

Utilization of Indian railway bio-toilet waste as an agriculture fertilizer

The Indian Railways have been widely chastised for dumping human waste on railway tracks, which pollutes the environment and makes human life difficult. Indian Railways are working hard to solve this problem by developing environmentally friendly toilet facilities. The bio toilets were adopted by the Indian Railways to handle this problem in an environmentally friendly manner. However, due to the failure of these bio-digesters for a variety of causes, new problems have arisen, so this paper outlines the issues raised by bio-toilets and how to address them, which satisfies the major objective of Swaccha Bharat Abhiyan.

Keywords: Bio-toilets, controlled discharge sanitary system, eco-friendly, agricultural fertilizer.

1.0 Introduction

A bio-toilet is a complete waste management solution which reduces solid human waste to bio-gas and water, with the help of a bacterial Inoculum. Biological decomposition of human waste is done in bio-digester tanks with the help of anaerobic bacteria. Discharging on schedule, in addition to causing environmental challenges, causes problems for workers. For the introduction of environmentally friendly toilets on IR passenger coaches, a multi-pronged plan has been implemented. Indian Railways have decided that all coaches to be fitted with bio-toilets by 2020-2021. Green toilets are having its benefits like environmentally friendly, prevents track corrosion, and improves the looks of railway stations [1]. The Indian Railways are regarded as a high-profit-making company that operates the world's most densely used train system. It covers around 105,000 miles, has over 8500 stations, and transports approximately 24 million passengers per day, however the primary issue that poses a danger to Indian Railways' reputation in the country and around the world is the inadequate sanitation conditions. [1, 2].

1.1 THE FOLLOWINGS ARE EXAMPLES OF ENVIRONMENTALLY FRIENDLY TOILETS

Bio toilets – the bio toilet system disposes of processed waste in a controlled manner. Vacuum toilets work on the idea

of direct transfer from the toilet bowl to the tank, which is made possible by the development of vacuum in the tank and pipeline. Waste from zero-discharge toilets is collected and handled at the terminus. The solids and liquids are separated in the tank, and the liquid is recycled as flush water. [1].

1.2 WORKING OF BIO-TOILET SYSTEM

As per the Fig.1. the bio toilet system collects the human waste and anaerobic bacterial reaction will help it to degrade into CO_2 and methane gases. It has the ability to double its population in 6 to 8 hours. [2]. It dominates and decomposes matter into liquids and gases in a bio digester tank for 3-4 months at ambient temperature, can withstand subzero temperatures as well as up to 60 degrees centigrade, and cold temperatures will not affect the inside processing because the anaerobic process is exothermic in nature, and thus heat will be available inside the chamber due to the presence of heat in cold regions. [2,4].

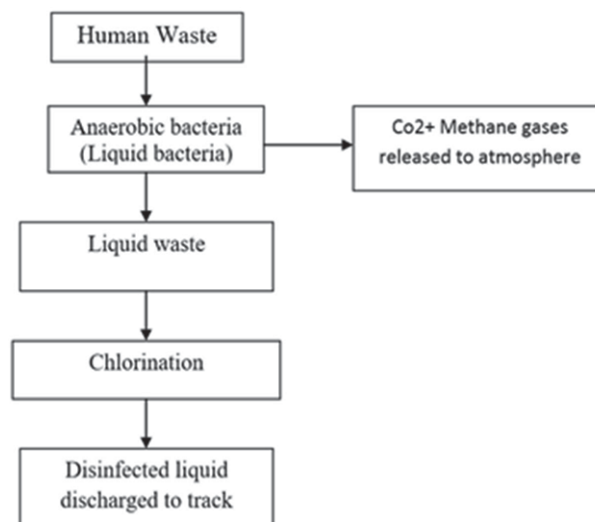


Fig.1. Working of bio-toilet system

2.0 Methodology

Previously, train toilets were little boxes with a hoe, from which human excrement was dumped freely on the railway lines [3,4]. Train toilets had become one of the most significant sources of pollution, spewing human waste across the

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country. Rats scurrying around trains and railway lines is nothing new, so do not be surprised. To overcome this problem railway department installed bio digesters which will stop open disposal of human waste by decomposing it in to gases and disinfected water and again the disinfected water is to be disposed outside and it requires lot of care to fill bacterial fungal inoculum [5,6]. The Indian Railways bio-toilets need to be recharged, i.e bacteria added to activate degradation-leaky malfunctioning toilets. So instead of investing so much of money to recharge the bio digester finally there is no product out of it. In the meantime, of investing the money on purchasing cow dung to activate bacterial reaction. Human waste will be stored in the storage tank, which will be treated by a biological process known as composting. This procedure causes organic matter to decompose and transforms human faeces into compost-like material, although it does not eliminate all pathogens. Microorganisms (mostly bacteria and fungi) perform composting under controlled aerobic conditions. Due to conversion of the human waste into the fertilizer or manure for agriculture sector. Manure boosts agricultural productivity, soil fertility and water and moisture conservation substantially. [6,7].

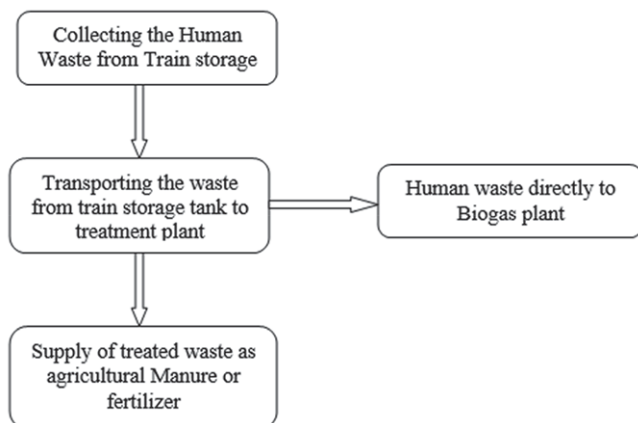


Fig.2. Working of bio toilet waste to agricultural manure

3.0 Result and discussion

Implementation of the above method to convert human waste from railways to agricultural. The direct disposal of human waste into a biogas plant rather than into the atmosphere. We can minimize waste to zero using this method [6]. This plan

aids in the production of biogas from garbage. It helps to limit the amount of carbon dioxide released into the atmosphere by bio-toilets during the anaerobic digestion process.

4.0 Conclusion

Proposed methodology where the faecal waste will be converted into energy in the form of biogas using this technology. This also produces fertilizers that can be utilized in agricultural settings. This model's approach will not only tackle the problem of maintaining sanitation in Indian Railways, but will also provide a variety of energy sources.

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