



BANK OR DRAIN

Pollution Prevention Pays in Food Processing

Poultry Processors: You Can Reduce Waste Load and Cut Sewer Surcharges



Did you know that many broiler processing plants produce thousands of pounds of potential wastewater pollutants every day—equivalent to the waste load from a city of 90,000?

Wastewater from many poultry processing plants is discharged to publicly owned treatment works (POTWs). These treatment plants must remove most of the pollutants (waste load) before the water is discharged to a public waterway. Treating the wastewater costs money, and most treatment works charge according to the volume of water treated. In addition, they commonly charge extra (apply a surcharge) if the waste load exceeds certain preset levels because it costs more to treat water that contains more pollutants. In other words, they charge more to clean up "dirtier" water.

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.

Poultry plant wastewater is most often tested for BOD₅, a measure of the amount of oxygen needed to degrade the organic matter (feathers, fat, and blood) in the wastewater. The BOD₅ concentration is measured in milligrams per liter (mg/l). When the level exceeds 250 to 300 mg/l, most treatment plants apply a surcharge. In the past this was based primarily on BOD, but now nutrients like nitrogen and phosphorus are included in surcharges.

Poultry plants may discharge as much as 65 pounds of BOD₅ per thousand broilers processed.* This waste load comes mainly from broiler components that find their way into the sewers. Blood alone can account for as much as 17.4 pounds of BOD₅ per thousand birds processed, almost 30 percent of the plant's total waste load.

* Waste load in pounds is found by multiplying the concentration in mg/l by 8.34 times the wastewater flow in millions of gallons.

Waste Load Affects Profits

In the past, most poultry 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 broiler 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 30 pounds of BOD₅ per thousand broilers processed.

Saving Money by Cutting Waste Load: An Example

How much money could a poultry plant save by reducing its BOD₅ load? To find out, consider two broiler plants that each process 250,000 birds per day. Both pay a BOD₅ surcharge of 20 cents per pound. Processor A, however, discharges 30 pounds of BOD₅ per thousand broilers, whereas Processor B discharges 65 pounds.

The table shows the daily and annual surcharge costs for the two plants. The operators of Plant A save \$7.00 per thousand broilers. That means they can bank an extra \$1,750 per day, or close to half a million dollars a year. In effect, Processor B is pouring that amount of money down the drain.

Sewer Surcharge Comparison for Two Broiler Plants Processing 250,000 Broilers Per Day (2.4 million gallons wastewater per day)

	Plant A	Plant B	Savings
Waste load (pounds of BOD ₅ per thousand broilers)	30	65	35
Daily surcharge*	\$300	\$2,050	\$1,750
Annual surcharge*	\$78,000	\$533,000	\$455,000
Cost per thousand broilers	\$1.20	\$8.20	\$7.00

* A surcharge of 20 cents per pound for BOD₅ loads in excess of 300 mg/l was used in calculating these charges. Surcharge could be in excess of 20 cents if nutrients are present that impose an additional surcharge. Nutrients include nitrogen and phosphorus.

Water and Sewer Charges for Your Poultry Plant

To estimate the potential savings for your plant, determine your current waste load per thousand birds processed and the sewer surcharges in your community. Then estimate the amount you think the waste load could be decreased by improved operating practices. Enter the values in the table and compute your savings.

	Current	Target
1. Enter your current and target water usage in gallons per bird	_____	_____
2. Enter number of broilers processed per day _____		
3. Determine current daily water use(1x2)	_____	_____
4. Divide current daily water use by 1,000 to determine water use in thousands of gallons.	_____	_____
5. Enter your combined water and sewer costs per thousand gallons \$ _____		
6. Multiply your daily water use in thousands of gallons by the water costs per thousand gallons to determine your daily costs (4 x 5)	\$ _____	\$ _____
7. Enter the number of days your plant operates each year _____		
8. Multiply the daily sewer and water costs by the number of days your plant operates each year to find your annual water and sewer cost. (6 x 7)	\$ _____	\$ _____
9. Subtract target cost in line 8 from your annual cost in line 8 to determine your potential savings.		

\$ _____ Potential Savings

Some poultry plants have cut their BOD₅ waste load by using dissolved air flotation (DAF) cells. If your plant has a DAF cell, you may not feel a need to institute waste reduction practices. To gain a true understanding of total operating costs, however, it's necessary to take into account the cost of owning and operating a DAF cell and disposing of the sludge it produces.

Although a DAF cell may reduce waste concentrations below the surcharge level, the organics removed as sludge must be disposed of properly. Its high water content (often 97 percent) makes the DAF sludge expensive to haul and render. Some renderers will not even accept DAF sludge in offal for reduction into by-products meal because of processing cost and because the chemicals involved often limit the usefulness of the final product.

One processor estimates that operating a DAF cell costs \$1.50 cents per 1,000 gallons of wastewater. This includes land application costs, capital costs, and chemical costs. This may not include the costs of required testing, regulatory permits and forms, and monitoring.

Therefore, it pays to cut waste loads even if your plant has a DAF cell. Materials that never find their way into the plant's wastewater will not have to be removed and disposed of as sludge. The hints in the box should be helpful in minimizing waste.

Waste Reduction Hints

- Reduce water use; most water used in processing becomes wastewater.
- Use screens and efficient systems for recovering solids.
- Improve blood collection by ensuring that all birds are properly stunned and by installing a blood collection system. Remove any coagulated blood from the floor and walls before they are washed down.
- Install dry systems for offal collection.
- Collect solids from the floor and equipment by sweeping and shoveling the material into containers before actual cleanup begins. *Do not use water hoses as brooms.*
- Adopt the attitude that waste load reduction is one of the best business decisions a manager can make.
- Train employees in the concepts of pollution prevention, and show them how to perform their jobs in a way that will cut waste loads in your plant.

The Time to Act Is Now

Many changes are taking place in waste regulations. Water costs are creeping steadily upward, and the increases promise to continue. It's important for poultry processors to take action now to be prepared for limitations on water use and waste loads that are likely to occur in the not-so-distant future.

Reduce your plant's waste load before it has a chance to become a costly burden and a point of contention with your local treatment plant.



Originally prepared by Roy Carawan, Food Science Specialist Emeritus

Revised by

Kevin Keener, Extension Food Processing Specialist

Patricia Curtis, Extension Poultry Processing Specialist

Melissa Taylor, Extension Food Safety Specialist

North Carolina State University

For further information, contact your county agent, and check the Food Science web site at www.ces.ncsu.edu/depts/foodsci/ext/pubs/.

You also may want to read the following Extension publications:

Liquid Assets for Your Poultry Plant (CD-20)

Poultry CEOs: You May Have a \$162 Million Opportunity! (CD-24)

Survey Shows that Poultry Processors Can Save Money by Conserving Water (CD-23)

This document was originally issued in print by the North Carolina Cooperative Extension Service.

Published by

North Carolina Cooperative Extension Service

Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Employment and program opportunities are offered to all people regardless of race, color, national origin, sex, age, or disability. North Carolina State University, North Carolina A&T State University, the U.S. Department of Agriculture, and local governments cooperating.
