# Water Management in Poultry Processing

William C. Merka*

In the past, the cost of water and waste-water treatment was so inexpensive that food processors were not concerned with its cost. However, since the passage of The Clean Water Act of 1972, the cost of water and waste-water treatment has increased more rapidly than any other cost in processing. Prior to the passage of The Clean Water Act, water and waste-water treatment costs were in the range of 24 to 40 cents per 1,000 gallons. At the present time, the 10 Georgia municipalities that provide water and waste-water treatment to poultry processors charge an average of $3.25 per 1,000 gallons. Water costs in Georgia are below the national average. A California food processor recently reported a water cost of $10.00 per 1,000 gallons. At $10.00 per 1,000 gallons, a gallon of water costs one cent. Each gallon of wasted water costs this processor one cent.

Not only have water costs increased rapidly but more stringent discharge requirements will cause water costs to rise to the range of $7.00 to $10.00 per 1,000 gallons by the turn of the century. There is little a processor can do to prevent these cost increases. To prevent this rapidly rising cost from impacting profits, processors must become much more efficient in their water use and waste-water loading patterns.

Table 1 shows that Processor 2 has a $962,000 annual profit advantage. If both processors have the same water use efficiency, by the turn of the century, Processor 2 will have a $2.5 to 3.0 million annual profit advantage. Data presented in Table 1 are not unrealistic; these conditions exist in the poultry industry at the present time.

## Controlling Water Costs

To control water costs, there are three essential steps.

1. **Commitment by management.** Unless management is committed to reducing water costs, little will be done to control them.

**Table 1. Annual Cost of Water and Waste-water Treatment.**

| | *Gallons/bird* | *Annual Cost* | *Annual Difference* |
|---|---|---|---|
| Processor 1 | 8.0 | $1,690,000 | |
| Processor 2 | 3.5 | $ 728,000 | $962,000 |

250,000 birds/day at $3.25/1,000 gallons
260 days processing/year

**W.C. Merka, Department of Poultry Science, University of Georgia, Athens, Georgia 30602*

*Reciprocal Meat Conference Proceedings, Volume 45, 1992.*

2. **Knowledge of water use and waste loading patterns.** Without knowledge of why, when, and where water is used and waste added to the waste stream, a rational plan to control them is difficult.

3. **Continuous management emphasis.** Without continuous management attention, control efforts will be lost. Studies show that water use returns to original levels within 60 days of management attention cessation.

## Water Conservation

### Water Use Profile

Conduct a 24-hour water use profile by reading incoming water meters hourly and concurrently measuring discharge flow volumes. This is a tedious chore, but information gained will be useful in determining those times where excessive water is used.

Many plants that have their own wells assume that water is free. In a recent plant study, the plant paid 41 cents per 1,000 gallons for water. Closer study of treatment costs showed that the true cost of water and waste water was $2.90 per 1,000 gallons. Because the plant assumed that water cost 41 cents per 1,000 gallons, it used 12 to 15 gallons per bird. This false assumption cost the plant $650,000 per year.

### Flumes and Weirs

Many plants have flumes or weirs installed at the outfall of their plant; however, few if any use this device to monitor flow patterns. Flows can be monitored continuously, using either simple mechanical devices or more sophisticated devices tied to computers.

### Install Water Meters

Plant operations and major equipment should have water meters installed in their supply lines to determine water use efficiency. At $3.25 per 1,000 gallons, the installation cost of a water meter ($250) will be recovered in 25 days, if monitoring reduces the flow to an operation by five gallons per minute. In a recent processing plant study, the annual water cost of two similar bird washers varied by $17,500 per year. If the more efficient bird washer could produce an acceptable product, why waste $17,500 per year?

### Small Flows

Small flows can be determined by measuring the time required to collect a measured volume, using a bucket. This method is useful in determining the cost of hand wash station, hoses, leaks, etc. Using this method, it was determined that in a year the hand wash station of one worker was using water equivalent to a month's wages more than the hand wash station of the worker standing next to him.

### Leak Control

Leaks seem so trivial that they seem to have no cost, yet they run constantly, 24 hours per day 365 days per year. A one quart-per-minute leak (a stream about one-half the diameter of a lead pencil) will use 131,000 gallons of water per year. This is enough water to fill a football field five inches deep. At $3.25 per 1,000 gallons, it will cost $425 per year, more than a week's wages.

## Waste Stream Load Minimization

The principle in waste load minimization is, "If you don't put it in, you don't have to pay to take it out." Plants that pay little attention to the amount of waste material being put into waste streams are probably paying excessive costs for waste-water treatment. Most plants have little knowledge of their waste loads.

### An Important Equation

To determine the waste load, use the following equation:

$$\frac{\text{gallons of waste-water}}{1{,}000{,}000} \times 8.34^{*} \times \text{concentration of } \textit{contaminant in mg/L} = \text{Pounds}$$

*A gallon of water weighs 8.34 pounds

Example: Your plant discharged 250,000 gallons of waste water per day. By sampling the waste water and analyzing it for grease, you found that the waste water contained 1800 mg/L of grease. How many pounds of grease were discharged per day?

$$\frac{250{,}000}{1{,}000{,}000} \times 8.34 \times 1800 \text{ mg/L grease} = 3{,}753 \text{ pounds of grease}$$

This equation is appropriate for any waste-water analysis where results are reported in mg/L (milligrams per liter).

These determinations can not only help reduce treatment costs, but may also give an idea of excessive product being wasted. If this plant was a breading frying operation, the question should be, "why are we dumping almost 2 tons of cooking oil to the drain every day?" At 25 cents per pound, $938 worth of oil is going to the drain every day.

One poultry plant studied (Table 2) discharged 0.03 pounds of $BOD_5$ per bird, whereas another discharged 0.15 pounds of $BOD_5$ per bird. If both plants were processing *100,000 birds per day and it costs* 10 *cents to treat a pound* of 1$BOD_5$, what profit advantage would the first plant have?

**Table 2. Cost Comparison of Waste Minimization.**

| | | | |
|---|---|---|---|
| Plant 1 | 3,000 x 10 cents/pound | = | $ 300 |
| Plant 2 | 15,000 x 10 cents/pound | = | $1,500 |

From the previous examples, both water conservation and waste minimization are cost effective.

## Will It Work In The Real World?

A Georgia poultry processing plant hired a university-trained person whose only job was to conserve water in the plant. Since July 1, 1991 (employee's starting date) water use has been reduced from 5.67 gallons per bird to 3.94 gallons per bird. This represents an annualized water cost savings of $300,000 or an approximate 10 to 1 savings-to-salary/benefits ration. Where else in your plant can you place a new graduate who will return $10.00 to each dollar of salary the first year?