MINNESOTA TECHNICAL ASSISTANCE PROGRAM

Fact Sheet

UNIVERSITY OF MINNESOTA

Wastewater reduction options for poultry processing

Poultry processing plants can be significant sources of phosphorus released to wastewater treatment plants. Examples of how to reduce water use, BOD, TSS and phosphorus are provided in this fact sheet.

The Minnesota Pollution Control Agency (MPCA) is phasing in effluent phosphorus limits for municipal wastewater treatment facilities. These treatment facilities are asking their industrial users to reduce phosphorus discharges to the treatment plant.

In order to sustain aquatic life and provide recreational use, Minnesota's waters must be clean and healthy. Although phosphorus is a nutrient for plant growth, excess phosphorus can stimulate algae growth, speeding up the aging process of lakes and streams. As the algae decomposes, the available oxygen supplies decrease creating a high biochemical oxygen demand (BOD), sometimes threatening the survival of fish and other aquatic organisms.

Poultry processing plants can be significant sources of phosphorus released to wastewater treatment plants. Most of the wastewater loading in the poultry industry comes from the slaughtering process when birds are bled, scalded with hot water, rinsed up to three times, gutted, and chilled with water. The need to maintain high production and meet 1997 zero fecal contamination requirements set by the U.S. Department of Agriculture (USDA) makes using high volumes of water essential.

Reducing BOD, TSS, Phosphorus and Water Use

The poultry industry is a large contributor to Minnesota's agricultural economy with sales accounting for about 7% of Minnesota's farm output. Poultry processing plants contribute large BOD loads, as well as total suspended solids (TSS) and phosphorus to wastewater. A number of steps can be taken to reduce poultry processing plant waste.

Measure for Success

Measure water flow throughout your facility. Measuring wastewater volumes helps you plan your pollution prevention tactics. Flow meters can quickly indicate water overuse. Some meters on the market use circular chart recorders to measure water use in gallons per minute (gpm) over a 24-hour period. Fluctuations may indicate leaks, wasteful water use, or inefficient equipment.

Install meters in high water use areas such as the chiller, scalder, wash cabinets, evaporators, and condensers. Monitor overflow areas like the chiller and scalder, which are both large water users. The USDA requires a water overflow of one gallon per bird for the chiller and 0.5 gallon per bird for the scalder. Regulate meters to avoid unnecessary overfilling and inefficient water use.

Fix Leaks

Prevent water loss by finding and repairing all leaks in the facility. Make a checklist of all potential sources of leaks and conduct weekly inspections of equipment such as valves, tanks, hoses, and nozzles.

Break and Shut-Off Time

Another source of inefficiency is water left running during breaks and shutdown times. Develop a water shut down checklist for all areas of the facility. Simple steps can be taken to reduce water loss during non-operating times. Post signs that remind workers to shut off water throughout the facility before plant shut-down time. Hang a reminder sign after the last bird is placed on the production line before break.

Measure water flow rates during non-operating periods to make sure water has been properly turned off and to discover leaks.

Nozzles and Spouts

Installing adjustable pressure/low-volume water nozzles can reduce the amount of wastewater from your facility. Equipment such as hand washing spouts in the evisceration room and cleanup hoses can use these nozzles.

The USDA requires that all employees on the evisceration line wash their hands after handling

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each bird to prevent cross-contamination. Many hand washing spouts run constantly to accommodate both USDA requirements and the rapid pace of the production line. Using lower-volume water spouts can reduce water waste. Also, consider installing foot pedals on the hand washing units. These save water by having the water on only when needed. Install water-saving devices such as water regulating valves or narrow pipe fittings in the hand washing unit pipes to reduce water flow.

Water Reuse

Consider reusing some of the water in your facility for melting ice and cleaning. Scalder water can be filtered and reused to melt ice left over from the chillers. This practice eliminates the need for fresh water to melt the ice. The same process can be used for reusing water from the evisceration process for some first stage cleanings.

Keep Organic Materials Out of the Wastewater

Poultry by-products can be cleaned up or moved out without using water. Keeping by-products out of the water stream can reduce BOD, TSS, and phosphorus loading in the wastewater.

Consider replacing water troughs with conveyors for moving organs from the evisceration line to the next process area. The USDA has no requirements on the amount of water used to clean the hearts, livers or gizzards.

Collect blood and other liquids from the birds using troughs and curbs to direct their flow. Solid by-products, blood, and other fluids can also be collected in holding tanks using a vacuum hopper system which does not require the use of water. These by-products may be shipped to rendering plants and converted to animal feed.

Dry Cleanup

Use dry cleanup methods before using water. This can reduce the BOD and TSS loading to the effluent water stream. Some of the most effective dry cleanup methods include scraping fat and grease off conveyor belts; installing strainers along the evisceration line and other areas to keep poultry by-products off the floor; and sweeping, squeegeeing, or shoveling materials off the floor before wet cleanup.

Table Toppers

Keep your employees informed of the plant's energy and water costs. One option is to post a comparison of the current month's water and sewer bills with that of last year's utility bill for the same month in the break area or a central location in the facility. Consider mapping out the trends using charts and graphs to show the cost comparisons.

CIP System

A CIP system eliminates the need to dismantle equipment for cleaning and can help you carefully control water and chemical use at your facility. Many production facilities manually run CIP systems, but fully automated CIPs are more consistent than manual operations and are typically more effective. Using final CIP rinses as the pre-rinse for the next cleaning cycle can cut the amount of wastewater generated.

Non-Phosphorus Cleaners

Move to low- or non-phosphorus chemicals for CIP systems and other cleaning operations.

Jennie-O Foods MnTAP Intern Project

Owned by Hormel Foods and based in Willmar, Jennie-O Foods, Inc. is the world's largest turkey producer. The company ships food products throughout the United States, as well as 14 foreign countries. Jennie-O wanted to reduce water use and BOD, TSS, and phosphorus loading into the wastewater for two of its plants in Minnesota.

MnTAP funded a student intern at Jennie-O Foods to reduce water use and wastewater loading at its plant in Melrose and the Heartland Foods Company plant in Marshall. The intern began by documenting improvements made earlier at West Central Turkeys, Inc., a Jennie-O facility located in Pelican Rapids.

West Central Turkeys

West Central Turkeys is* a slaughter and processing plant. West Central produces processed turkey products such as turkey bacon and turkey roasts. It employs about 720 people. West Central has implemented many effective pollution prevention tactics that served as models for other Jennie-O facilities.

West Central developed a utility task force to help the plant reduce its use of energy and water. One goal was to involve all employees in lowering utility costs. Employees in each department were assigned to help reduce monthly energy use. To reduce water use and effluent water loading, the task force met weekly to review the volumes and cost of wastewater loading. They looked for inefficient water use and leaks, and installed meters to track water use. By monitoring cleanup water use alone, West Central was able to reduce its water use by 23,000 gallons per day.

The West Central staff used water volume reduction tools such as narrower pipe fittings, low-volume spray nozzles and foot pedals on hand washers in the evisceration line. They also started reusing water from evisceration for first stage washings of the turkey transfer trucks. This helped reduce the need for fresh water.

The most effective waste load reduction practice was keeping by-products out of the water stream. Employees used dry cleanup methods to remove by-products before wet cleanup. Keeping by-products off the floor greatly reduced BOD and TSS loading into the effluent water stream.

Jennie-O Foods

The Jennie-O Foods plant in Melrose is the largest turkey slaughtering plant in Minnesota. The facility is a whole bird packing plant that employs about 900 people and bags turkeys under 200 different name brands.

In addition to reducing its water use, the Melrose plant wanted to decrease the amount of water discharged. The MnTAP intern started addressing water loss by documenting leaks throughout the facility. He estimated that the plant wasted 876,500 gallons of water per year, costing approximately $2,640 annually. By eliminating leaks, the Melrose plant reduced wasted water and improved the efficiency of the water-using equipment. To make sure that all leaks were continuously addressed, the intern made a weekly checklist for leaks throughout the plant.

The Melrose facility also started using adjustable pressure, low-volume hose nozzles on the evisceration line and on cleanup hoses. This flow reduction strategy had an estimated savings of more than $25,000 and more than eight million gallons of water per year. The plant also installed aerated nozzles, which mix air with water, on all hand washing spouts on the evisceration line. The intern estimated savings of more than $10,000 and more than three million gallons of water per year.

The intern looked at water use during company break times and estimated that the Melrose facility could save more than eight million gallons of water per year by turning off the water. Employees posted signs in the high water use areas reminding workers to shut off the water before breaks and shutdown time.

Melrose also decreased the rate of the water going into the prechiller. The intern noted that the plant exceeded the USDA required one gallon overflow per bird by 0.63 gallons. He brought down the average overflow to 1.2 gallons per bird. This reduction had a projected annual savings of more than seven million gallons of water.

The plant's salvage station was another source of water waste. This water station continuously pumped chlorine into the water stream to rinse and disinfect partially damaged birds that are cut up and salvaged. Water runs constantly to maintain a dilute amount of chlorine in the water. The intern incorporated an idea from Heartland Foods Company which involved installing a flow switch and surge pump to regulate the amount of chlorine in the water flow. With this system in place at Melrose, the chlorine pump runs only when the water at the product salvage station is running, reducing the amount of water and chlorine waste. Melrose estimates a yearly savings of more than one million gallons of water from this change.

By implementing the intern's suggestions, the Melrose plant estimated a savings of about 31 million gallons of water with an annual savings of $93,700.

Heartland Foods Company, Inc.

Heartland Foods Company slaughters, de-bones and packages turkeys. Its main product is the whole bird. The plant employs approximately 500 people. A large volume of water is needed for daily production.

Heartland was interested in reducing its water use to help bring down utility costs and reduce the load on its pretreatment water system. A MnTAP intern made suggestions that led to significant changes at the facility.

Heartland installed five water flow meters and a computer system to measure and track water flow. This helped identify areas where water use could be reduced.

A tank to recycle water for melting ice or cleaning was installed. The tank was used to collect relatively clean water for reuse. Heartland estimated that it would quickly recoup the cost to install the tank by lowering water and sewer costs. The plant would also benefit from reducing its flow into Heartland's water pretreatment system.

The intern borrowed an idea from West Central Turkeys and the Melrose Jennie-O plant to post reminders to shut off the water throughout the facility. This simple solution also helped reduce the plant's water waste.

With these changes, Heartland Foods reduced its water use from about nine gallons per bird to about six gallons per bird. The plant estimated savings of more than 14 million gallons and $43,000 annually.

The intern project was conducted in 1999 by MnTAP intern Nick Zewers, a chemical engineering sophomore at the University of Minnesota.

** Currently West Central Turkey is a further processing facility that produces ready to eat deboned cooked and seasoned products.*