BIOLOGICAL TREATMENT TO WASTEWATER GENEREATED FROM FOOD PROCESSING INDUSTRY

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Keywords: Biological Treatment, Wastewater Generated, Food Processing Industry

Abstract

Most of the food industries around the globe are associated with very heavy consumption of water also with variety and larger quantity matters mostly organic as well as inorganic resulting in release of wastewater. As compare to other industry in market the food industry requires more amount of water for processing round the year. The release wastewater from the food industry requires treatment which completely depends upon capacity, operational mechanism as well as facilities in waste water treatment plant. The article aims to analyze effectiveness of membrane bioreactor technology as a modern tool to minimize the water pollution level caused by noodle, curd, and infant food plants. Wastewaters are produced from cleaning and finishing operations in the food industry (potatoes and snacks) and are generally high in natural and nutritious content Indicators of contamination (BOD, COD, total suspension, temperature, appearance, and pH) of contaminated water in the food industry had high prices but remained at a distance after treatment for MBR. MBR technology is thus the best and most advanced way to treat contaminated water in the food industry.

Keywords: Wastewater, COD, BOD, Food industry.

1. INTRODUCTION

Wastewater management can include physical, chemical or biological processes or combinations of those processes at betting rates. The food industry includes Potato chips and snacks, dairy / dairy products, alcohol production, edible oils, and breweries. These industries require a large amount of water and discharge wastewater of various levels. Biological responses have been shown to be effective in treating many industrial waste areas over the past few years where effective treatment efficiency is of paramount importance. Some points have been developed to make it understandable. Preventing pollution from domestic, industrial and agricultural activities is essential to ensure the sustainability of local development. During the last century or so, much of the industrial wastewater was discharged into rivers, lakes, and coastal areas. The impact of industrial effluent on the environment and human beings can sometimes be devastating. Compared to other industrial sectors, the food industry consumes a very large amount of water per ton of product. Wastewater produced in food production has different characteristics that distinguish it from ordinary municipal wastewater as it decays and does not collect. Potato chips and snacks are just one example of a food preparation prepared for deep fat frying. Production of potato chips, and other snack-related foods is increasing. The potato industry is well-known for its abundance of organic waste. Commercial pollution

treatment for organic removal. For the accurate treatment of potato processing water it is essential to understand all its negative impact on the environment. Currently, there is a major shift in the demand for improved quality of water resources with the need for good quality of finished products. These demands have forced the potato industry to build roads.

2. OBJECTIVE

The main objective is to remove the contaminants in the wastewater by the 14 microorganisms.

A four stage treatment process followed by a Activated carbon Filter & Multi-grade filter separation is used to treat the wastewater.

3. METHODOLOGY

Treatment Methods

Therapeutic approaches where the use of natural energy focuses on an arc known as unit function. Method of treatment removed by pollution caused by a chemical or biological reaction known as a.) Unit processes. At present, the functioning of units and processes is grouped together to provide various levels of treatment known as preliminary (Primary, advanced advanced) secondary (with or without organ removal) and advanced treatment. In the first treatment, excessive solid foods as major additives to enhance the removal of fixed stiffness and in the second treatment, biological and chemical processes are used to remove most of the organisms.

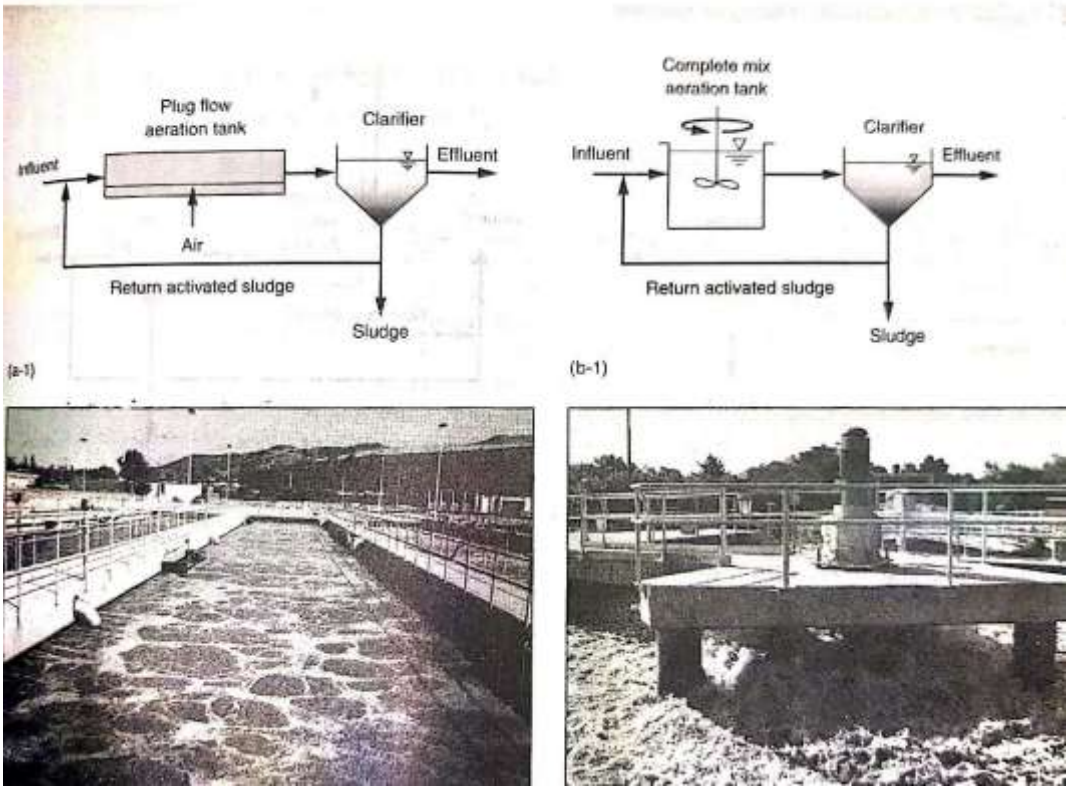


Figure: 3.1 Typical Process flow Diagram

Potato Processing and Source of Wastewater

For the processing of potato high quality is required for raw products. The final product as well as the waste generated product is hampered by low quality raw materials. In general, potatoes with a strong high content,

low sugar content, a thin layer, and the same shape and size are worth considering. Potatoes contain about 18% starch, 1% cellulose, and 81% water, which contain soluble organic compounds such as protein and carbohydrate. Depending upon product selection the type of processing unit is decided , for example, potato chips, frozen fries in French and other frozen foods, mashed potatoes, dehydrated potatoes, potato flake, potato starch, potato flour, canned white potatoes, and so on potatoes, etc. . Major processes in all products are storage, washing, peeling, cutting, cutting, extraction, cooking, drying, etc.

Processing Potatoes and the Source of Wastewater - High quality green potatoes are important in potato processing. The quality of potatoes affects the final product and the amount of waste produced. In general, potatoes with a strong high content, low sugar content, a thin layer, and the same shape and size are worth considering. Potatoes contain about 18% starch, 1% cellulose, and 81% water, which contain soluble organic compounds such as protein and carbohydrate.

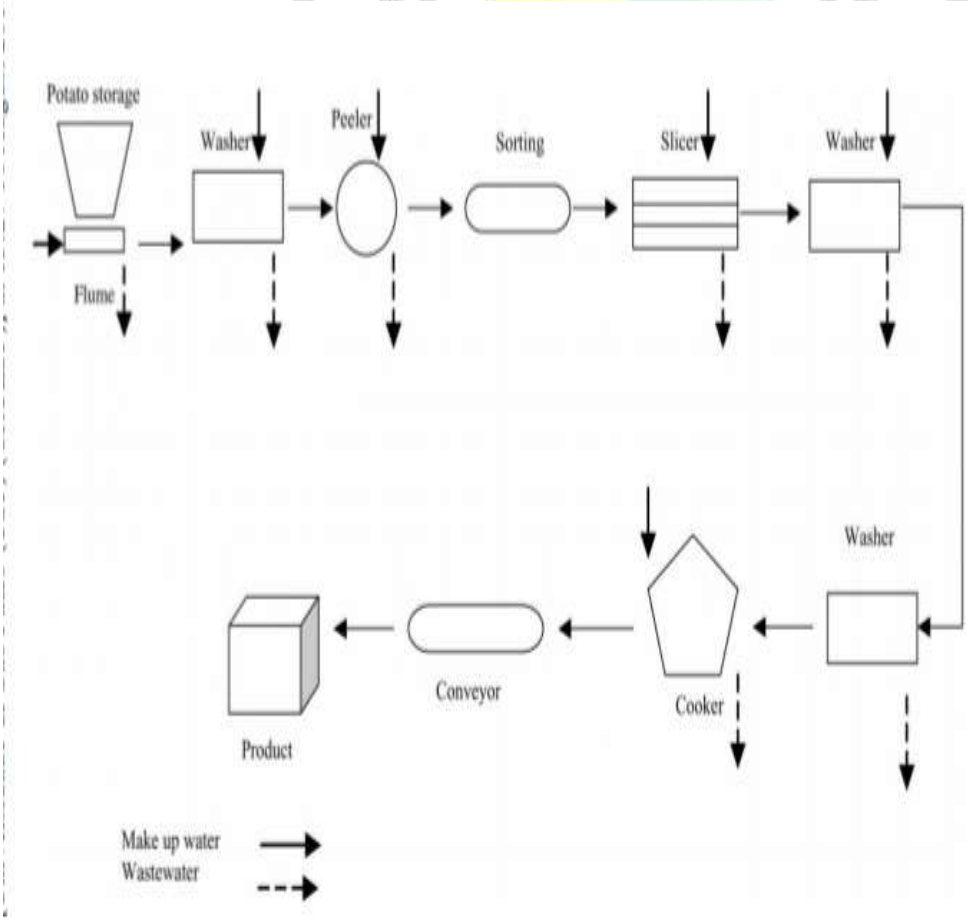
MAJOR PRODUCTS POTATO PROCESSING

Potato Chips: Making potatoes into potato chips basically involves cutting mashed potatoes, washing the pieces in cold water, cleaning, drying them slightly, and frying them in oil or oil.

Frozen French Frames: Frozen products and other frozen potato production, large potato for high strength and low sugar content are highly desirable. After washing, the potatoes are rinsed by steam or lye. Filtering and reduction of losses vary in potato quality and are within the range of 15-40%.

Potato Starch: Potato starch is the most advanced product of many applications where starch is used in potatoes that are fed on a grinding machine or hammer and separated by a slide, which is transferred to the screen to separate the released starch from the hole.

Figure: 3.2 Potato Process flow Diagram



Biological wastewater treatment Methods

Wastewater treatment is an important and important step in the wastewater treatment system and manages wastewater from residential or industrial buildings etc. It is often referred to as the second treatment process used to remove any impurities left over after basic treatment. Chemical wastewater treatment uses chemicals to convert contaminants into contaminated water and natural remedies use bacteria to reduce wastewater pollution. It is divided into two types and is as follows:

1. Biological Aerobic Treatment (there is oxygen)
2. Biological Anaerobic Treatment (without oxygen)

1. Aerobic Biological Treatment: Aerobic wastewater treatment is a biological process that occurs in the presence of oxygen. It is a fast and effective waste treatment treatment that removes up to 98% of biological pollutants. This process results in the effective deterioration of natural pollutants and produces clean water contamination rather than anaerobic treatment.

a. Activated Sludge Process: The sludge process used is a waste treatment method that is widely used in the second stage of wastewater treatment. The activated sludge process refers to a multi-chamber chemical unit that uses microorganisms that focus on natural degradation and the removal of nutrients from contaminated water to produce high quality impurities. In this way, organic matter and micro-organisms are raised (by mechanical aerator) in the aeration tank.

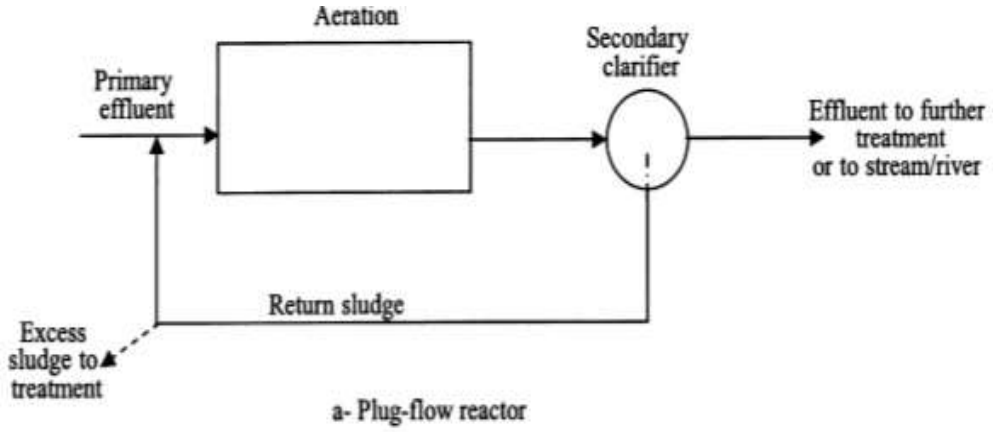
b. Deceptive filters: This is the second most commonly used type of aerobic treatment also called filtration or spraying. These filters are often used to remove substances such as ammonia from water after basic treatment. A second permanent pollution can enter the alarm system

c. Aerated Lagoons: It is one of the most effective aerobic or wastewater treatment systems. A high-pressure dam is a therapeutic pool that is provided by aeration of equipment that delivers oxygen to the pool to promote biological wastewater. Polluted air pollutants can be recycled or recycled, but structured mud needs further treatment.

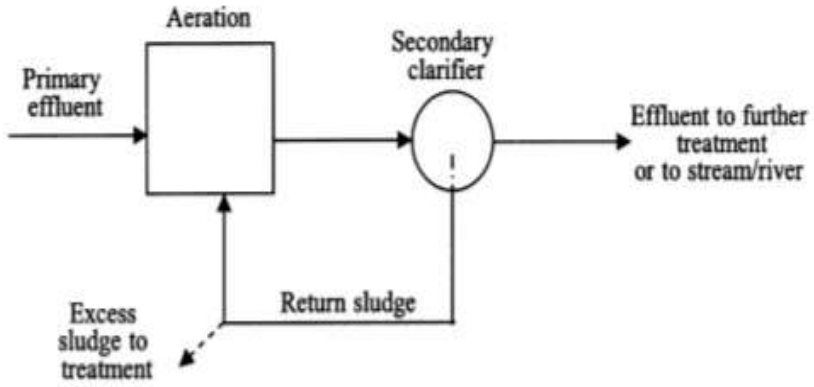
d. Oxidation Dam: Pools that include contact between bacteria, algae and other organisms that feed on organisms found in contaminated water. These ponds are also productive, as they produce impurities that can be used by other applications. All in all the process is slow and requires large areas of the world. Ordinary oxidation pools are used in densely populated areas where the earth is easily accessible.

2. Biological Anaerobic Treatment: This treatment method is effectively used to treat high waste treat the wastewater at a level that will allow municipal sanitation system's and uses organic matter that works where there is no oxygen and will treat the wastewater at a level that will allow municipal sanitation system.

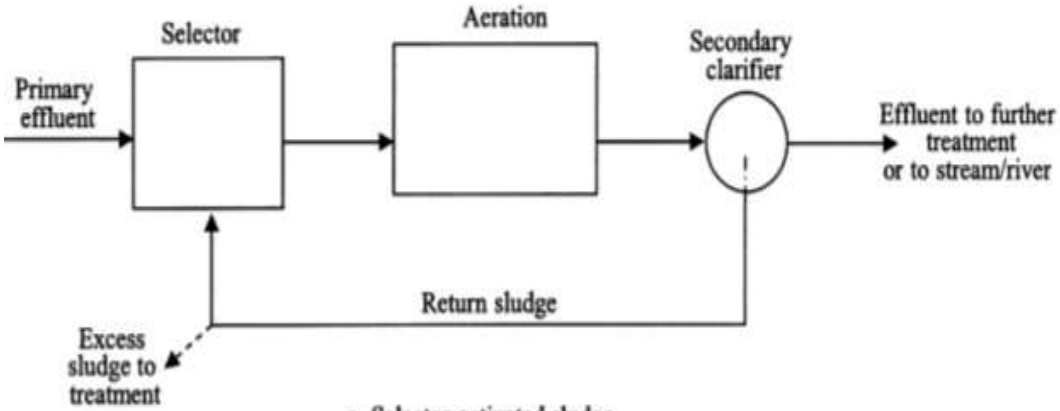
Figure: 3.3 Biological Treatment Process flow Diagram



a- Plug-flow reactor



b- Completely mixed reactor



c- Selector-activated sludge

Table: 3.1 Treatment Units, Unit Operation, Unit Processes, and Systems for Potato Processing Wastewater

Treatment Unit	Unit operation	Remarks
In-plant	Conservation and reuse of water, Process control	Reduction of waste flow and load
Pretreatment	Screening by using the mesh, (mesh size: 20 to 40 per inch),	10–25% BOD5 removal
Primary treatment	Sedimentation, Flotation	30–60% BOD5 removal
Equalization Neutralization	Using the Balancing tank or the buffer tank or the Conditioning tank	Constant flow and concentration pH and temperature corrections
Secondary treatment 1. Aerobic processes	By using the Natural systems, Irrigation land treatment, Stabilization ponds and aerated Lagoons, Wetland systems Method : Activated sludge, MBBR, MBR, Rotating biological contactors, Trickling filters	70–80% COD removal
2. Anaerobic processes	Method: Up flow anaerobic sludge blanket (UASB) reactors, Expended granular sludge bed (EGSB) reactors, Anaerobic contact reactors, Anaerobic filters and, fluidized-bed reactors	80–90% BOD5 removal 70–80% COD removal
Advanced treatment	Micro straining Granular media filtration Chemical coagulation/sedimentation Nitrification–denitrification Air stripping and ion exchanging Membrane technology (reverse, osmosis, ultrafiltration)	90–95% BOD5 removal 90–95% COD removal

MOVING BED BIOFILM REACTOR [MBBR]

The MBBR process uses floating plastic carriers (media) inside the aeration tank to increase the number of microbes available to treat contaminated water. Microorganisms feed on living things. The media provides more space for the formation of tiny germs that attach to it and grow in aeration tanks. The expanded surface area reduces the treading of tanks needed to handle wastewater. The media continues to be disrupted by bubbles from the aeration system that add oxygen to the bottom of the first chamber of the aeration tank. Microorganisms feed on living things. Compared to conventional secondary treatment it offers better performance and value.

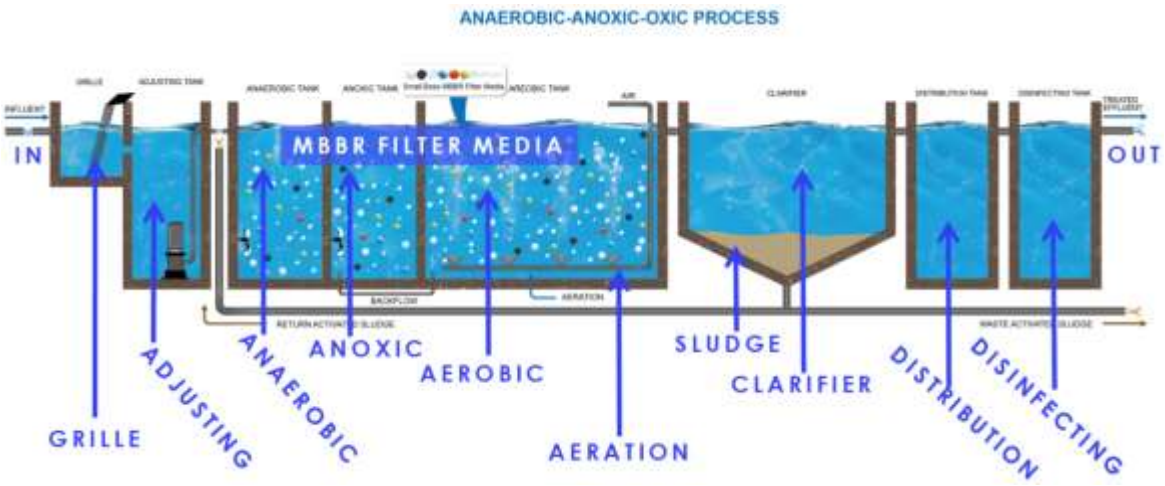


Figure: 3.4 Moving Bed Bio Reactor (MBBR) Process flow Diagram

Microorganism start to grow and attach on bio media within 7 to 20 days under stable system. Carrier provi de a safe and comfortable environment for microbial breeding, biological variety, because of no sludge age limit, nitrifying bacteria have also been large-scale breeding, microbial population huge is dissolved organi c compounds and ammonia decomposition.

Figure 3.5 Bio Media or MBBR Media.

Technical specification of Bio-media: Density: 0.94-0.97g/cm³, Virgin HDPE material, Dosing ratio: 15%-70%, Packing number: >990000pcs/m³, Active surface area more than 1000㎡/m³, Life span: >15years, Nit rification efficiency: 500g NH4-N/m³.d

Advantages of Bio-media - ·High hydrophilicity and excellent adhesion to surfaces, High bio-activity and b io-film short time, High impact resistance and stable operation, Less residual sludge, High volume load, hig h filling rate and less land occupation, Cost-effective, easy to operate and maintain, Rebuild-free, easy to up grade or expand, Long service life more than 15 years.

4. RESULT AND DISCUSSION

Table 4.1 Characteristic of untreated wastewater generated from Potato chips and snacks Industries

Parameters	Unit	Untreated Waste water			
		September	October	November	December
COD	mg/l	3210	3322	3158	3267
BOD	mg/l	1800	1891	1788	1859
Total suspended solids	mg/l	778	788	765	756
pH unit	pH	7.20	7.30	7.30	7.45
Chlorides	mg/l	390	400	380	405
Nitrogen	mg/l	328.4	330.7	325.6	326.8
Phosphorus	mg/l	328.4	332.1	327.5	330.2

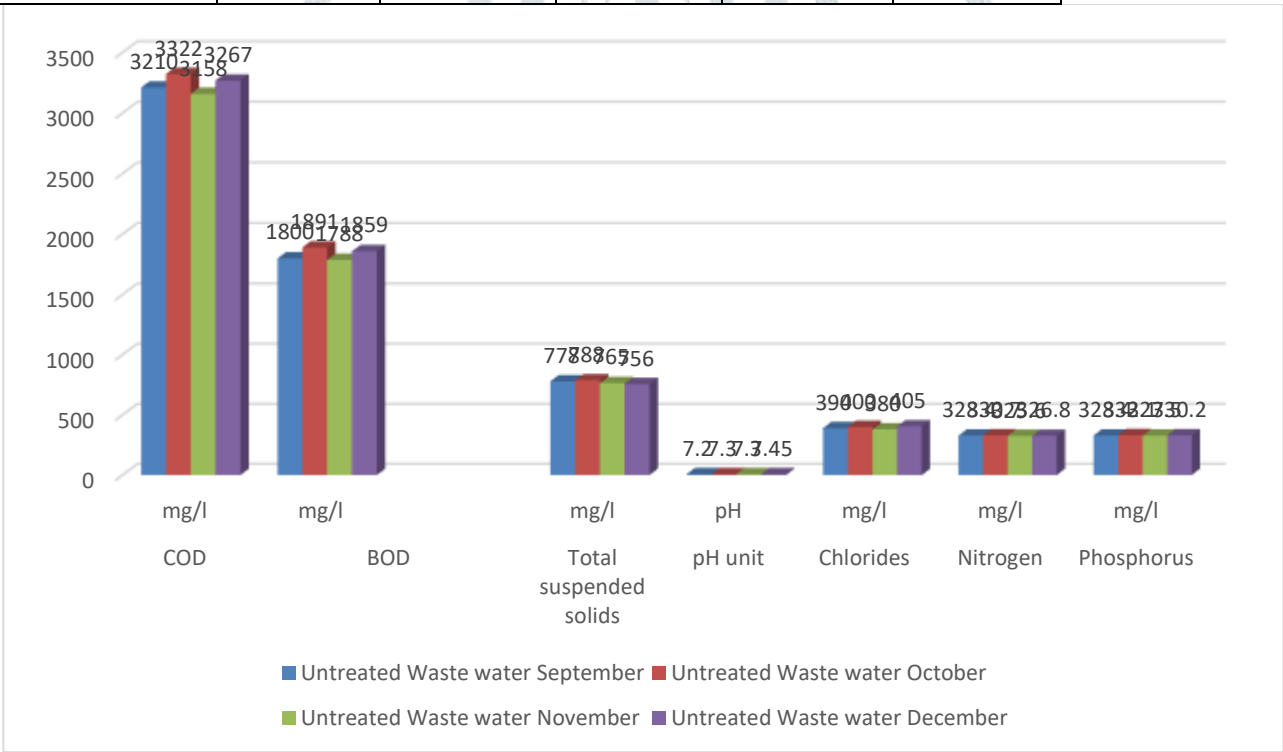


Figure: 4.1 Characteristic of untreated wastewater generated from Potato chips and snacks Industries

Table 3.3 Characteristic of treated and untreated wastewater generated from Potato chips and snacks Industries

Parameters	Unit	Treated Waste water			
		September	October	November	December
COD	mg/l	80	77	78	82
BOD	mg/l	20	22	19	24
Total suspended solids	mg/l	50	55	45	50
pH unit	pH	6-8	6-8	6-8	6-8
Chlorides	mg/l	30	28	32	34
Nitrogen	mg/l	50	48	52	54
Phosphorus	mg/l	10	9	11	13

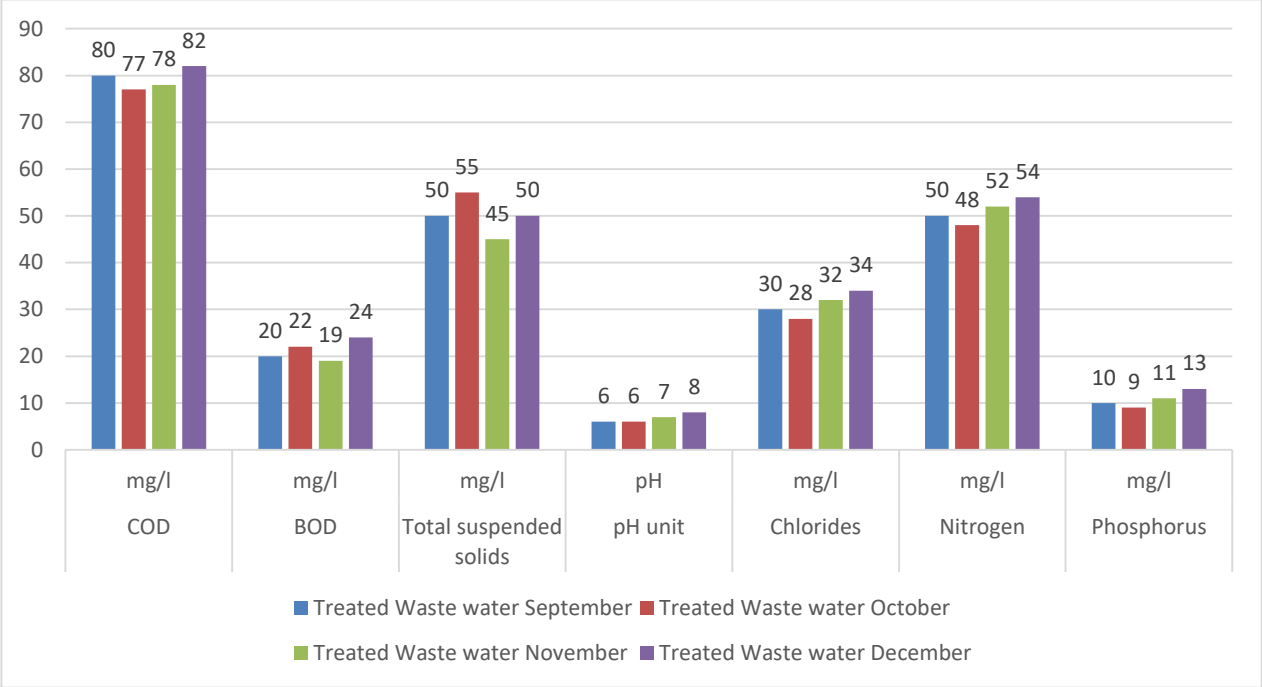


Figure: 4.2 Characteristic of treated wastewater generated from Potato chips and snacks Industries

ADVANTAGES

Using a Moving Bed Bio reactor on top of other traditional wastewater treatment systems can be an industri al step in many industries, as MBBR comes with very high quality. Comparison study with the following-

Compact: MBBR is an excellent alternative to spatial space, requiring less space than other systems.

Simple: Another obvious advantage of MBBR is that it is a straightforward process. MBBR allows the envi ronment to take its course, reducing user experience.

Low maintenance: MBBR is also a low maintenance system. Maintenance tasks such as back washing whic h the operator has to perform in some cases are usually not required with MBBR.

Flexible: MBBR is naturally able to adapt as needed to various loads and mutations in an influential person, because the microorganisms do not respond to the mutations.

Effective: The MBBR system can work much faster than other water treatment methods. The BOD hydrauli c (HRT) retention time and nitrogen removal by MBBR are approximate

CONCLUSION

Wastewater is highly perishable, which can be successfully treated with wastewater treatment programs. Wastewater is produced by the dairy industry, the slaughterhouse, the potato processing plant contains a high amount of contaminants. The volume, concentration, and composition of the pollutants from the food industry depend on the type of product being processed, the production system, operating methods, construction of the repair facility, the level of water management used, and later the amount of water stored. MBBR or Moving Bed Biofilm Reactor technology is a new process of purifying wastewater using a special biological treatment system using high-quality communication media, including the benefits of suspended growth and consistent film processes into one easy-to-use solution. Addition of media to activated sedge container Biomass expansion without increasing MLSS load to specify Ventilated Reactors to process and integrate MLSS requirements into transition reactors, housed in clarifier return to reactor (such as RAS) Repetitive use internally recycled provides nitrate for the reduction of anoxic areas, if required Common for retrofits of existing plants with high loads or limitations.