

# Bio-Waste Management in Indian Railways: A Pilot Plant Model

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**Abstract:** - This effort is a step towards the direction of bio waste management in railways. The Indian Railway (IR), one of the largest rail network in the world is a national railway system operated by the ministry of railways India. It manages one of the largest railway networks in the world by size with a 115000 km of track over a route of 65000 km with 7500 railway stations. More than 20 million passengers travel daily in Indian Railways and around 2.8 million tons of freight is transported daily. IR owns locomotives and coach-production facilities at several locations in India.. The Indian Railways needs a comprehensive strategy for management of waste requiring efforts at different levels. To create an enabling environment, it should simultaneously leverage existing regulations, find synergies with national missions/policies, restructure existing institutional arrangements or create new institutions, wherever required.

**Keywords-** Bio-Toilets; Biowaste Management; railways

## 1. INTRODUCTION

Approximately greater than 20 million passengers travel daily in Indian Railways and around 2.8 million tons of freight is transported daily on both long-distance and suburban routes, from 7,500 stations across India (1-4). Waste Management (WM) challenges in the IR are specific to two different situations- traction and non-traction. Waste is generated across various IR operations, and a preliminary analysis considers moving trains and railway stations, which are seen as low hanging fruits for effective implementations of waste management practices. Inconsistent or more often, non-existent data makes it difficult to estimate how much waste is generated and the quantum of investment and other types of resources to the allocated to manage waste. It has also been noted that a strong institutional arrangement is needed to give the necessary importance to waste management within the Indian Railway (5). The Indian Railway handles about 23 million passengers per day resulting in an enormous amount of solid waste generated. It is estimated that solid waste generated at major railway stations across the country is nearly 670 tones per day (2,45,000 tones per year). Out of these nearly 120 tones per day is food waste which can be locally processed at major stations for composting or energy recovery through bio-methanation. Indian Railway used "open discharge" type toilet system. Approximately 4000 tones of human waste per day is dumped through 'open discharge' type toilets that directly goes across the rail tracks all over the country due to which many types of diseases occur. To solve these challenges bio-toilets were developed by the railways in collaboration with the Defense Research

And Development Organization (DRDO) and are increasingly being adopted in all coaches. A stainless steel bio-toilet set with six chambers costs nearly Rs.90,000 is fitted beneath each of the four rest rooms in a train coach and from 2016-17 all the new coaches have this system. These bio-toilets break down faeces into methane and portable odourless liquid, using anaerobic bacterial cultures. At major stations these all bio-wastes flow from train to the open drains adjacent to the train tracks using water jets. Finally, these all wastes flow through the wastes of stationary toilets to the municipal waste-water sewerage system. (6)

Now-a-days, waste in railways is a major problem in India. It is very important to do something about it. These wastes from railways affect human health and it also pollutes the environment as well. This waste is the cause of many diseases. To decentralize this waste, we have introduced an idea by which we can reduce this waste or remove this waste. This method is so effective that by this process we can decentralize this waste and their products like methane gas and fertilizer are also very useful. This process is not so expensive.

## 2. EXPERIMENTAL

In India as well as in other countries, the railway system has many facilities. There are bio-toilets also. But these bio-toilets are not closed, they are opened as all the wastes are not stored. So the need of the hour is we have to introduce some technique by which these bio-toilets can be interconnected. In this process, interconnection of these bio-toilets was planned

.These waste from each bio-toilet was stored when the train reached at big junctions. Then this collected waste will be passed or flown into the tankers build at the junctions at a distance of 0.25-0.50 kilometers from platform. This all waste from the interconnected bio-toilets can be removed with the help of motor connected in the engine.

### 3. RESULTS AND DISCUSSION

When all the waste is removed from these interconnected bio-toilets, then the train is free to move. Now, this waste collected in the tankers can be further moved into the boilers where this waste gets treated. According to their necessity in the boilers, this waste gets boiled and on boiling these wastes we get methane gas produced This. methane gas is transported through the pipes to turbines due to produce electricity. After moving the turbine, this gas is stored into the gas container which has further advantages. When all the liquid waste from the boilers gets evaporated, then remaining solid waste can be used as fertilizer in the trees or in the agricultural fields. This solid waste can be removed from the boilers with the help of machines or can even be removed manually.(Figure1)

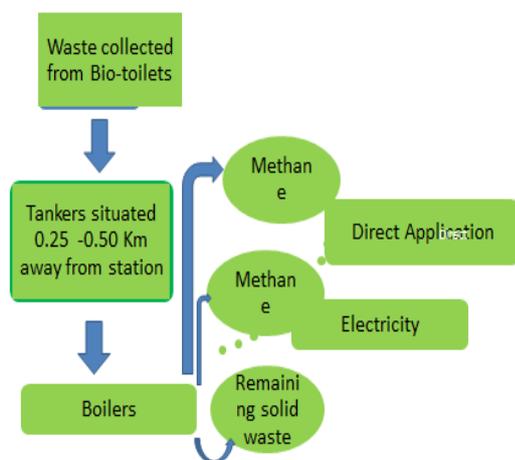


Figure1: Flow chart of Bio – waste Management

### 4. CONCLUSION

1. Formation and uses of three main products obtained from this process:

- (a). Electricity: By this process we get electricity which we can use for the lightning the street light near the railway station or the platform or many more things.
- (b).Methane Gas: Gas produced from this process is methane gas (CH<sub>4</sub>).This methane gas can be used in houses, factories, industries, for providing fuels to the boilers, etc. This gas has domestic use as well.

(c).Manure or Fertilizer: The manures or fertilizers can be used in agricultural fields or the tree or the plants in the houses or gardens, etc.

2. It has a low maintenance cost.
3. It occupies less space.
4. It requires less labour.

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