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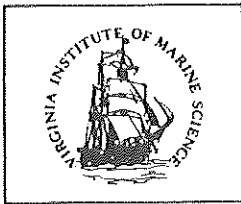
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# Marine Resource Advisory

**A Sea Grant Advisory Service**

Advisory No. 17

June 1979

## WASTE WATER DISCHARGES, TREATMENT and NPDES PERMITS

*by Walter I. Priest, III and Joseph C. Mizell  
Marine Scientists*

FOR THE PAST TWO YEARS the Virginia Institute of Marine Science (VIMS) has been engaged in an advisory program to seafood processors concerning the discharge of their waste water. Most of these discharges require a permit from the State Water Control Board. This permit contains a requirement for monitoring the discharge and the limits of the waste load permissible in the effluents.

Both of these requirements have caused some problems for seafood processors. However, many of the most commonly encountered problems can easily be remedied with very little effort on the part of the processor. This advisory, funded by the Coastal Plains Regional Commission, will explain many of the common effluent limitation and monitoring problems and offer practical and effective solutions to them.

The United States Congress passed the Federal Water Pollution Control Act Amendments of 1972 with the declared purpose "to restore and maintain the chemical, physical and biological integrity of the Nation's water." This act provided for the creation of the National Pollutant Discharge Elimination System (NPDES) to eliminate the discharge of pollutants into the nation's waters by 1985.

The NPDES in Virginia is administered by the State Water Control Board (SWCB) under authority delegated to it by the U.S. Environmental Protection Agency (EPA). Under this program all industries, including seafood processors, sewage treatment plants and other point source discharges of waste water must obtain a permit to discharge into navigable waters. This system is designed to achieve the elimination of pollutant discharges through a series of increasingly stringent effluent limits. These limitations are based upon the implementation of increasing degrees of waste treatment, the Best Practicable Control Technology (BPCT) by 1 July 1977 and the Best Conventional Technology (BCT) by 1 July 1984.

The waste load limits upon which the NPDES permit limits are based were developed by contractors hired by the EPA to sample the waste water from

seafood processors throughout the country. This study produced the various categories into which seafood processors are divided and the average waste load of pollutants for plants in each of the categories. Table 1 shows the applicable waste load limits for 1977 and current new source standards for all of the categories of processors in Virginia. The BCT limits are currently under review by EPA.

The waste load limits listed on the permits are based on three different parts of the production operation: the actual concentration of the pollutant in the waste water, the amount of water used in the production process and the amount of product processed. The formula below shows how these factors are related:

$$\frac{A(\text{mg/l}) \times B (\text{mdg}) \times 8.345 = \text{lbs pollutant}/1000 \text{ lbs of product}}{C (\text{tons/day}) \times 2}$$

where A = the pollutant concentration in mg/liter

B = water used in million gallons per day

C = product processed in tons/day

and 8.345 = metric to English units conversion factor.

The importance of the accuracy of the figures used in this formula cannot be over-emphasized. A small error in pollutant concentration, flow rate or production can be multiplied into a very large error in the waste load and can result in having the report exceed the permit limit.

The calculation of the waste load has been one of the more common problem areas with Virginia seafood processors. Common examples include:

a) Crab processors have reported production figures in terms of finished product instead of raw product as required. This causes the pollutant load to be divided by a comparatively small production figure, thereby raising the waste load.

b) Oyster processors have overestimated their water usage. This also results in raising the waste load reported. The less water utilized during processing, the better.

The collection and care of the sample is also vitally important to the accuracy of the analysis. Several of the more important points to remember include:

a) The sample must be taken at the end of the discharge pipe after the effluent has passed through all treatment facilities.

b) The sample container must be clean and free of contamination. This includes being free from soap residue which can raise oil and grease values.

c) The sample should be kept on ice and delivered to the laboratory as soon as possible after it is taken. The permit requires that it be analyzed within 24 hours to be acceptable. Prolonged storage at room temperature can adversely affect analyses, especially Biochemical Oxygen Demand (BOD).

d) The sample taken must be representative of the total waste water flow from the plant. This means that water from all of the discharges from the plant must be composited in the sample in proportion to their portion of the total flow from the plant.

This is a very important point, because the pollutant load in the processing water seldom is uniform. It may be very high at one time and very low at another, depending on what is happening in the plant. Without proper compositing procedures you do not get the full advantage of the waste water low in pollutant concentration. The following are the very basic principles of compositing:

- Determine flow rate from each discharge pipe by timing how long it takes the average flow to fill a bucket of a known volume.

- Collect one quart samples at specific intervals from each discharge pipe throughout the processing day and mix these in a large container for each discharge pipe. This container should be kept iced during the compositing process.

- Stir the composite of samples from each discharge and take a quart sample of the composite.

- If the plant has more than one discharge, the composite samples from each discharge must be mixed together in proportion to each discharge's portion of the total flow from the plant.

DICK COOK .....EDITOR

*Marine Resource Advisories are monographs on special topics produced by the Virginia Institute of Marine Science Sea Grant Program. Single copies are available without charge.*

William J. Hargis, Jr. .... Director

This is a very general review of compositing procedures. The scope of this advisory does not allow detailed procedures for each seafood processing category. However, this assistance is available by contacting the author at VIMS.

There are several very effective measures which can be employed by processors to improve the quality of their waste water effluent. The best place to start is in plant clean-up. The amounts of suspended solids, BOD and oil and grease discharged can be significantly reduced by thoroughly sweeping the plant when possible during processing and at the end of the day, and removing by hand as much mud, shell, scrap and other waste material as possible before the final washdown with hoses.

Also it is important to be sure that the floor drain screens are in place and that they are periodically cleaned during washdown. This prevents the large pieces of waste material which were missed during the dry clean-up from being washed down the drain.

The use of water should be conserved as much as possible during processing and clean-up. This reduces the cost of pumping the water, the amount of waste water that must be treated and discharged and the flow rate used to calculate the plant's waste load. Reductions in water usage should not be made at the expense of product quality or sanitation.

Some measures which could be initiated include:

1. Turn off hoses and faucets when not in use.
2. Use spring loaded nozzles.
3. Use high pressure, low volume washdown systems.
4. Encourage plant personnel to minimize water consumption by eliminating other wasteful practices.<sup>1</sup>

Although not required, the most practical and economical treatment device that can easily be installed, when necessary, by seafood processors is a settling basin (Fig. 1). This will provide an effective means of removing most of the sediment, product particles and pieces of shell not removed by the previous processes. This design can be adapted to most of the plants in Virginia with a minimum of expense and effort. It can be improved by adding a baffle and a removable sediment container to facilitate cleaning. The more effective the dry clean-up procedure used in the plant and the floor screens, the less often the settling basin will have to be cleaned out.

Plants with extremely high concentrations of suspended solids in their effluents may have to employ one of the many mechanical screening devices on the market to achieve effective solids removal. There are plants in Virginia which could benefit highly from the installation of such a device because of the opportunity to recover product that is

<sup>1</sup> Brinsfield, R. B. 1978. Impact of seafood industry's waste water treatment regulations analyzed. *Commercial Fisheries News* 11(6):1-2 Department of Natural Resources of Maryland.

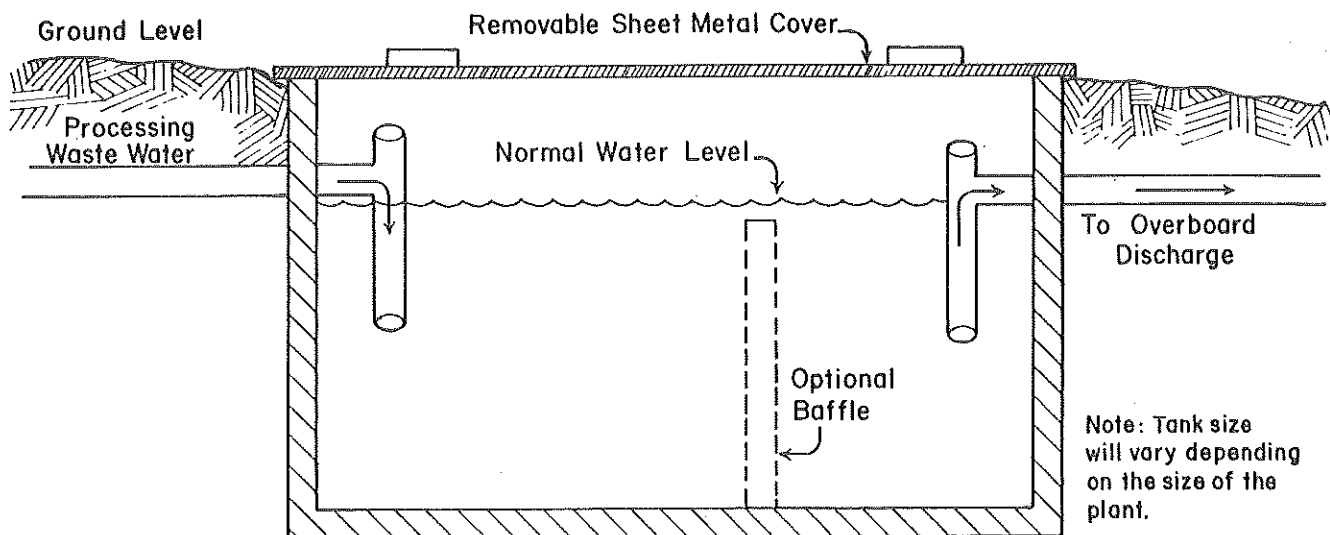


Figure 1. Schematic Diagram of a Typical Settling Tank

normally wasted. Further information is available on request.

Many seafood processors in the Tidewater area discharge directly into municipal sewer systems, and therefore are not required to obtain NPDES permits. The municipality or sanitation district may still impose a surcharge, however, based on the quality of their effluents. Many of the procedures outlined previously will help them reduce the pollutant load in their effluent, thereby minimizing these costs.

The surcharge usually is based upon the amount of BOD and TSS over the amount normally found in domestic sewage (200-300 parts per million (ppm)). The determination of the wasteload is based on the same procedures that are used for those processors discharging their effluents into navigable waters.

Each type of seafood processing has its own particular set of waste water characteristics and clean-up and processing problems. Outlined below are some suggestions for the major Virginia categories which our experience has shown will help reduce the waste load in their effluent.

#### HAND-SHUCKED OYSTER CATEGORY

- Use dry clean-up methods in shucking room, shellstock storage and shell alleys. Sweep before washdown to reduce TSS.

- Maintain effective floor screens to remove large particles from effluent stream.

- Minimize the time the oysters are washed. This helps reduce the amount of water used which will tend to reduce the waste load in the effluent.

- Use proper compositing procedures to include periods of both high and low pollutant flow.

- Take the grab sample for oil and grease mid-way through the blowdown process to obtain most representative results.

#### HAND PICKED CRAB CATEGORY

- Dry clean-up methods in picking room are very important. Almost all of the shell material can be removed from the waste water system.

- Drainage from retorts is exceptionally high in BOD. The effluent should be channeled wherever possible into a municipal sewer for a no-discharge drainfield. However, this must be done by means of an open channel to prevent any blockage in the drain line from backing sewage up into the retort.

#### BREADED OYSTER CATEGORY

- Dry Clean-up is very important because each pound of breading which enters the effluent stream equals approximately .4 pounds of BOD. Dry clean-up also includes placing trays and boxes under machinery to catch excess breading and emptying batter mixers into drums for disposal rather than washing the mix down the drain. Excess batter and breading mix can be used as hog feed.<sup>2</sup>

<sup>2</sup> Bough, W. A., R. J. Reimold, M. S. Hardisky and T. C. Hall 1978. Pollution reduction through dry clean-up and by-product recovery. Marine Extension Bulletin No. 3, Ga. Sea Grant Program, Univ. of Ga., Athens, Ga. 30602

## HAND SHUCKED AND MECHANICAL CLAM CATEGORY

- Water usage in surf clam processing can be reduced by screening and recycling the water used for transporting the product through processing. This should be done in conjunction with and under the supervision of the Bureau of Shellfish Sanitation in order that adequate health protection controls may be instituted. Also, use vacuum and conveyors to move the product whenever possible.

- Reclaiming meat from shells and screening portions of the waste water to remove the large pieces

of product can help increase production and reduce the waste load in the plant's effluent. This must also be done in conjunction with the Bureau of Shellfish Sanitation in order that adequate health protection controls may be instituted.

- Suggestions under the breaded oyster category also apply to clam plants which bread their product.

- Surf clam bellys and other non-utilized portions of the clams with additional processing can be used for animal feed.

Table 1. EPA Seafood Processing Effluent Limitations.

Sub-category	Cut-off for Existing Source Max. lbs. for one day	BPT (1977 Limits)						Current New Source Limits					
		BOD <sub>5</sub>		TSS		O + G		BOD <sub>5</sub>		TSS		O + G	
		Avg. Daily	Max. Daily	Avg. Daily	Max. Daily	Avg. Daily	Max. Daily	Avg. Daily	Max. Daily	Avg. Daily	Max. Daily	Avg. Daily	Max. Daily
Hand Shucked Oyster	1000			16	24	0.81	1.2			16	23	0.77	1.1
Steamed/Canned Oyster				190	270	1.7	2.3	17	67	39	56	0.42	0.84
Conventional Blue Crab	3000			0.74	2.2	0.20	0.60	0.15	0.30	0.45	0.90	.065	0.13
Mechanized Blue Crab				12	36	4.2	13	2.5	5.0	6.3	13	1.3	2.6
Hand-Shucked Clam	4000			18	59	0.23	0.60			17	55	0.21	0.56
Mechanized Clam				15	90	0.97	4.2	5.7	15	4.4	26	.092	0.40
Herring				24	32	10	27	15	16	5.2	7.0	1.1	2.9
Menhaden		3.9	7.0	1.5	3.7	0.76	1.4	3.8	6.7	1.5	3.7	0.76	1.4
Conventional Bottom Fish	4000			2.0	3.6	0.55	1.0	0.71	1.2	0.73	1.5	.042	.077
Mechanized Bottom Fish				12	22	3.9	9.9	7.5	13	2.9	5.3	0.47	1.2
Catfish	3000			9.2	28	3.4	10	2.3	4.6	5.7	11	0.45	0.90

Units = lbs/100. of raw product except the hand shucked Oyster which is based on final product.

pH limits for all categories are 6-9



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