

Food & Fruit Processing Water Treatment Options

INTRODUCTION

In previous newsletters to the membership, we discussed the increasing regulation of process water discharges and how the soil and groundwater may be impacted by them. We also discussed how each facility should be evaluated to limit the environmental impact and increase process efficiency. Finally, we noted that other treatment options may be required if process modifications are not adequate to limit the impacts to the soil and groundwater. In this newsletter we will discuss some of the options for treating discharge water.



Spray Irrigation Nozzle

will occur. The MDNRE distinguishes between “surface water” discharges to lakes and streams, and “groundwater” discharges that apply treated water to the ground and ultimately to the groundwater. The rules governing a surface water discharge and a groundwater discharge are very different and will dictate which treatment options are viable. Most facilities discharge to groundwater, so this newsletter will focus on those types of facilities. But, if a surface water discharge is feasible, it can be an attractive alternative.

TREATMENT OPTIONS FOR FACILITIES WITH PROCESS WATER DISCHARGES

Several options are available to treat discharges from a processing facility. The type and cost of treatment is affected by the characteristics of the discharge, the availability of land, the availability of a municipal sewer system, and the volume of waste discharged. Some of these treatment strategies include:

Municipal Treatment Facility

A municipal sewer system can be a viable solution. However, careful coordination with the municipality regarding flow capacity and water quality will be required. Most municipal treatment facilities are not designed for the high strength waste associated with food and fruit processing. These facilities may require pre-treatment by the processor. Pre-treatment strategies would be similar to the treatment options discussed below for stand alone facilities, but effluent quality requirements could be reduced.

On-Site Treatment and Disposal

For many food and fruit processors municipal treatment systems are not available. So, treatment and discharge must be performed on-site. The regulatory issues and treatment options will depend on where the discharge

Limited Treatment Land Application

Many processors currently use this alternative for waste disposal. Process water is discharged through a spray or drip irrigation system to the ground. These facilities have little or no treatment and rely on the spreading of process water over the land. The key to success is to irrigate quickly before the wastewater begins to ferment and generate odors, and to spread the discharge over a large area. Aerated lagoons can delay the fermenting process, but detention times need to be short. Irrigation area should be large enough to meet MDNRE’s recommended limit of 50 pounds of BOD₅ per acre per day.

Aerated Lagoon – Partial Treatment

This alternative is similar to the limited treatment alternative, but it provides longer detention time, multiple lagoons, and significant aeration horsepower to get maximum performance out of the lagoon technology. BOD₅ removal will still be low due to the limitations of the lagoon technology. The area required for irrigation can be slightly reduced with this option.



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Aerobic Activated Sludge

Aerobic activated sludge is the treatment technology typically used in most municipal treatment facilities. It is a "mechanical treatment plant" based on providing an adequate amount of air to support aerobic organisms (activated sludge) which treat the wastewater. BOD₅ removal efficiencies are generally 85% - 90%. Spray irrigation of this effluent must still follow the recommended 50#/acre/day application rate. A significant reduction in irrigation area is achievable with this alternative because of the high quality effluent produced.

Anaerobic Treatment

Anaerobic ("in the absence of oxygen") treatment is commonly used for high strength food and industrial waste. It is suitable because the natural tendency for high sugar waste is to ferment and deplete oxygen. The process generates much less waste product than the aerobic process and also generates methane gas (biogas) which may be able to be recovered and used as a biofuel. BOD₅ removal efficiencies are approximately 90%. This type of treatment is susceptible to upsets due to variable flow or loading conditions. Unless process water flow is uniform and predictable, this alternative should be considered with caution.

Air Sparging

In the previous newsletter, we talked about the advantages of air sparging in the groundwater to remove the high iron and other metals present in the groundwater. Gosling Czubak is currently conducting a pilot study to investigate the effectiveness of air sparging as a treatment mechanism in the ground and groundwater. The goal is to provide adequate air in the soil and groundwater to support the growth of naturally occurring aerobic bacteria to treat the process water as it percolates through the soil. If successful, this innovative approach will greatly reduce the irrigation area required and provide a cost effective alternative to the other treatment technologies discussed.

SUMMARY OF TREATMENT ALTERNATIVES

Alternative	Advantages	Disadvantages	Construction Cost	Operation Cost
Limited Treatment Land Application	- Simple technology - Ease of operation - Low cost	- Lowest treatment - Large irrigation area - Odor potential	Low	Low
Aerated Lagoon – Partial Treatment	- Simple technology - Ease of operation - Low cost	- Low treatment level - Large irrigation area - Odor potential	Moderate	Moderate
Aerobic Activated Sludge	- Reliable technology - Ease of Operation	- Moderate treatment - Minimal odor issues - High operating cost - Not efficient	High	High
Anaerobic Treatment	- Typically used for high strength waste - Low odor potential - Production of biogas - Low waste sludge	- Good treatment level - Vulnerable to variable loading - Aesthetic, tall tank and waste gas burner	High	High
Air Sparging	- Effective technology - Reduced irrigation area - Remediate any metals in groundwater	- Unknown efficiency - New application for the technology	Low - Moderate	Unknown, Expected Low - Moderate

As a member of MFPA, Gosling Czubak Engineering Sciences' team of professional engineers, certified professional geologists, and environmental professionals are well versed in the issues you face as an industry and would like to discuss the issues in greater detail with you. Contact Mark Hurley, P.E. at 1-800-968-1062 for assistance.

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