



N.C. Division of Pollution Prevention and Environmental Assistance

North Carolina Department of Environment and Natural Resources

Site Visit Report

MEAT PROCESSING FACILITY COD Reduction

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DISCLAIMER

This report is intended to offer information and guidance for identifying opportunities and options for waste reduction. Compliance with environmental and occupational safety and health laws is the sole responsibility of each business. All legal and regulatory references within this document are intended only for informational purposes and are not to be taken as reliable sources of legal reference. Businesses should contact the appropriate legal and regulatory authorities for current regulatory requirements as well as for interpretation and implementation. All references and vendor materials (when available) mentioned in the report are included. Mention of a vendor or manufacturer does not represent an endorsement by the State of North Carolina. Neither the State of North Carolina nor the authors of this report are responsible for practices or procedures implemented by individual facilities.

Meat Processing: Waste Reduction Assessment Centering on COD Reduction

1.0 Introduction

In a continuing effort to reduce wastewater disposal surcharges, as a part of the city pretreatment program, a meat processing facility requested technical assistance from the N.C. Division of Pollution Prevention and Environmental Assistance. This division is a non-regulatory state agency offering free environmental technical assistance and is part of the Department of Environment and Natural Resources. A DPPEA team made a waste reduction inspection visit to the plant. The plant manager gave a detailed synopsis of the facility's operations and provided a plant tour. The waste assessment team concentrated mainly on the reduction of COD in the facilities wastewater discharge.

2.0 Plant Description and Site Visit

This beef and pork processor's operations include meat processing, curing, smoking and cooking meats delivered already butchered, cut up and/or packaged. Much of the meat is delivered frozen and is thawed by a once-through thawing water stream.

The meat production wastewater is pretreated, in accordance with a pretreatment permit from the city's pretreatment program and then disposed of into the city sewer system. Domestic wastewater is disposed of into the city sewer separately. The pretreatment units are grease and oil separation, grease trap and a dissolved air flotation unit with influent storage tank. Wastewater from production containing blood, debris and cleaning agents enters the first chamber of the grease pit and flows into a second chamber. It is pumped to the DAF influent storage tank, then into the DAF unit where large amounts of greases and oils are separated. DAF effluent wastewater is returned back to the third chamber of the grease pit, which also receives the once-through thawing water. It is from this third chamber where the wastewater enters the city sewer and where the city conducts sampling. A contracted renderer collects greases, oils, other fatty tissues and debris removed from the DAF unit and grease pit.

3.0 Wastewater Characterization

In the city's annual report to the state, this facility does not have any significant non-compliance with the pretreatment limits, but the facility is charged for the levels above surcharge limits for Flow, BOD, COD, TSS, pH, Temperature, Chloride, Oil & Grease and TKN.

The city does not surcharge for BOD and does not sample for phosphorus.

Table 1 provides the six-month averages for the level of these parameters in the effluent, as measured by the city pretreatment program.

Table1: Six-Month Averages of Surcharge Parameters

Parameter and daily max limit	January to June	July to December
Flow (mgd) 0.108	0.0771	0.0701
BOD (lb/d) 900	453.2*	1,0547*
COD (lb/d) 1,920	1,062.9	1,482.1
TSS (lb/d) 360	107.4	124.4
Mercury (mg/l) monitor	<0.0002	<0.0002
pH (std units)	7.10	7.20
Temperature (C)	16.6	17.3
Chloride (lb/d) 1,800	964.4	2,093.3
TKN (lb/d) 180	44.2	39.3
Oil and Grease (mg/l) 100	<5.00	9.0

* City is surcharge measuring COD, in lieu of BOD5

Following the plant visit, the DPPEA team investigated several possibilities for reducing those wastewater parameters that are regularly being surcharged. The major possibilities are as follows.

- *Is it possible that blood escaping down the drains is causing high BOD, which causes COD to read high?* During the site visit, blood was observed being washed down or escaping to the floor drains, in several areas in the plant. It is not known how much blood was being captured or disposed of with the meat scraps. But, if blood were the only cause, reducing the escaping blood by half could theoretically reduce COD to the point of eliminating this surcharge.
- *Is there a possibility that cleaning agents being used are contributing to COD and chlorides in the wastewater?* The team examined some of the MSDS sheets and found chemicals that could have an effect on COD and chlorides if used in large enough quantities. In particular, terpenes, a family of chemicals often used as cleaning agents at cool temperatures, contributed to high COD loading. However, the cleaning solution vendor was unwilling to provide more specific information besides the general information on the MSDS. Without testing or further information from Oakkite, any cleaning agents with particularly high COD loadings cannot be identified.
- *As this is an older area of the city, is it possible water coming into the plant contains elements that affect the surcharged parameters?* The DPPEA team checked with the state Division of Environmental Health to review the city's drinking water records and found no elements that would significantly effect wastewater testing.
- *Is it possible ingredients in the additives to the cooking/smoking operations affect COD and other parameters?* The concentration of acetic acid in the liquid smoke is sufficient to have an effect on the pretreatment system although the reaction of a complex waste flow is difficult to predict. A drop in pH may improve the separation of fats in the DAF as well as

the breakdown of the sodium tripolyphosphate in the brine. However, liquid smoke is used so infrequently that it probably has little effect.

- *With the large volumes of nitrates and phosphates being used by the plant, can COD be affected?* Nitrites and sodium tripolyphosphate contribute to COD as they oxidize to nitrate and orthophosphate forms.

It is clear that as plant operations and flows vary, wastewater makeup will vary. Only the grease pit and the influent tank for the DAF unit have some equalization effect on the wastewater before it goes into the sewer. Sometimes oil and grease help mask COD during sampling.

4.0 Waste Reduction and Compliance Options

Listed below are several measures that could significantly reduce the wastes discharged into the city sewer and effectively reduce surcharges paid by the facility.

4.1 Saving money by reducing blood and meat scrap in the wastewater

One of the most concentrated sources of COD/BOD pollutants is blood. Since blood is water soluble, the DAF unit has little effect on it. Theoretically, if half of the blood going into the wastewater were stopped, COD surcharges could be eliminated or at least greatly reduced. With very little effort this extra blood could be collected with the meat scraps for disposal. It is certain CPI or any other collection contractor would take the additional blood.

- With extra care by employees, blood and more meat/fat residuals can be squeegee/scraped into the collection barrels before washing tables and floors with water/cleaners. During the site visit it was noticed that employees were letting a lot of blood come off the tables and across to the floor drains.
- In the meat cart washing room it was not apparent that blood and very small meat/fat residuals were being collected before a cart was washed. Consistent strict enforcement in the collection of this blood and meat scrap would greatly reduce COD/BOD.
- In the cooking and smoking operations, can cooked fats, greases and/or cooked blood be collected before cleaning of the ovens/smoker units? This could reduce significant amounts of COD/BOD. It is understood CPI would also be able to take cooked scraps and blood.
- Additional blood loss to the wastewater occurs on the floors of the processing rooms. It is recommended that the floors be squeegee/scraped (usually termed 'dry cleanup') to get up as much blood and scrap as possible before the floors are washed down.
- With better blood control it is possible that cleaning labor will be reduced and lower amounts of cleaning agents will need to be used. This will also reduce chlorides in the wastewater and thus reduce surcharges.

Constant attention to preventing blood and even the smallest meat scraps from going down the floor drains will save significant dollars in surcharges.

4.2 Brine Re-use

Brine from corned beef processing is one of the major waste streams at Freirich. Brine usage was stated as:

- 40,000 lb/day of brine with 30 percent retained in the product
- 2,000 lb/day of salt
- 300 to 500 lb/day of sodium tripolyphosphate

At this rate of usage, waste brine contributes 5 percent of the total wastewater flow, 47 percent (850 lbs.) of the chloride limit and 2 percent of the COD limit. The COD in brine is from the sodium tripolyphosphate, which creates oxygen demand as it converts to orthophosphate. Other sources in DPPEA have noted that other meat processors have been able to reuse the brine in their operations, although they were not at present. From a waste and cost reduction point of view, it may be worth investigating what conditions health authorities would allow reuse of brine.

4.3 Saving money by reducing water use

The plant's water usage often reaches and sometimes surpasses 60,000 gallons per day. While water use must meet federal and state health requirements, substantial savings in non-regulated water use can be realized with additional water conservation measures.

- **Water conservation of once-through water in all plant areas** should be identified and evaluated to determine the feasibility of reuse or recycling. If practical and allowed by health requirements, this water flow could be captured, collected and reused in other operations.
- **Faucets, hoses and other water supplies** should also be checked to eliminate running water when not in use. Running water not used is a waste and contributes to the environmental and economic demands on the facility. Low-flow "fogging" type nozzles typically use less water than conventional nozzles.
- **Meat cart washing** can be a major water and energy user. Consider recycling the final rinse water, where allowed, for use in less critical operations where a water wash is necessary. Keep flow rates as close as possible to manufacturer or in plant optimum specifications. Better insulation of the washroom would help on the cooling costs for the rest of the plant.
- **Routine inspections** of all hoses and washing/cleaning areas for running water not being used should be conducted. There should be regular inspections of chiller units, cooling towers, plant piping and bathrooms for running water and leaks. These simple techniques could be made into a standard operating procedure to potentially save money and resources. Consider using low-flow faucets and adding aerators to hose heads.
- **Dry clean up** in all meat handling areas is an effective method to separate meat waste from the wastewater effluent. Dry clean up reduces the hydraulic capacity demands on the pretreatment system and better enables the handling of meat scraps and blood. Dry-clean up includes removing all residual from processing areas before it falls to the floor and eventually into the drains. Also when equipment is to be washed, remove any meat scrap and trash from their surfaces before wet cleaning. Water should not be used as a broom to move debris and waste into floor drains. After conducting dry clean up, the areas to be cleaned can then be sanitized with the traditional wet methods. To make dry clean-up successful, employees should have the appropriate tools and education. Brooms, mops,

squeegees and clearly marked meat and blood collection containers must be available to allow gathering and collection of waste scraps, blood and other trash.

4.4 Sugars and other additives that help create BOD/COD

In meat curing, smoking and cooking processes, additives used may contain ingredients that feed and increase the organisms that cause BOD.

- Sugar in just about any form is a major COD loader/contributor. Formulas using additives containing sugar should be examined, or even experimented with, to reduce any excess or leftover waste additives in the process. If possible, dry clean-up methods should be used for cleanup of spilled, leftover or wasted additives to keep sugars out of the wastewater stream.
- Nitrates can affect/help create COD. Process formulas and methods should be examined to minimize any leftover or unabsorbed nitrates, to keep them out of the wastewater stream.

5.0 Other Suggestions for Waste Reduction Programs

Many companies view waste treatment and disposal as a fixed cost of doing business. Instead, pollution prevention should be viewed as a part of comprehensive cost reduction and quality improvement processes. There are basically two different methods of implementing waste reduction. The facility could add waste reduction responsibilities to existing quality or process committees or create new workgroups specifically for waste reduction. The DPPEA has case studies available which may offer various ideas on how best to implement waste reduction in your facility.

The waste reduction process works best when an employee helps organize and motivate the process. This champion can be from any level of responsibility in the facility, but enthusiasm for the waste reduction process is required. As in quality control, employees from all levels and areas of production should be included in waste reduction. The different perspectives offered will provide great insight as to sources and reduction methods for waste.

5.1 Recycling

Recycling programs can be a good place to start. Most facilities already recycle aluminum cans or cardboard but don't track overall waste cost and recycling gains. Success in these simple recycling areas can help carry over when more difficult projects are attempted.

A comprehensive waste reduction program should also encompass a written buy-recycled policy. The recycling loop is not complete until the materials collected for recycling are manufactured into a new product and then sold.

5.2 Energy Conservation Assessments

The North Carolina State University Industrial Extension Service provides energy audits and energy conservation courses for a small fee. This assistance targets nearly all the basic unit operations of a manufacturing or processing operation ranging from compressors to HVAC units.

5.3 Pollution Prevention Training

Employee training is an integral aspect of any waste reduction program. Waste reduction/pollution prevention training that focuses on employee awareness and stresses continuous improvement can lead to improved environmental programs and cost savings. The DPPEA provides various training services. These include:

Management Awareness Training - Training on the importance of waste reduction from an economic and environmental standpoint, how to implement a waste reduction program, and,

Train-The-Trainer Training - Process specific or facility specific training for waste reduction teams on waste reduction options for the facility. Training includes:

- facilitated brain storming session to identify and rank options,
- fundamental of material balances and waste identification,
- discussion of potential barriers to implementation, and
- implementation plan development.