УДК 628.3

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SEWAGE TREATMENT OF WINERIES

Water is a key resource, used throughout the winemaking process from vineyard to bottle – for irrigation, temperature control, cleaning, sanitation, sterilization, and filter rinsing. Wastewater is simply water plus anything else that is put down the drain. Things that go down the drain in a winery can include unused grapes and juice, winemaking remnants such as alcohol and sugars, and chemicals such as cleaning agents. Winery wastewater contains inorganic salts, organic compounds, yeast, and bacteria. The "high – strength" winery process wastewater (i.e. having more than 7,000 mg/dm^3 of BOD, with a TSS of over 3,000 mg/dm^3) has unique characteristics that differ significantly from other food processing wastewaters.

Some factors to watch for in winery wastewater are:

– chemical (biochemical) oxygen demand (COD and BOD mg O_2/dm^3);

– total suspended solids (TSS) and total dissolved solids (TDS);

– salts such as sodium (Na), calcium (Ca), magnesium (Mg), and potassium (K);

– salinity (electrical conductivity);

– nutrients such as nitrogen and phosphorus;

– acidity or alkalinity (pH);

– dissolved oxygen levels (DO).

Wastewater characteristics vary from winery to winery and appear to be significantly influenced by climate and wine type produced. Wastewater loads also vary seasonally, with the highest organic loads produced during vintage [1].

Most wineries do not have sophisticated wastewater treatment systems to deal with their highstrength wastewater; in most cases, the untreated or marginally – treated wastewater is discharged into leach fields, infiltration ponds, or dry wells. This makes it even more important for wineries to make sure the strength and quantity of their wastewater is closely managed.

When winery wastewater is discharged onto soil, it can lead to increased salinity and acidity, which are detrimental to vegetation growth and soil biota. It can also have a detrimental effect on surface and groundwater ecosystems, from increased microbial and algal growth that consume the available oxygen necessary for other organisms to survive.

Wastewater treatment processes can also generate nitrous oxide, which is a significant greenhouse gas. In addition, high strength wastewater that is directly applied to the vineyard can stimulate soil microbes, thereby increasing the amount of nitrous oxide released to the atmosphere.

Good wastewater management will also reduce the risk of odours, which are often caused by loading large amounts of organic materials in the wastewater, or treatment systems that are over-capacity or not operating properly. Odours can impact neighbours, winemaking, and tasting experiences [2].

The wastewater from primary wineries is polluted in the food industry. This is especially the case for the processing of secondary winemaking products. On average, primary winemaking enterprises dump about 20,000 m^3 of sewage (about 150 m^3 per day) per year.

Secondary winemaking wastewater is less polluted compared to primary wineries. This includes domestic water – water from washing of premises, utensils and equipment located on the territory of the enterprise.

The production wastewater of wineries must be subjected to mandatory treatment. The treatment of these waters may be by mechanical or physical-chemical means, but they do not provide an adequate level of purification from organic pollutants [3].

Mechanical cleaning methods are used to clean runoff from solid and oil contaminants, used to remove suspended impurities and partially colloids. Mixing sewage and averaging the concentration of their pollution. Mechanical cleaning is performed by settling and filtration. The composition of the wastewater treatment plant is taken depending on the degree of purification required. Maximum transparency and significant reduction in BIA are achieved in bunk tanks and preaeration or biocoagulation tanks.

Physical-chemical wastewater treatment is that a reagent substance (coagulant or flocculant) is introduced into the treated water. By reacting with the elements of contamination, these substances contribute to a more complete separation of insoluble impurities, colloids and part of soluble contaminants, which reduces their concentration in waste water; transfer soluble compounds insoluble, alter sewage reaction, in particular neutralize them; discolored colored water.

Recently, biological methods of purification have become increasingly popular. Thus, for purification of highly concentrated sewage of wineries, it is advisable to use an anaerobic-aerobic purification scheme.

First, pre-mechanical sewage treatment is performed on the lattices and sandblasters, with the removal of suspended fine particles (sediment and sand), which are then sent for disposal. The wastewater is then sent for treatment to the methane tank, where the bulk of the pollutants are extracted under anaerobic conditions under the influence of activated sludge organisms. This produces biogas that can be used to meet energy needs treatment plant.

For the final removal of contaminants from wastewater, grade I and II grade aeration tanks are used. After aerobic purification, a sludge mixture is discharged from the aerotanks into the secondary settling tanks, where the activated sludge is deposited. Excess activated sludge is digested into the methane tank and, as a consequence, biogas is obtained. After regeneration, the circulating activated sludge returns to the aeration tank to maintain a constant concentration in it. Before discharge into natural reservoirs, treated wastewater must be disinfected.

Thus, anaerobic-aerobic treatment allows to reduce wastewater pollution by 98.2 % for HCC, and by 99.8 % for BIA [1].

Therefore, the wastewater of the wine industry must be cleaned before dumping. It is advisable to combine several types of purification: mechanical, physical-chemical, anaerobic-aerobic. In addition to the preserved environment, anaerobic purification makes it possible to collect biogas and use it for industrial purposes.

References

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