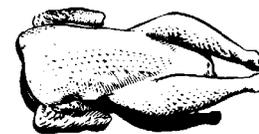*The University of Georgia*
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PROCESSING TIP . . .

WASTEWATER ANALYSIS TO MEASURE YIELD LOSS

Wastewater discharged by a processing plant is considered a problem of environmental compliance. Few processors consider that analysis of wastewater can also be used to determine the amount of product lost. The organics in wastewater come from the chickens that are processed. These organics is the product, in some form, that is sold. Product may be of low value such as offal or of high value such as meat. By analyzing the concentration of organics in wastewater and measuring the volume of wastewater flow, the amount of organics, i.e., product, lost can be determined.

The equation to determine the amount of product lost is called the "**Pounds Equation".** This equation is typically used to determine the design of a wastewater treatment system, however, it can also can be used to determine product loss.

The Pounds Equation

$$\frac{\text{gallons of wastewater} \times 8.43 \times \text{concentrations of organics in mg/L}}{1{,}000{,}000} = \text{pounds}$$

Example problem:
- birds per day processed   250,000
- live weight   5.5 pounds
- gallons of water per bird   7.0
- offal per cent water   75
- percent offal per bird   30
- mg/L (ppm) organics   2500

$$\frac{1{,}750{,}000 \times 8.43 \times 2500}{1{,}000{,}000} = 36{,}500 \text{ pounds dry weight organic matter}$$

PUTTING KNOWLEDGE TO WORK

36,500 pounds dry weight = 145,950 pounds wet weight organic matter
250,000 birds x 5.5 pounds per bird x 30 percent offal = 412,500 pounds offal

$$\frac{145{,}950 \text{ pounds offal in wastewater}}{412{,}500 \text{ pound total offal}} = 35.4 \text{ percent of offal in wastewater}$$

It is difficult to believe that a processing plant can be discharging more than one third of the offal in wastewater, but the calculation is correct and the assumptions are correct for a typical slaughter plant.

If DAF float material is considered to have no value and primary offal has a value of 2.5 cents per pound, the daily product loss (145,950 pounds @ 2.5 cents per pound) is $3650 per day. Can the processing plant be operated to reduce the amount of offal lost to wastewater and kept in the form of primary offal, thereby, increasing offal yield?

The **"Pounds Equation"** can also be used to determine the loss of high value product in a further processing plant.

Example Problem:
- Wastewater volume..200,000 gallons
- Concentration of Nitrogen...................................200 mg/L
  (Nitrogen comes from the protein in chicken meat)
- Nitrogen x 6.25 = protein dry weight
- Chicken meat = 20 percent protein
- $\frac{200{,}000}{1{,}000{,}000}$ x 8.43 x 200 mg/L = 337 pounds nitrogen
- 337 pounds nitrogen x 6.25 = 2100 pounds dry weight protein
- 2100 pounds dry weight protein x 20 per protein chicken meat = 10,500/lbs meat in some form in wastewater.

All processes have loss, but, by determining the amount of product that winds up in wastewater, the questions asked should be "Is this loss excessive?" and "Can we improve our processes so that we put more product in the box and loose less to the wastestream?"

Although not typically used in this way, wastewater analysis can be a tool to determine process efficiency.

William C. Merka
Extension Poultry Scientist   Extension County Coordinator/Agent

"Your local County Extension Agent is a source of more information on this subject."