

DESIGN & DEVELOPMENT OF MECHANISM OF ECO-FRIENDLY TOILET IN TRAIN BOGIE

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Abstract - The environment is continuously affected by constant addition of pollution waste material and other hazardous product. It is essential that environment should be protected and maintains to make safe for living. Use of smart toilet or green toilet should help the cause of achieving the goal of environment safety. The First Rake with bio-toilets developed with DRDO is running in Bundelkhand Express since 18th January -2011. DRDO is constantly trying to make improvements in EFT to reduce the pollution and make travelling in railways more comfortable .This project deals with an ECO FRIENDLY TOILET system. It is developed to solve three problems in eco-friendly toilet. This eco-friendly toilet will be in accordance with DRDO (Defence research & Development organization) rules and regulation. Improvement is to be needed in railway bogies to reduce the pollution and deposition of waste material. The system is developed while considering the railway passenger. The problem of space availability, cost, odour and quantity of water is solved in this project. This problem is solved by merging two EFT tanks and it is also used for disable person as well as common passenger in railway bogies many other improvements.

Key Words: Smart toilet, environment safety, green toilet, merging two tanks, cost, odour, space availability, quantity of water.

1. INTRODUCTION

Bio-toilets are based on bio-digester technology which was initially developed by Defence research &Development organization (DRDO) for defence personnel. The enterprise is pioneering this, in integrated approaches and taking this effective and innovative Sanitation solution to the civil population with varying applications.

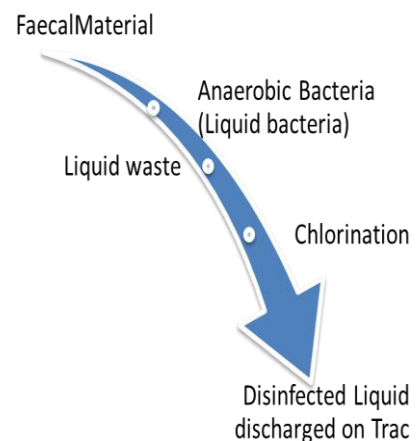
Developed by DRDO and hence called ‘DRDO Bacteria’ – converts human waste into water and gas which is released through outlets. Water is subjected to chlorination and then discharged outside and the long-term impact will be a clean and environmental-friendly track that also facilitates a healthy working condition for those working on railway tracks. “Apart from being eco-friendly, workers find it easy to attend to coaches with bio-toilets as the under-frame

tends to remain clean”, he added. However, there are minor issues related to the bio-toilets which pertain to behavior of the passengers. “People tend to dispose newspapers, plastic water bottles, polythene bags and gutka pouches that clog bio-toilets. But a new design providing for manually operated lever to clear the non-biodegradable materials has been made and installed.

1.1 Brief About bacteria – Anaerobic Anaerobic Bacteria:

Can process doubling its population within 6 to 8 hrs.
 Dominates and decompose matter in to liquid and gases.
 Can be kept for 3-4 months at ambient temperature.
 Can withstand subzero temperature as well as up to 60 Degree centigrade but charging of Inoculum should be.
 Done not less than 5°C Temperature.
 Cold temperature would not affect the inside processing.
 Because:
 Anaerobic process is exothermic in nature thus; in cold regions heat will be available inside the chamber because of chemical process.

1.2 Working of anaerobic system



1.3 Anaerobic bio-digester system-Bio gases & parameters

- Composition of Bio-gases

Compound	Chemical Name	%
Methane	CH ₄	50-75
Carbon dioxide	CO ₂	25-50
Nitrogen	N ₂	0-10
Hydrogen	H ₂	0-1
Hydrogen sulfide	H ₂ S	0-3

- Parameters being monitored

2. LITERATURE SURVEY

2.1 G. Raghu ram: INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD-380 015 INDIA "Toilets and Trains"

Brief inside It is important for IR to focus on the issue of dealing with fecal matter on their system. Open discharge of fecal matter must stop. Current practices are outdated. Other country railway systems have advanced in this matter. There are lessons to be learnt from other modes such as aircraft and ships.

2.2 Environment Management in Indian Railways:

Report No. 21 of 2012-13 (Railways)

Brief inside Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process that is generally undertaken to reduce their effect on health, the environment or aesthetics.

Parameter	Recommended Values
pH	6 to 9
Total Solids	Max 750mg/100ml
Total Dissolved solids	Max 350mg/100ml
COD levels	Max 2000 ppm

2.3 MOHIT SHARMA, KANGKANIK A NEOG: council on energy, Environment and water. "Decentralized Waste Management in Indian Railways"

Brief inside The Indian Railways has installed a waste to energy (WTE) plant for biodegradable waste in its residential colony at Kisangani in Delhi and has plans to build two more WTE projects at New Delhi and Jaipur railway stations.

2.4 Indian Railways: CAG, 2007. Chapter 2, CAG Report No 6 of 2007. "Cleanliness and Sanitation on Indian Railways"

Brief inside Cleanliness and sanitation on Indian Railways was not receiving due importance and was secondary to other activities. The expenditure on providing and maintaining a clean and hygienic environment was inadequate. Standards for performance were not laid down, infrastructure was inadequate and deficient, passenger amenities were not commensurate with increasing passenger traffic, waste management was ineffective, railway stations were overcrowded due to unauthorised use and harnessing user perception was ineffective especially in A, B and C category stations where 85 per cent of the passenger traffic was handled. Involvement of multiple departments with complex reporting structures only compounded the issue.

2.5 Ankit Jain, Dr. Anita Shukla , Chanchal K.Vishwakarma:

International Journal of Electrical and Electronics Engineers(ISSN- 2321-2055 (E)) "ECO-FRIENDLY TREATMENT OF SANITATION PROBLEM IN INDIAN RAILWAYS BY INTELLIGENT"

Brief inside The solution provided is eco-friendly, economical and electronically operated making Indian railways more passengers friendly.

- Proposed system has provision of converting toilet automatically into storage type while the station is reached thus providing controlled discharge toilet system.
- Problem of using toilet in emergency will be rectified.
- Proposed system provides many more other additional features like an air exhaust system (fan), automatic water flush system, check on occupancy in toilet, obstacle detection, water level indicator and additional information system for speed of train which are essential to make ones journey full of comfort and happy.

3. FUTURE SCOPE

In future EFT toilet will help keep the railway track clean. It will be very effective. Scope for future work has suggested in above is to merge two EFT tank due to which usage of water consumption is reduced significantly. It will also help the engineer and worker working on railway track to work smoothly without the distraction of waste material or smell. It will also reduce maintenance cost of the railway track further improvement can be achieved by proper analysis and studying to make EFT tank more efficient. This water can be used in tree plantation, agriculture activities and many more.

4. CONCLUSIONS

In this project we studied on EFT (eco-friendly toilet), then after analyzing we improve the design of EFT by merging two EFT tanks. Due to this length requirement of EFT is reduced. Water consumption used in railway bogies is

decreased. Manufacturing cost and time required to manufacturing EFT tank is reduced.

Working on railway track become a lot easier due to EFT.

Maintenance cost required on railway track is reduced.

The designed life of bio-digester is 25 years with one time bacteria fill. Methane as a bi product of the process can be used for various applications depending upon the quantity produced.

REFERENCES

1. **G. Raghuram:** INDIAN INSTITUTE OF MANAGEMENT AHMEDABAD-380 015 INDIA **“Toilets and Trains”**
2. **Environment Management in Indian Railways:** Report No. 21 of 2012-13 (Railways)
3. **MOHIT SHARMA, KANGKANIK A NEOG:** council on energy, Environment and water. **“Decentralized Waste Management in Indian Railways”**
4. **Indian Railways:** CAG, 2007. Chapter 2, CAG Report No 6 of 2007. **“ Cleanliness and Sanitation on Indian Railways”**
5. **Ankit Jain , Dr.Anita Shukla , Chanchal K.Vishwakarma:** International Journal of Electrical and Electronics Engineers(ISSN- 2321-2055 (E)) **“ECO-FRIENDLY TREATMENT OF SANITATION PROBLEM IN INDIAN RAILWAYS BY INTELLIGENT”**