

**North Carolina Cooperative Extension Service**

## Cut Waste to Reduce Surcharges for Your Dairy

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*Did you know that your dairy plant may be producing a waste load of 800,000 pounds of BOD5 per year - equivalent to the load from a city of 13,000 people?*

Wastewater from most dairy plants is discharged to publicly owned treatment works (POTWs), where the majority of the pollutants are removed before the water is discharged to the environment. Treating the water costs money, and most treatment works charge according to the volume of sewage treated. In addition, they commonly charge extra (apply a *surcharge*) if the waste load exceeds certain specified levels because it costs more to treat water that contains more pollutants.

Waste load can be determined by a number of different measurements, including BOD5, the biochemical oxygen demand; COD, the chemical oxygen demand, TSS, the total suspended solids concentration, TKN, the total Kjeldahl nitrogen content, and FOG, the concentration of fats, oils, and grease.

Wastewater from dairy plants is most often tested for BOD5, a measure of the amount of oxygen needed to degrade the organic matter carried by the water. The BOD5 concentration is measured in milligrams per liter (mg/l). When the level exceeds 250 to 300 mg/l, many treatment plants apply a surcharge.

Some dairy plants discharge as much as 12 pounds of BOD5 per 1,000 pounds of milk received. More than 90 percent of a plant's total waste load comes from milk components that are lost and flow into floor drains during processing. Lactose, proteins, and butterfat are the major components. The wastewater may also contain cleaning agents, lubricants, and solids removed from equipment and floors.

### Waste Load Can Affect Profits

In the past, most dairy plant managers did not concern themselves with reducing their plant's waste load because treatment costs were minimal and restrictions few. Over the past 25 years, however, some cities have increased their surcharges ninefold. BOD5 surcharges now exceed 30 cents per pound in some cities. Pretreatment ordinances in some localities may limit the level of wastes that can be discharged into the sewers. In that case the waste load must be reduced before the wastewater leaves the dairy plant.

Sewer costs, once a minor operating expense, have become something that every cost-conscious manager must

consider. At today's rates, a plant's waste load can have a real effect on profitability. Realizing this, some plant managers have been able to cut waste discharges to as little as 1 pound of BOD5 per thousand pounds of milk received.

## Calculating Your Surcharge

The total amount of BOD5 in a plant's wastewater can be calculated by multiplying the BOD5 concentration in milligrams per liter by the amount of effluent in millions of gallons: Amount of BOD5 = 8.34 x BOD5 concentration x effluent volume For example, if a plant discharges 3.7 million gallons of wastewater per month with a BOD5 concentration of 2,300 mg/l, the total amount of BOD5 discharged during the month is calculated as follows:

$$\text{Amount of BOD5} = 8.34 \times 2,300 \times 3.7 = 70,973 \text{ pounds}$$

The monthly surcharge is normally based on the amount that the BOD5 concentration exceeds a specified limit. To find the monthly surcharge cost, multiply the excess amount of BOD5 by the surcharge rate:

$$\text{Surcharge cost} = \text{Excess amount of BOD5} \times \text{surcharge rate}$$

If the plant with a BOD5 concentration of 2,300 mg/l is subject to a surcharge on BOD5 in excess of 250 mg/l, the concentration subject to surcharge is 2,050 mg/l:

$$\begin{aligned} \text{Amount BOD5 subject to surcharge} &= 8.34 \times (2,300 - 250) \times 3.7 \\ &= 8.34 \times (2,050) \times 3.7 \\ &= 63,259 \text{ lb} \end{aligned}$$

If the surcharge rate is 20 cents per pound of excess BOD5, the monthly cost is:

$$\begin{aligned} \text{Surcharge cost} &= 63,259 \text{ lb} \times 20 \text{ cents/lb} \\ &= \$12,652 \end{aligned}$$

In addition to the charge for excess BOD5, surcharges may also be made for excessively high levels of COD, TSS, FOG, and TKN.

## Saving Money by Cutting Waste Load: An Example

How much money could a dairy plant save by reducing its BOD5 load to only 1 pound per thousand pounds of milk? To find out, consider two dairy plants that each process 645,000 pounds of milk per day. Both pay a BOD5 surcharge of 20 cents per pound. Processor A discharges 1 pound of BOD5 per thousand pounds of milk processed (1 pound for every 116 gallons), while Processor B discharges 5 pounds in processing the same amount of milk.

The table shows the daily and annual surcharge costs for the two plants. The operators of Plant A save 80 cents per thousand pounds of milk processed. That means they can bank an extra \$516 per day, or almost \$130,000 annually if the plant operates 250 days each year. In effect, Processor B is pouring that amount of money down the drain.

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### Sewer Surcharge Comparison for Two Dairy Plants Processing 645,000 Pounds (75,000 gallons) of Milk per Day

	Plant A	Plant B	Savings
Waste load (lb of BOD5 per			

thousand lb of milk).....	1	5	4
Daily BOD5 surcharge .....	\$129	\$645	\$516
Annual surcharge .....	\$32,250	\$161,250	\$129,000
Cost per thousand pounds of milk processed .....	\$ .20	\$1.00	\$ .80
Cost per thousand gallons of milk processed .....	\$1.72	\$8.60	\$6.88

It is also important to remember that the excess waste load reflects milk lost during processing, and the cost of this lost product must be added to the surcharge to find the true cost.

*To estimate the potential savings for your plant, determine the sewer surcharges in your community and the current waste load produced by your plant per thousand pounds of milk processed. Then calculate the amount you think the waste load could be decreased by improved operating practices. Enter the values in the work sheet to compute your savings.*

### Sewer Surcharge Savings for Your Plant

	Current	Target
Enter current and target waste load in pounds of BOD5 per thousand pounds of milk processed .....		
Enter daily production in thousands of pounds of milk.....		
Multiply current and target waste loads by daily production to find daily waste load in pounds .....		
Enter your BOD5 surcharge cost per pound .....	\$	
Multiply the daily waste load by the surcharge cost to find your daily surcharge cost .....	\$	
Enter the number of days your plant operates each year .....		
Multiply the daily surcharge cost by the number of days your plant operates annually to find the annual surcharge cost .....	\$	
Subtract the annual surcharge cost for the target waste load from the annual cost for the current waste load to find your annual savings .....	\$	

### You Can Reduce Waste Load and Save Money in Your Plant

You can take positive steps to reduce the waste load produced by your plant. Some suggestions are given in the box. To keep tabs on your progress, use the work sheet to calculate your plant's waste load. You'll not only

help protect the environment, you'll also show the people in your community that your firm is a responsible corporate citizen. **AND . . . you will send more money to the bank instead of down the drain.**

## Waste Reduction Hints

- Make waste reduction a management priority.
- Establish waste load reduction goals for your plant.
- Establish waste load reduction goals for all important processes and areas of the plant where waste can be monitored and controlled.
- Improve maintenance to prevent product leaks from valves, piping, and equipment.
- Reduce water use; remember that water used in processing becomes **wastewater** that must be treated.
- Thoroughly drain product from tanks and vats before cleaning.
- Collect solids from floors and equipment by sweeping. Shovel the wastes into containers before actual cleanup begins. **Do not use hoses as brooms.**
- Adopt the attitude that waste load reduction is one of the best managerial decisions you can make.
- Orient employees toward preventing pollution, and train them how to do their jobs in a way that will reduce the discharge of wastes from your plant.

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