

Distillery Spent wash: Problems and Solutions

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Abstract: India is a major producer and consumer of sugar in the world. Molasses based distillery along with their product (alcohol) generate wastewater called as spent wash. A huge amount quantity of spent wash has been produced by the distilleries in India whose disposable into water bodies or land causes a number of environmental problems. Now-a-days emphasis is laid on waste minimization and revenue generation through byproduct recovery. The distillery spent wash can be utilized in agriculture for irrigation purposes, as fertilizer, a source of renewable energy and as manure.

Keywords: Distillery spent wash, Utilization, irrigation, renewable energy

1. INTRODUCTION

India being a developing country establishing a large number of industries such as sugar, distillery, steel, paper, textile that play important role in progress of the nation. These industries along with their product produce wastewater, causes various environmental problems. However, wastewater characteristics are different from industry to industry. India is a major producer of sugar in the world, and sugar industry offers employment potential and contributes substantially to economic development. There are about 579 sugar mills and 285 distilleries in India. Apart from sugar and alcohol, these factories generate many by-product and waste material [1]. Molasses a by-product of sugar industry is being used as a raw material in distilleries for the production of alcohol, which gives considerable income to these industries. However, for every liter of alcohol production about 10-15 liters of wastewater known as spent wash is produced. About 40 billion liters of spent wash is generated from distilleries in India [2].

2. ALCOHOL MANUFACTURING PROCESS

The distilleries use molasses as a raw material for production of alcohol. This molasses contain 7-8 % glucose, which is converted in to alcohol by fermentation process. First molasses is diluted by adding water and adjust the total dissolves solids up to 7-8%. Then yeast is added in diluted molasses solution and fermentation process takes place. As process goes up glucose is converted in to ethyl alcohol and carbon dioxide. This carbon dioxide will remove as a gaseous form, which is collected separately. After sufficient conversion of glucose in to ethyl alcohol this solution is called beer solution. This beer solution is then passed through distillation column. Based on temperature

difference ethyl alcohol separated from beer solution and condensed into liquid form. The wastewater from distillery column called spent wash.

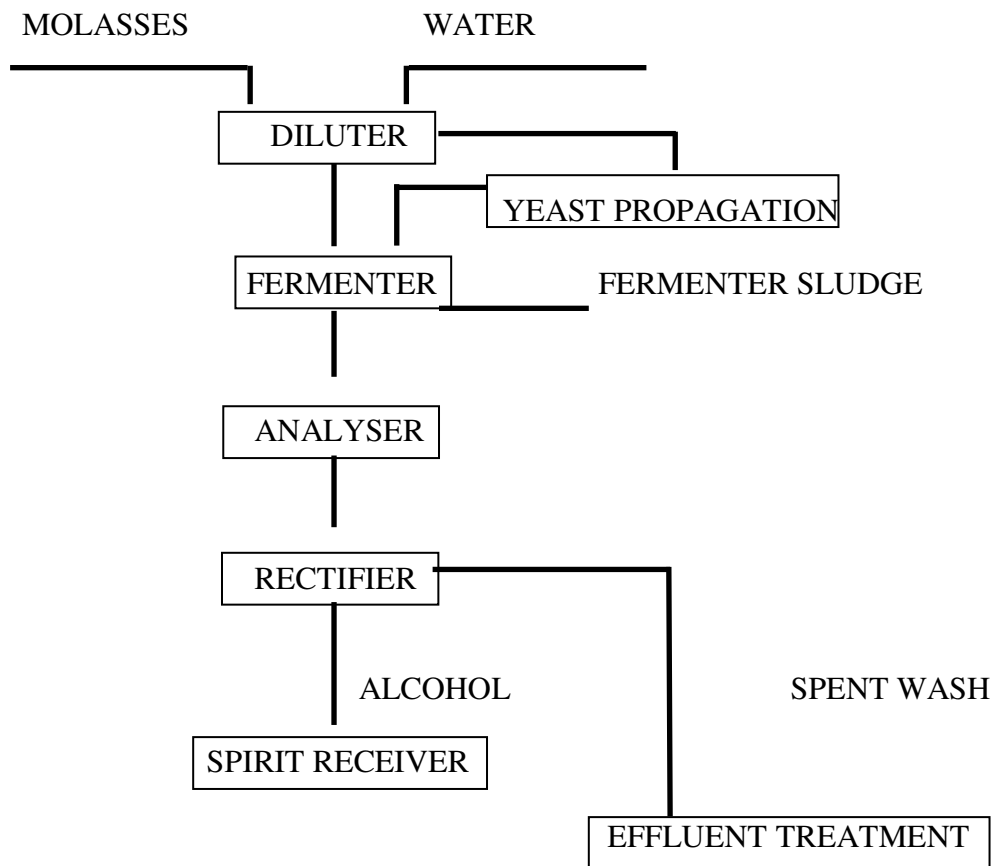


Figure 1: Diagrammatic representation of alcohol manufacturing process

3. NATURE OF DISTILLERY SPENT WASH

The aqueous distillery effluent, spent wash is a dark brown highly organic effluent. It is one of the most complex, troublesome and strongest organic effluent. The spent wash is acidic and characterized by high BOD and COD value. Being plant origin, the spent wash contains considerable amount of plant nutrients and organic matter [1]. Spent wash is an acidic effluent rich in organic carbon, K, Ca, Mg and S, considerable amount of N, P, traces of micronutrients viz Fe, Mn, Zn, Cu and traces of sugar are also observed [3]. The presence of appreciable amount of plant growth promoter viz gibberellic acid (GA) and indole acetic acid (IAA) have also been detected

which further enhances the nutrient value of spent wash [4]. The distillery spent wash is dark brown in colour with unpleasant odour. However it is non-toxic, biodegradable, purely of plant origin and contains large quantity of soluble organic matter and plant nutrients [5].

Table 1: Physico-chemical characteristics of distillery spent wash (100%)

Parameter	Observation
Colour	Deep reddish brown
Odour	Aromatic
Specific gravity	1.05
pH	4.5
DO	Nil
BOD	51000
COD	82580
Total solids	86804
Total nitrogen	927
Total phosphate	45.60
Total potassium	61.00

Values other than colour, odour, pH and specific gravity are mentioned in (mg/l).

Source: [6]

4. UTILIZATION OF DISTILLERY SPENT WASH

The distillery spent wash can be utilized in a number of ways such as:

1. Composting:

In this process, press mud generated from sugar mill is utilized to produce compost by mixing distillery effluent. Both anaerobic and aerobic are practiced. In some plants composting with treated effluent treated effluent treated through bio-methanation plant is also practiced. The system can achieve zero effluent if the press mud quantity matches with the effluent generated.

2. Potash recovery:

It is done by incinerating the distillery spent wash. In this process, the raw spent wash is first neutralized with lime and filtered. This is further concentrated to about 60% solids in multiple-

effect forcer circulation evaporators. Now this thick liquor form the evaporator is burnt in an incinerator and is converted into ash. The dry solids of the spent wash in the form of coke in the incinerator has an average calorific value of 2 kcal/kg, which is sufficient for supporting self-combustion of the thick liquor in the incinerator. The resulting ash is found to contain about 37% of potash as potassium oxide on an average. This ash is further leached with water to dissolve the potassium salts.

3. In agriculture:

Distillery effluent can be used in agriculture practice. It is of purely plant origin and contains large quantities of soluble organic matter and plant nutrients. It does not contain any toxic elements or compounds. The only problem with distillery effluent to be used in agriculture is excessive biological oxygen demand and chemical oxygen demand. These problems could be overcome either by application of distillery effluent after proper dilution (1:10 to 1:50) with irrigation water by pre-plant application (40-60 days before planting) [7]. Spent wash do not contain any toxic metals, since it is mainly waste form plant material and microbial residues contains major micronutrients and sustain soil fertility and yield of crop [8].

A number of researchers have shown their results to demonstrate the effect of distillery spent wash on plant growth and crop productivity as in rice and wheat [9], groundnut [10], C3 and C4 plants [11], sugarcane [12], pulses [2], maize [13], *Stevia rebaudiana* [6] etc.

4. Biogas production:

For the production of biogas from distillery spent wash anaerobic biomethanation of the effluent is adopted, generally. High rate anaerobic technologies are utilized for biogas production.

5. CONCLUSION

One of the most important environmental problems faced by the world is management of wastes. Now-a-days emphasis is laid on waste minimization and revenue through byproduct recovery. Pollution prevention focuses on preventing the generation of waste, while waste minimization refers to reducing the volume or toxicity of hazardous waste by water recycling and reuse, and process modification and the byproduct recovery as a fall out of manufacturing process creates ample scope for revenue generation thereby offsetting the cost substantially. The utilization of distillery effluent in agriculture would save cost on fertilizer, better crop productivity and facilitate reduction in pollution.

It has also been elucidated that many technologies are available in our country need to be exploited to the maximum so that, this will help to control the pollution created by the distillery wastewater and also derive by-products which are commercially beneficial.

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