Electrocoagulation Solutions

Technology meets needs of food & beverage wastewater treatment

By Nick Nicholas

The effects of water scarcity and stricter environmental regulations placed on water usage are increasing the cost of using freshwater globally. The consequences of these increasing costs on food and beverage companies are twofold, since the companies are charged for both the water that they utilize in their processes and on their wastewater discharge.

Additionally, the food and beverage industry is faced with mounting external pressure to ensure that its operations are environmentally conscious, while internal pressures to maintain or increase profitability for its stakeholders exist as well.

Food and beverage manufacturing is a highly water resource-intensive sector when it comes to production and distribution. Each process uses large amounts of water for a variety of critical purposes, such as storage, boiling and chilling, ingredients, equipment cleaning, conditioning and transportation of raw materials. In fact, these production plants can typically consume more water than nearly any other resource to ensure that their operations function properly.

The vast amounts of wastewater generated by processing facilities create several challenges, including wastewater treatment operating costs or surcharges, treatment chemicals, sludge disposal costs, and power consumption.

These issues make the challenge of allocating and effectively managing water—with a focus on energy efficiency and sustainability—a critical component to food and beverage processing operations.

Meeting these challenges with sustainable treatment solutions prevents water pollution from entering into local watersheds, protecting public health and the surrounding wildlife.

Wastewater Composition

Typically, wastewater effluent from food and beverage processing plants has the following characteristics:

- High concentration of total suspended solids (TSS);
- Biological oxygen demand (BOD) and chemical oxygen demand (COD);
- Fats, oils and grease (FOG), and nutrients consisting of ammonia, phosphorus and nitrogen; and
- Pathogenic organisms and trace pesticides.

The characteristics listed above and other potential contaminants can present problems for facilities that use conventional primary treatment methods for wastewater treatment.

Dissolved air flotation units (DAF) are typically common in food and beverage wastewater treatment system processes because they can effectively remove a significant percentage of suspended solid particles. The ability of these systems to reduce FOG is one particular benefit. However, DAF systems are subject to inherent limitations, especially with variable solids effluent levels and emerging contaminants. These and other limitations, including the cost and dosage monitoring of expensive specialized chemicals required for operation, can make this treatment solution expensive and complex to operate on its own.

A New Approach

Utilizing a new approach through the use of advanced primary and secondary water treatment solutions can be beneficial for meeting the challenges facing this industry.

Electrocoagulation is one of the emerging water treatment solutions capable of handling the wastewater effluent characteristics presented by food and beverage processing

operations. This technology combines the functions and advantages of conventional coagulation, flotation and electrochemistry in water and wastewater treatment to optimize contaminant removal in an environmentally sustainable and cost-efficient way.

This solution provides companies with new and existing wastewater treatment systems the opportunity to optimize their current treatment process, adding dependability; reducing operations and maintenance costs and sludge disposal costs; and mitigating environmental concerns relating to solids sludge disposal.

Advanced electrocoagulation solutions can be of value in several aspects of the wastewater treatment process. These include primary pretreatment after large solids removal or as a polishing pretreatment for specific contaminants such as colloidal organics, minerals, microbiological contaminants, pesticides, and emulsified oils and greases prior to ultrafiltration (UF) or reverse osmosis (RO) systems.

Intelligent Reuse

Many companies have the idea that reusing wastewater or process water is too risky or difficult of a task

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due to public health concerns or other limitations. But risk and complexity rely on the specific application, and in some cases wastewater or process water can be treated comparatively inexpensively based on the intended end-use application for the reuse water.

Food and beverage companies often produce wastewater containing a high solids content, in addition to various potential contaminants. The municipal wastewater disposal surcharge is based on the levels of constituent contaminants, including suspended solids; the higher these levels, the higher the surcharge will be.

Specialized electrocoagulation system solutions are demonstrating their value in installations in several food and beverage applications, from eliminating or drastically reducing chemical costs to significantly reducing sludge disposal costs and consumables expenses for secondary and tertiary process equipment.

Future Trends

A United Nations study indicated that 30% more water is anticipated to be required by 2030 to accommodate a growing and progressively affluent world. Increasing water costs and stricter regulations are propelling a variety of conservation efforts as everyone searches to get the most out of their water resources.

Utilizing more efficient ways to treat and reuse wastewater and process water, coupled with advanced treatment solutions will remain a consideration for food and beverage companies across the world in the future.

Other predicted future trends include:

- Water reuse and conservation will continue to be primary goals for pollution prevention reduction practices in the food and beverage processing industry.
- Optimization of existing wastewater treatment processes will continue to be a main focal point for food and beverage companies as the costs of freshwater and wastewater disposal continue to escalate.
- The food and beverage industry will continue to adopt and implement advanced innovative water treatment solutions to reduce their water footprint and decrease the environmental impact from their wastewater discharge and solids sludge generation.

Case Study: TSS/BOD/FOG Reduction

Challenge

A fish meat processing plant wanted to reduce their effluent discharge costs and eliminate chemical cost in primary wastewater treatment.

Solution

Genesis Water Technologies, with its local partner, provided engineering and design of a electrocoagulation solution with prescreen and post-solids separation that eliminated chemical usage in the primary clarification process.

The raw effluent was pumped from the primary holding tanks through a rotary drum filter to extract large solids larger than about 1 mm (1/32 in.). The prescreened wastewater stream exited the rotary filter and was collected in a tank to be delivered via a submersible pump to the electrocoagulation system, followed by a dissolved air flotation system to remove the coagulated floc.

The raw water had an extremely high TSS and FOG content.

The flocculated solids could be used as a valuable source of renewable energy. The independent laboratory analysis showed that the floc had a solids content of 42.3%, of which 29.7% was fat.

Benefits

Benefits of this solution include a 70% reduction in discharge charges and the potential to reuse water, as well as utilizing solids floc to create renewable energy to reduce power costs. **iWWD**

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