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WASTEWATER MANAGEMENT IN MOLASSES BASED DISTILLERY INDUSTRY: A REVIEW

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ABSTRACT
The present study reviews recent research works of waste water management techniques in distillery industry across India. The paper not only discusses need of waste water management but also existing methods of doing it. Paper also provides an insight for future reference application of the same.

INTRODUCTION
Industrial development significantly contributes to economic growth but brings along with it a lot of environmental problems. The expanding industries discharge their waste in neighboring streams, the latter get polluted and become progressively unsuitable for irrigation since the growth and yield of the crop is affected.

A large network of distilleries has been established in India which has been recognized as one of the most polluting agro-based industries generating huge quantities of distillery effluent. There are more than 350 distilleries in India which release 45 billion liters of wastewater yearly. For the production of every one liter of alcohol nearly 12 -14 lit. of effluent is discharged. Every distillery unit is generating 5-10 lakh lit. of raw effluent per day.

Molasses form the sugar factory is the major constituent in the sugar Industry. Molasses is the by-product of sugar Industries. The effluent of distillery is known as spent wash. Spent wash is the approximately 13-16 times more by volume to that of the alcohol. It is highly organic brown in color. Spent wash having BOD 40000-60000 mg/lit and COD about 1, 20,000-1, 40,000 mg/lit. So it is very troublesome to treat spent wash.

It is therefore obvious that some treatment is necessary to minimize the deleterious effects before the waste is discharged onto land. Disposal of these effluents after proper treatment is favorable approach because after by using appropriate measures effluent comes within limits and pollution load is reduced.

LITERATURE REVIEW
Shivkumar K., Ramesh S.M. (2013) has carried out the study of M/s Rajeshree Sugar and Chemicals Ltd, Karnataka for recycling of treated distillery evaporator condensate and excess condensate from sugar plant. While analysing it is concluded that with well-planned prevention of pollution and water management techniques, it is possible to achieve zero effluent discharged industry.

V.G.Bahulekar, (2010); discussed that while evaluating various technologies for distillery spentwash treatment like Incineration of effluent after evaporation and Methane gas generation using anaerobic rectors to be followed by aerobic secondary and tertiary treatment which achieve zero effluent discharge in DISTILLERY.

Prof. Annasaheb Warade (2015) discussed that spentwash can be incinerated in the boiler to make a distillery complex self-sufficient in terms of steam & Power. Also condensate & spent less can be treated & recycle back in the process which has reduced the fresh water requirement.

Leskshmi S.R.(2008) discussed that for treatment of effluent in distillery the anaerobic digestion along with advanced oxidation is very effective to reduce the COD along with biogas production.

Plavsic et al (2006); discussed that the distillery spent wash were characterized by dark brown color, objectionable odour with total solids of 52,000 to 86,000 mg/l, total volatile solid of 3000 to 5000 mg/l very high BOD and COD and chlorides of 1000 to 1500 mg/l. Physical methods for distillery effluent are incineration, vinasses (spentwash) concentration and valorization, potash recovery and production of organic fertilizer.

Kaushik et al (2010) revealed that microbial strains sequential treatment has gained importance in the treatment of distillery spent wash due to the reduction of high organic load. A three stage treatment of the distillery spent wash was studied. Where two Fungal culture of Emericella nidulance and Neurospora are used in first two stages followed by bacterial strain of Bacillus sp as third stage .The treated effluent showed 82.5% reduction in color and 93 % reduction in COD after 30h.

Recently **Amit et al** revealed that a coupled biological treatment followed by photochemical processes was implemented for treatment of bio-recalcitrant effluents from an agro-residue based pulp and paper mill. However these sequential methods has its own technological advantages and yet are in its infancy, requiring economical considerations in order to apply it in large scale distillery units. So far a combined treatment of biological (fungi) followed by photochemical processes (cyanobacteria) was not been implemented for the treatment of distillery spent wash.

Apte S. S., Hivarekar S. B.(2014) conducted a study in their project that was based on actual data generated through practical operations of the treatment scheme employed. Also the design was carried out by the author and the plant erected on the same basis. The treatment proved to be a critical initiative for the proper disposal of the spent wash from the distillery which is a major environmentally dangerous wastewater stream

According to Lekshmi.S.R (2013) this study the main objective was to use anaerobic digestion along with advanced oxidation to reduce COD from the distillery spent wash. The COD of the raw spent wash was found to be around 82,000 mg/l which was reduced to 17,000 mg/l in the first stage. The remaining COD's biodegradability was increased by using by hydrogen peroxide oxidation. Further it was again passed to another plug flow anaerobic reactor were the biodegradable COD is further reduced. Here the COD of HABR was further reduced to 6000 mg/l l thus giving an overall COD removal efficiency of 92% at the end of the whole cycle of process. Thus the objective of COD reduction of distillery spent wash was achieved by the stated methodology along with biogas production.

N.K. Saha, M. Balakrishnan, V.S. Batra (2004) aimed at identifying options for improved water use through a case study in a local distillery. It emerged that optimization of cooling tower operation, innovative ways to reuse wastewater streams like spent lees and spent wash and employing semi-continuous/continuous fermentation could reduce water use in distilleries.

Verma Chhaya and Rajesh Kumar (2014) found evidence which shows success stories of fertigation and the distillery effluent and its composition, positive effects of distillery effluents after dilution. Apart from these immense qualities the paper also focuses on the beneficial use of distillery effluent in agriculture which reduces the use of chemical fertilizer and fresh water in irrigation purpose.

P.K. Tewari, V.S. Batra, M. Balakrishnan (2007) insists in this paper that considerable water saving can be achieved by better housekeeping, segregating, recycling and reusing of non-process wastewater. There are several initiatives being followed by Indian distilleries to minimize their water consumption and recycle

the treated wastewater. However, in addition to this, research to address existing gaps is also necessary to provide a comprehensive and cost effective solution to enable the industries to become low water consuming and zero discharge units.

DISCUSSIONS

The review done here in this study reveals more and more about methods for waste water management carried out in molasses based distilleries across India. Paper also evaluated sources and causes of wastewater generation. And recognized the possibilities to reduce, reuse and recycle the wastewater. The paper identifies gap in the research work as to propose the appropriate measures towards Zero Discharge.

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