

CHARACTERISTICS OF CORN(Maize) INDUSTRIAL WASTEWATER

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Abstract. Corn(Maize) processing requires, a considerable amount of water. In comparison to other industrial sectors which is employed in the majority of processes such as Production, cleaning, and sanitising which are examples of plant activities. Cooling and materials transportation to name a few which requires more water. The properties of wastewater reveal a high Biological Oxygen Demand(8500 mg/L),Chloride(14,245mg/L), Sulphate(700mg/L), phosphate(18.7mg/L) and Total solids(9845mg/L). If wastewaters containing properties mentioned above are released without treatment, receiving water sources are badly polluted and utterly destabilises the water sources. Characteristics of wastewater shows that the waste is highly organic in nature and biologically decomposable.

KeyWords: Corn¹, BOD², COD³, Wastewater⁴, Strength⁵

1.INTRODUCTION

Modern industrial wastewater has entirely factor quality and volume relying upon the sort of industry creating it. The waste may be exceptionally biodegradable or not in any way and could conceivably contain compounds obstinate to treatment. These incorporate organic synthetic substances or heavy metals whose content in agricultural nations. wastewater might be impressively divergent (in amount and quality) from that of developed nations. The fundamental worry with modern wastewater is the expanding sum (in amount and assortment) of toxic compounds and heavy metals contained in and released into the environment. Starch is frequently utilised in huge amounts in the food, pharmaceutical, paper, and textile industries. Corn is a major source of starch in a variety of Countries. Corn starch produced worldwide contributes huge amount of acidic effluent containing, biological oxygen demand and also contains nitrate, sulphates, phosphates, Totaldissolves solids, Volatile organic compounds. Hence such a waste cannot be discharged without treatment. The anaerobic digestion process is one of the treatment process to treat strong organic wastes. Which is very sensitive to pH value, which raises the cost of operation. Several recent concepts have been shown to be highly promising, including low pH methanogenesis, anaerobic ammonium oxidation, it still requires assessment for effective waste treatment from corn starch industrial effluent.

1.1 Source of Corn Industrial Wastewater

Corn starch and its subsidiaries are delivered by wet processing and preparing includes a progression of cycle from screen grain, cleaning, pounding, partition of protein and starch, drying and further handling to yield subordinantes, similar to fluid glucose, dextrose mono hydrate and so forth with acid or enzymatic hydrolysis. Wet milling is a water-intensive technique that necessitates a large volume of water, resulting in massive amounts of effluent. The wastewater after corn processing contains high amount of volatiles, precipitation of modified starch, dissolved chemicals utilized in modification, impurities from syrup, gluten and dextrose.A schematic of entire interaction is addressed in Fig. 1

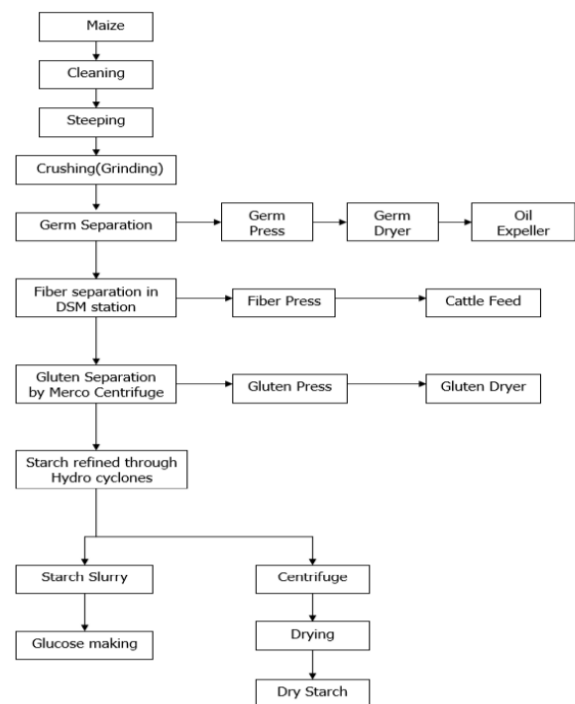


Fig. 1. Schematic representation of corn starch production by wet milling method

1.2. LITERATURE SURVEY

Santosh Jogur, Rajani S (June 2019): “**CHARACTERISTICS OF DAIRY AND DISTILLERY INDUSTRIAL WASTEWATER**” : This study focuses on the characteristics of the Dairy and Distillery Industrial wastewater. Dairy and Distillery wastewater had BOD values 11787mg/L and 49975mg/L respectively. Both wastewater had higher Chemical oxygen demand (COD) 16296mg/L (Dairy wastewater) and 120000mg/L(Distillery wastewater). Solids, Nitrate, Sulphate, Chloride, Alkalinity concentration contents also higher.

Mona A. Abdel-Fatah (July 2015) : “**Investigation on Wastewater Treatment of Maize Processing Effluent**” : In this study a treatment unit for wastewater resulted from maize processing for sucrose, fructose and starch production is proposed. Wastewater obtained with a capacity of 3960 m³ /day is analysed. Main pollutants in wastewater are settleable matter, sulphide, SO₂, ammonia; COD and BOD while no problems concerning pH, temperature, oil and grease. Most of the organic will be removed, but inorganic salts may be too high. This will require some type of reverse osmosis (RO) treatment which is suitable also for Cl--removal; while total phosphorus removal will be done by chemical precipitation.

2. MATERIALS AND METHODOLOGY

The study was conducted under ambient environmental conditions. Grab sampling method was used while sampling. Characteristics were tried according to Standard methods (19th edition). The characteristics of Corn industrial wastewater such as Color, BOD₅, COD, pH, Nitrate, Total Solids, Dissolved Solids, Suspended Solids, Chloride, Phosphate and Sulphate had been analyzed.

The Environment Protection Rules 1986 effluent standards for discharge of wastewater to inland surface water and marine coastal areas as shown in table - 1

SL.NO	Parameters	Standards	
		Inland surface water	Marine costal area
1	pH	5.5-9	5.5-9
2	Suspended solids mg/L(max)	100	100
3	Biochemical oxygen demand (mg/L 3days 27 ^o c)	30	100
4	Chemical oxygen demand mg/L	250	250
5	Nitrate nitrogen mg/L	10	20

Table 1 - The Environment Protection Rules 1986 General standards for discharge of environmental pollutants: effluents

3. RESULTS AND DISCUSSIONS

The results obtained during the study are presented in Table-1

Sl.NO	Parameters	Units	Characterstics
01	Color	-	Creamish yellow
02	pH	-	4.2
03	Total solids	mg/L	9560
04	Dissolved solids	mg/L	9450
05	Suspended solids	mg/L	110
06	COD	mg/L	11000
07	BOD ₅ @20 ^o C	mg/L	8500
08	Chloride	mg/L	14,245
09	Phosphate	mg/L	18.7
10	Sulfate	mg/L	700
11	Nitrate	mg/L	4
12	BOD ₅ /COD ratio		0.77

Table -1: Physio-Chemical characteristics of Corn industrial wastewater

Corn industrial wastewater has Creamish yellow color. Wastewaters characterized has average BOD₅ value of 8500mg/L and COD value of 11000mg/L. pH value of 4.2 which indicates acidic in nature. Total solids, Nitrate, Chloride, Sulphate, Phosphate is 9560 mg/L, 4mg/L, 14,245mg/L, 700mg/L, 18.7 mg/L respectively

The results shows the wastewater is highly strong in nature and BOD/COD ratio indicates it is bio-degradable in nature

4. CONCLUSIONS

- From the qualities examines it is inferred that wastewater released from corn Industry has Cremish yellow tone so it needs to be treated.
- pH value shows that it is highly acidic in nature
- COD, BOD₅, and Total solids are all greater in wastewater, indicating that it is a strong wastewater.
- Cholride levels in wastewater are high it may interfere with the treatment
- The BOD₅/COD ratio in corn wastewater is 0.77. Hence it indicates that waste can be treated biologically

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