7.65	7.65	7.65	7.65	
Final DO	8.20	8.20	7.55	7.55	4.25	
DO Drop	-0.55	-0.55	0.10	0.10	3.40	
Average Drop	-0.55			0.10	3.22	

5-day BOD Samples

Date Setup: 8-6-97 Date Read: 8-11-97

Bottle #	350	501	96	59	4	72	24	43	61	205	19	369
% Conc.	0.00033	0.00050	0.0010	0.0020	0.0030	0.0050	0.010	0.020	0.030	0.060	0.090	0.10
mls added	1.0	1.5	3.0	6.1	9.1	15.2	30.0	61.0	91.0	182	273	Full Btl.
Initial DO	7.50	7.50	7.55	7.60	7.60	7.55	7.60	7.55	7.55	7.65	7.70	7.70
Final DO	6.90	6.45	6.50	6.15	5.70	5.00	3.65	3.40	3.30	5.55	6.45	6.70
5day SDW Drop	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Adjusted Drop	0.50	0.95	0.95	1.35	1.30	2.45	3.85	4.05	4.15	2.00	1.15	0.90
BOD (g/g or g/ml)	0.17			0.07	0.066	0.054	0.042	0.022				

ANALYST(S)/DATE(S): 8-6-97 M. Steinberg
8-11-97 Tammy Kleiber

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By M. Steinberg Date 9-26-97

FIGURE II

20-day BOD Worksheet

20 - Day Biochemical Oxygen Demand

Bottle # 4
 Date Set-up 8-6-97
 pH Prior to setup _____

HAEL# 97-0216
KANEAN 972790 (Circle one)
 Concentration of Stock Sample 1.0 ml/L

20 - Day Biochemical Oxygen Demand										20- Day Seed Water								
Initial DO	5.70									Bottle #	5	60						
Final DO	2.95	8.05									Init. DO	7.65	7.65					
DO Drop	2.75	3.95	8.05								Final DO	4.25	4.60					
Prev. Drop	1.45	4.10	3.55	8.10								DO Drop	3.40	3.05				
Tot. Drop	4.20	4.20	4.50	5.75	7.65							Average	3.23					
Day	1	2	3	4	5	6	7	8	9	10								
	8/12/97	8.30	8.30	2.35	5.20	8.20												
		13	7	12.80	12.80	2.45	5.15	8.25										
			4	8	15.15	15.15	3.05	5.60	8.05									
				15	9	17.60	17.60	2.65	5.75	5.75								
					16	10	20.65	20.65	2.30		5.75							
						17	11	23.30	23.30		2.50	8.00						
							18	12	25.60	25.60	3.25	5.85	5.85					
								19	13		25.60	2.15						
									20	14	28.85	28.95	1.40	8.25				
										21	15	31.00	31.00	4.60	8.35			
											22	16	32.40		3.65	6.00		
												23	17	32.40	2.35			
													24	18	36.05	36.05		
														25	19	38.40		
															26	20		
																3.23		
																1.29		
																1.30		

* previous drop should be 1.90
 therefore 0.45 is added to 38.40 for a total drop of 38.85 *

Percent Concentration: 0.0030
 Analyst: Tammy Kleber, M. Steinberg 8-26-97
 Date: 8-12-97, 8-13-97, 8-14-97, 8-15-97, 8-21-97, 8-22-97, 8-25-97
Margaret Aywer 8-15-97
Joni Dunlop 7/1/97
8/10/97 & 8/17/97
 JS 8/23/97

20-Day Seed Water Drop
 20-Day BOD (g/g or g/mL) 1.30

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FIGURE III

20-day BOD Worksheet

20 - Day Biochemical Oxygen Demand

Bottle # 72
 Date Set-up 8-6-97
 pH Prior to setup _____

HAEL# 97-0216
 KAN/EAN 978790 (Circle one)
 Concentration of Stock Sample 1ml/L

Initial DO	5.00										Bottle # Init. DO Final DO DO Drop Average					
Final DO	1.65	7.95														
DO Drop	3.35	3.35	7.95													
Prev. Drop	2.55	4.60	3.05	7.90	8											
Tot. Drop	5.90	5.90	4.90	5.40	7.90	8										
Day	8/12/97	6	10.50	10.50	2.50	4.95	8.20									
		13	7	15.40	15.40	2.85	4.70	8.30								
			14	8	17.90	17.90	3.50	5.60	8.05							
				15	9	20.75	20.75	2.70	5.35	5.35	8/21/97					
					16	10	24.25	24.25	2.70	1.40	5.35					
						17	11	26.95	26.95	3.95	1.40	7.90				
							18	12	29.65	29.65	3.95	5.40				
								19	13	33.60	29.65	2.50	8.15			
									20	14	33.60	33.60	4.15			
										21	15	36.10	4.00	8.00		
											22	16	36.10	3.90		
												23	17	40.10	4.20	
													24	18	40.10	
														25	19	44.30
															26	20
																20-Day Seed Water Drop
																3.23
																20-Day BOD (g/g or g/mL)
																0.90

Percent Concentration: 0.0050
 Analyst: Tammy Kleiter, H. Steinhilber 8-26-97
 Date: 8-12-97, 8-13-97, 8-14-97, 8-18-97, 8-21-97, 8-22-97, 8-25-97
Margaret Raywell 8-15-97
Jared Daniels 8/19/97
[Signature] 8/16/97 & 8/17/97
 28 8/24/97

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FIGURE IV

20-day BOD Worksheet

20 - Day Biochemical Oxygen Demand

Bottle # 24
 Date Set-up 8-6-97
 pH Prior to setup _____

HAEL# 97-0216
 KAN(EAN) 972790 (Circle one)
 Concentration of Stock Sample 1.0 ml/L

Initial DO		Final DO		DO Drop		Prev. Drop		Tot. Drop		Day	
3.65		0.10		7.75		3.55		2.25		7.80	
		3.95		5.50		2.80		7.80			
		7.50		7.50		5.00		5.15		7.90	
		13.00		13.00		2.65		4.75		8.20	
		18.00		18.00		3.15		4.70		8.00	
		20.65		20.65		3.50		5.30		8.05	
		23.80		23.80		2.70		5.80		5.80	
		27.90		27.90		2.25		5.80		7.80	
		30.00		30.00						7.80	
		32.25		32.25		3.25		5.65		8.25	
		35.50		35.50		4.60		7.50		9.50	
		37.65		37.65		3.65		3.70		3.80	
		41.30		41.30		4.30		4.30		4.30	
		45.10		45.10		3.25		3.25		3.25	
		49.00		49.00		0.46		0.46		0.46	

20-Day Seed Water	
Bottle #	5
Init. DO	7.65
Final DO	4.25
DO Drop	3.40
Average	3.23

Percent Concentration: 0.010
 Analyst: Tammy Klatzer, M. Steinberg 8-26-97
 Date: 8-12-97, 8-13-97, 8-14-97, 8-15-97, 8-16-97, 8-22-97
Marybeth Payne 8-15-97
Josh Donnelly 8/14/97
JS 8/16/97 & 8/17/97
JS 8/24/97

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FIGURE V

20-day BOD Worksheet

20 - Day Biochemical Oxygen Demand

Bottle # 45
 Date Set-up 8-6-97
 pH Prior to setup _____

HAEL# 97-0216
 KAN/EAN 973790 (Circle one)
 Concentration of Stock Sample 1.0 ml / L

Initial DO	3.40																			
Final DO	1.85	8.05																		
DO Drop	1.55	5.75	7.80																	
Prev. Drop	4.15	2.30	0.20	7.50																
Tot. Drop	5.70	5.70	7.60	4.15	7.80															
Day	1/2 1976	8.00	8.00	3.35	4.50	8.10														
		13 7	15.60	15.60	7.30	4.20	8.45													
			14 8	18.95	18.95	3.90	5.55	7.95												
				15 9	22.25	22.25	2.90	5.35	5.75											
				16 10	26.15	26.15	2.60	5.35												
				17 11	29.05	29.05		1.70	7.65											
				18 12	31.65	31.65	3.65	5.90												
				19 13			3.65	2.35	8.15											
				20 14	35.30	35.30		4.40												
				21 15	37.65			3.75	8.15											
				22 16				37.65	4.40											
				23 17	41.40				3.75	8.15										
				24 18					4.40											
				25 19	45.15				4.40											
				26 20					45.15											
				27					3.23											
				28					0.23											

20-Day Seed Water

Bottle #	5	60
Init. DO	7.65	7.65
Final DO	4.25	4.60
DO Drop	3.40	3.05
Average	3.23	

Percent Concentration: 0, 0.20
 Analyst: Tammy Kleiber, M. Steinbocker 8-26-97
 Date: (8-12-97, 8-13-97, 8-14-97, 8-15-97, 8-16-97, 8-17-97, 8-21-97, 8-22-97)
Mary Jo Frywell 8-15-97
Joel Daniels 8/14/97
8/14/97 + 8/17/97
8/24/97

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FIGURE VI

20-day BOD Worksheet

20 - Day Biochemical Oxygen Demand

Bottle # 61
 Date Set-up 8-6-97
 pH Prior to setup _____

HAEL# 97-0216
 KANEAN 972790 (Circle one)
 Concentration of Stock Sample 1.0 ml/L

20 - Day Biochemical Oxygen Demand										20- Day Seed Water				
Initial DO	3.30									Bottle #	5	60		
Final DO	1.75	8.05								Init. DO	7.65	7.65		
DO Drop	1.55	6.90	6.90	7.70						Final DO	4.25	4.60		
Prev. Drop	4.25	1.15	4.90	6.90						DO Drop	3.40	3.05		
Tot. Drop	5.80	5.80	2.70	6.50	6.50						Average	3.23		
Day	8/2/97	6.95	6.95	1.20	4.65	8.10								
		7.87	9.5	6.95	1.85	6.20	6.20							
			8	8.95	11.15	1.90	3.90	7.85						
			15	9	13.00	13.00	2.30	5.90						
			16	10	14.90	14.90	1.85							
				17	11	17.20	17.20							
				18	12	19.15								
				19	13									
				20	14	22.90	22.90	0.95						
				21	15	23.25	23.25					9.25		
				22	16	24.20					5.20			
				23	17					3.05				
				24	18					24.20				
				25	19					27.25				
				26	20					3.23				
										0.088				

Percent Concentration: 0.030
 Analyst: Tammy K. Ober, M. Steinberg 8-26-97
 Date: 8-12-97, 8-14-97, 8-14-97, 8-18-97, 8-21-97, 8-22-97
Marquet Sawyer 8-15-97
Joan Daniels 8/16/97
8/16/97 & 8/17/97
38 8/23/97

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FIGURE VII

Density Worksheet

9-24-97	Density determination for 97-0216		
MS	* NoF Method 24 *		
	Run	wt. of 1ml vol. flask	wt. of 1ml vol flask + 1ml sample
	1	19.4314	20.3398
	2	19.6354	20.5477
	3	19.1314	20.0350
			density
			0.9084
			0.9123
			0.9036
			Arg. density = 0.9081 g/ml

"This is an exact copy of the original document"
 By M. Sticlyla Date 9-26-97