CHARACTERISTICS OF FOOD PROCESSING (MAIZE) INDUSTRIAL WASTEWATER

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Abstract - *Food industry requires a large quantity of water for various processes. Compared to other industrial sectors, food industry requires more water, used in throughout most of the plant operations, such as production, cleaning, sanitizing, cooling and materials transport, among others. The characteristics of wastewater shows high chemical oxygen demand, biological oxygen demand, Nitrate, sulphate, phosphate and Solids such wastewaters, if discharged without proper treatment, severely pollute receiving water bodies and disrupts completely.*

Key Words: Maize[1] Effluent[2] wastewater[3] Strength[4] BOD[5] COD[6]

1. INTRODUCTION

Corn starch industry contributes almost 12% of starch production. Maize starch, produced worldwide, contributes huge amount of acidic effluent (pH 3-5) containing high Chemical oxygen demand (COD) (10000-30000 mg/L), biological oxygen demand (BOD) (4000-8000 mg/L), nitrogenous pollutant (400-900 mg/L) Conventional methods of anaerobic digestion and nitrification-denitrification process are widely being used to treat starch industry effluent. The anaerobic digestion requires neutral pH operation thus increases operational cost. Similarly, nitrification and denitrification processes are lengthy processes consuming high operational cost and require secondary treatment for generated excess sludge. Several technologies like low pH methanogenesis, anaerobic ammonium oxidation, and sludge pyrolysis are the newer concept found to be very promising. But it still requires evaluation for effective removal of waste from corn starch industry effluent; as well as a matter of extensive research itself because of the non-confirmative bacterial characteristic, occurrence, growth factor, culture and isolation possibilities, which are still to be explored. (e.g. [1])

1.1 Source of Maize Industrial Wastewater

Waste generating processes of major significance include Flow chart shown Figure-1(e.g. [2])

1) Washing, cleaning and cleaning, sanitizing, cooling and materials transport, processing equipment, tanks, trucks and filling machines.

2) Breaking down of equipment and breaking of packages resulting in spilling during filling operations.
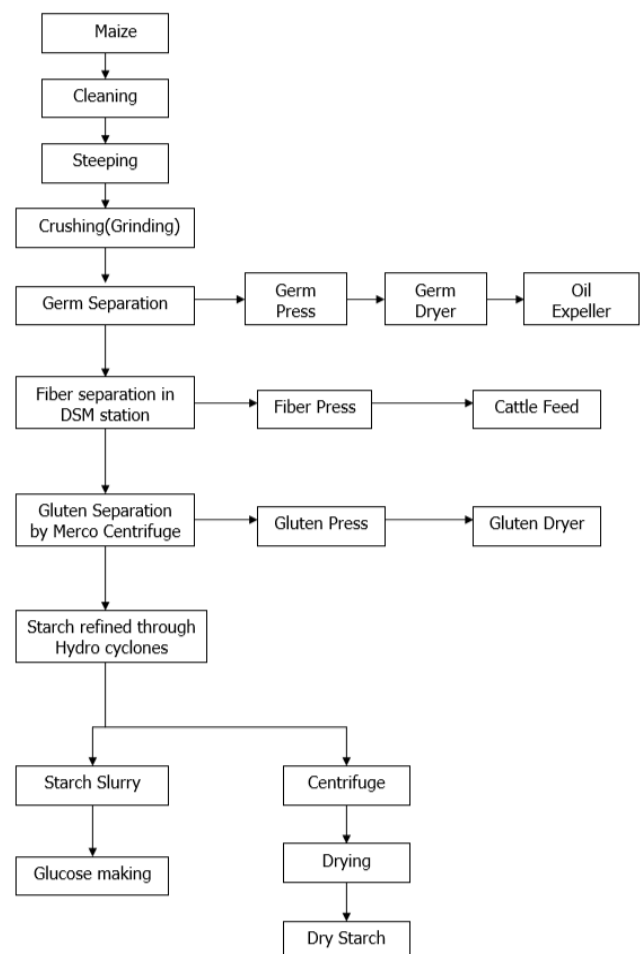
3) Lubrication of cases, stackers and conveyors

FIGURE-1 General Process Flow Diagram for Maize Processing Operations

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2. MATERIALS AND METHODOLOGY

The study was conducted under ambient environmental conditions. Grab sampling method was used while sampling. Characteristics were tested as per methods prescribed by central pollution control board (CPCB) for the examination of water and wastewater (21st edition 2012). The characteristics of the Food Processing (Maize) industrial wastewater such as Color, Odor, BOD5, COD, pH, Nitrate, Total Solids, Dissolved Solids, Suspended Solids, Chloride, Sulphate, had been analyzed. The Characteristics of both the wastewaters are conducted at ambient temperature the results obtained during the study are presented in Table-1. (e.g. [3])

Table-1 Physico-chemical characteristics of Maize Industrial Wastewater

Sl.N0	Parameter	Unit	Characteristics
01	pH	_	4.0
02	Color	-	Cremish yellow
03	Total solids	mg/L	19700
04	Dissolved solids	mg/L	16100
05	Suspended solids	mg/L	3500
206	COD	mg/L	11500
07	$BOD_5@20^0C$	mg/L	9000
08	Chloride	mg/L	2650
09	Phosphate	mg/L	3750
10	Sulfate	mg/L	4300
11	Nitrate	mg/L	250
12	Iron	mg/L	243

The Environment Protection Rules 1986 effluent standards for discharge of wastewater to inland surface water and marine coastal areas as shown in table discharge of wastewater to inland surface water and marine coastal areas as shown in table-2

Table -2 The Environment Protection Rules 1986 General standards for discharge of environmental pollutants: effluents (e.g. [4])

SL.NO.	Parameters	Standards	
		Inland surface water	Marine costal area
1	pH	5.5-9	5.5-9
2	Suspended solids mg/L	100	100
3	Biochemical oxygen demand (mg/L 3days27^{0}c)	30	100
4	Chemical oxygen demand mg/L	250	250
5	Nitrate nitrogen mg/L	10	20

3. RESULTS AND DISCUSSION

Maize Industrial wastewater had Cremish yellow color respectively so while discharging treatment required removing color. Wastewaters characterized higher BOD5 5630mg/L.COD of Maize wastewater is 8500mg/L. pH value of Maize wastewater is 4 indicates acidic in nature. Nitrate of Maize 243 mg/L respectively. Total Solids waste is high 12490mg/L. Chloride 480mg/L and Sulphate 3930 mg/L. and Maize waste had BOD5/COD ratio 0.41 it indicates this wastewater cannot be treated biologically.

4. CONCLUSIONS

- From the characteristics studies it is concluded that wastewater discharged from Maize Industry Cremish yellow color so it cannot be discharged without any treatment.

- Wastewaters had higher values of COD, BOD and Total Suspended Solids indicates strong wastewater.

- Higher quantity of Nitrate found in wastewater.

- Maize wastewater is highly acidic in nature. Wastewaters had high concentration of Chloride and Sulphate contents. Maize wastewater cannot be treated biologically as BOD/COD ratio is less than 0.6. These kinds of wastewater cannot be discharged to natural water bodies without suitable treatment.

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