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STATE OF WASHINGTON

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Governor

DEPARTMENT OF ECOLOGY

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M E M O R A N D U M

July 14, 1978

To: Roger Stanley

From: Bill Yake and Mike Morhous

Re: Weyco Thermo-Mechanical Pulp Mill - Everett
Class II Inspection

Date: June 13-14-78

Findings and Conclusions:

A Class II inspection was conducted on June 13-14, 1978, at the Weyerhaeuser Thermo-Mechanical Pulp Mill in Everett, Washington. Roger Stanley and Bob Bishop of the Industrial Section (DOE), Bill Yake and Mike Morhous of Wastewater Monitoring (DOE) and Rich Eger of Weyerhaeuser Co. were present. Bill Wilson and Stacy Turner (UNOX operator) were involved in the review of laboratory procedures.

Thermo-mechanical pulp wastewater is treated in a pure oxygen (UNOX) activated sludge system without primary clarification. Nutrient supplements in the form of aqueous ammonia (3.4 to 3.5 lb. N/100 lb. BOD_5 loaded) and phosphoric acid (0.5 to 1.0 lb. P/100 lb. BOD_5 loaded) are added prior to aeration. Wastewater temperatures are high (approximately 40°C) throughout the system.

Influent and effluent composite samples were taken with both mill and DOE samplers. In addition, grab samples of the wastewater prior to final clarification of the 004 discharge and of final 001 effluent (for coliforms) were collected. The results of the analyses of these samples are attached.

The mill laboratory had been experiencing unrealistically low BOD_5 results for approximately six months prior to the inspection. Despite considerable effort to isolate and remedy the cause of these apparent errors the difficulties were unresolved. A thorough review of laboratory techniques was undertaken during this inspection and the apparent cause of the discrepancy isolated (see Laboratory Procedures and Techniques). Unfortunately the test procedure was not corrected before the samples from this inspection were analysed by the mill laboratory. Thus, the mill lab BOD_5 results included here are incorrect. The Industrial Section will probably wish to collect, split, and analyse another sample from the mill to verify the quality of current, reported effluent BOD_5 values.

Based on the results of this inspection the mill was complying with NPDES suspended solids limitations. BOD_5 discharge was 25-60% in excess of permit limitations. Analyses for additional parameters revealed no unusual values except in the case of coliforms. The 001 discharge had very high quantities of total coliforms (2,100,000 to 2,300,000/100 ml) and fecal coliforms (100,000 to 160,000/100 ml). These values are greatly in excess of permit limitations on municipal facilities discharging to marine waters. The growth of coliforms in the UNOX system is possibly promoted by high wastewater temperatures. The 004 discharge also contained substantial total coliform (190,000/100 ml) and fecal coliform (13,000/100 ml) concentrations.

The UNOX system appeared to be operating well during the inspection and was producing an activated sludge with good settling characteristics (SVI = 65 ml/g).

WY:ee
cc: Dick Cunningham
Central Files through Skip Harlan

24 Hour Composite Sampler Installations

Sampler	Date and Time Installed	Location
1. Influent aliquot - 250 ml/30 min.	0955 - 6/13/78	Influent tap to 2 liter bottle to compositor.
2. Effluent aliquot - 250 ml/30 min.	0940 - 6/13/78	Effluent tap to 2 liter bottle to compositor.
3. aliquot -		

Grab Samples

	Date and Time	Analysis	Sample Location
1.	6/13/78 - 1100	Solids	Final clarifier influent well
2.	6/14/78 - 1000	Coliforms	Final clarifier launders
3.	6/14/78 - 0900	COD, Solids, pH, Cond., Color, Turb., Phenols, Grease, Nutrients, Coliforms	End of concrete channel before culvert
4.	6/21/78 - 1210	Coliforms	Final clarifier launders
5.	6/21/78 - 1210	Coliforms	Final effluent tap

Flow Measuring Device

1. Type In line, magnetic flowmeter
2. Dimensions

a. Meets standard criteria ☐ Yes In-line, could not be assessed.
☐ No Explain:

b. Accuracy check

	Actual Instan. Flow	Recorder Reading	Recorder Accuracy (% of inst. flow)
1.			
2.			
3.			

☐ is within accepted 15% error limitations
☐ is in need of calibration

Field Data

Parameter	Date and Time	Sample Location	Result
Settleable Solids	6/13/78 - 0950	Influent	8 ml/l
pH, Cond.	6/13/78 - 1045	Influent	See tables
pH, Cond.	6/13/78 - 1100	Effluent	See tables
pH, Cond., Settleable solids	6/13/78 - 1100	Final clarifier in-well	See tables
pH, Cond.	6/14/78 - 1000	002 at concrete sump	See tables

Review of Laboratory Procedures and Techniques

The Weyco Thermo-Mechanical Pulp Mill analyses are limited primarily to BOD_5, suspended solids and pH. The suspended solids analyses were reviewed using the 'Laboratory Procedural Survey' questionnaire and inspection of laboratory facilities and equipment. This analysis is being performed correctly. pH results from continuous monitors and mill lab instruments were checked against DOE field and lab values and compared favorably.

The mill had been recording low BOD_5 values for about 6 months prior to the inspection. Extensive effort by labs at both the Everett thermo-mechanical pulp mill and Kraft mill had previously failed to isolate the cause of the discrepancy. Review of test procedures during this inspection (6/13/78) indicated that saturated water calibration of the mill's dissolved oxygen meter might be responsible for faulty D.O. values obtained from the dilutions. By 6/14/78 the D.O. meter and probe had been calibrated at low D.O. concentrations against the Winkler Method. The meter was reading 1-2 mg/l high. The meter/probe was not repaired/recalibrated until after the inspection analyses were run, thus mill values reported here are incorrect.

A second possible source of error is the mill's practice of freezing BOD samples for up to 6 days prior to running the test. Freezing of BOD samples is not in compliance with Standard Methods and other accepted procedures. The mill split a sample from the mill's effluent compositor and ran one BOD analysis immediately while freezing the second portion for one week prior to analysis. The extent of the discrepancies caused by these two analytical problems can be noted in the following table.

Summary of BOD_5 (mg/l) Results

	Influent		Effluent	
	DOE Comp.	Mill Comp.	DOE Comp.	Mill Comp.
DOE Lab.	> 750	>740	108	131
T.M. Mill Lab	620	563	65	75 45*

* sample frozen one week prior to analysis

Since the inspection, the mill has obtained sugar standards and BOD_5 analyses appear to be improved. The Industrial Section will probably wish to make an additional split of mill effluent and satisfy themselves with regard to present analytical methods at the mill.

In addition to the problems noted above, two additional procedural deficiencies were noted in the BOD analysis.

1. Nutrients are not added to the blanks, this should be corrected.

2. Nutrient stock solutions are not stored in the dark and may be exceeding their shelf life.

The following tables are comparisons of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to inspection have also been included.

TABLE 1

	DOE Laboratory Results				Weyco Laboratory Results				NPDES (Monthly Average)
	DOE Composites		Weyco Composites		DOE Composites		Weyco Composites		
	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	
BOD_5 (mg/l)	>750	108	>740	131	620[4]	65[4]	563[4]	75[4]	
lbs/day		3150		3910		1900		2240	2500
TSS (mg/l)	276	67	430	126	320	67	327	78	
lbs/day		1950		3760		1960		2330	3500
Total Plant Flow (MGD)	3.50			3.58		3.50		3.58	
COD (mg/l)	2790	1060	2870	1030				988	
NH_3-N (mg/l)	0.6	4.7							
NO_2-N (mg/l)	<0.02	<0.02							
NO_3-N (mg/l)	<0.01	<0.01							
O-PO_4-P (mg/l)	0.3	0.3							
T-PO_4-P (mg/l)	1.7	1.8							
Total Coliform (#/100 ml)		2,300,000[1]							
		2,500,000[2]							
		2,100,000[3]							

1 Grab, 6/14/78, 1000, from secondary clarifier launders

2 Grab, 6/21/78, 1210, from secondary clarifier launders

3 Grab, 6/21/78, 1210, from composite sampler tap

4 Results questionable, see text.

The following tables are comparisons of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to inspection have also been included.

TABLE 1
(Continued)

	DOE Laboratory Results				Weyco Laboratory Results				NPDES (Monthly Average)
	DOE Composites		Weyco Composites		DOE Composites		Weyco Composites		
	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	
Fecal Coliform (#/100 ml)		> 90,000 [1] 160,000 [2] 100,000 [3]							
% Klebsiellia		50% [2] 80% [3]							
Total Solids (mg/l)	3080	1960	2910	1930					
Total Non-Vol. Solids (mg/l)	1750	1280	1690	1280					
Total Sus. Solids (mg/l)	276	67	430	126					
Total Sus. Non-Vol. Solids (mg/l)	36	21	59	40					
Turbidity (NTU)	180	36							
Color (color units)	2420	4360							
pH	8.5 8.1* 9.5**	6.9 6.4* 6.5**	7.2	7.5					6-9 inst

[1] Grab, 6/14/78, 1000, from secondary clarifier launders
[2] Grab, 6/21/78, 1210, from secondary clarifier launders
[3] Grab, 6/21/78, 1210, from composite sampler tap
* Field Analysis - composite
** Field Analysis - grab

The following tables are comparisons of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to inspection have also been included.

TABLE 1
(Continued)

	DOE Laboratory Results				Weyco Laboratory Results				NPDES (Month Averag
	DOE Composites		Weyco Composites		DOE Composites		Weyco Composites		
	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	Influent	001 Effluent	
Dewatered Sludge									
% Total Solids	24%								
Cadmium mg/Kg dry wt.	< 4								
Chromium mg/Kg dry wt.	6								
Copper mg/Kg dry wt.	13								
Lead mg/Kg dry wt.	<17								
Zinc mg/Kg dry wt.	13								

The following table is a comparison of laboratory results from 24 hour composite(s) together with NPDES permit effluent limitations. Additional results pertinent to this inspection have also been included.

	UNOX Effluent	DOE 002	004 Discharge	NPDES (Monthly average)
BOD_5 mg/l lbs/day				No. 004 discharge addressed in permit
TSS mg/l lbs/day			7	
Total Plant Flow MGD			- -	
pH	6.2 6.2*	8.0*	6.9 6.3*	
Sp. Cond. (μmhos/cm)	1890 2010*	72*	113 122*	
Tot. Solids (mg/l)	9680		95	
Tot. Non-Vol. Solids (mg/l)	1570		55	
Tot. Sus. Solids (mg/l)	8760		7	
Tot. Sus. Non-Vol. Solids (mg/l)	360		4	
Settleable Solids (mg/l)	570			
SVI (ml/g)	65			
COD (mg/l)			44	
Tot. Coli. (#/100 ml)			190,000[2]	
Fecal Coli. (#/100 ml)			13,000[2]	
% KES			100%	
NH_3-N (mg/l)			0.02	
NO_2-N (mg/l)			<0.02	
NO_3-N (mg/l)			0.01	
O-PO_4-P (mg/l)			0.01	
T-PO_4-P (mg/l)			0.08	
Total Oils (mg/l)			4	
Phenols (mg/l)			0.004	

* Field Analysis-grab "<" is "less than" and ">" is "greater than"

1) Prior to final clarification

2) Grab sample