

# Automatic Sewage Disposal System for Train

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## Abstract:

**I**ndian railways have 114,500 km of total track over a route of 65000 km and 7500 stations. While travelling by the train everyone expect healthy and hygienic surrounding. Feel uncomfortable due to the waste on the platform and the allied foul smell. Creates bad impression on foreign tourist. sanitation problem cause due to system in which train toilets dispose human waste openly on to tracks. So as an electronics engineer it is our duty to solve the problem and give the better solution to it. This module discussed in the paper suggests the solution for the same and thereby creating awareness among the commuters.

**Keywords:** Indian Railway, Human Waste Disposal, Automatic sewage Disposal, Track changing mechanism, Design and Construction.

## I. INTRODUCTION

While travelling by the train everyone expect healthy and hygienic surrounding. But whenever we are waiting on platform or travelling through the trains we feel uncomfortable due to the waste on the platform and the allied foul smell. It creates bad impression on foreign tourist. In the present scenario the sewage will be laid on the track it will cause other problems such as environmental pollution, spreading of viral disease etc. In present status worker have to clean the every track properly and this work is unhygienic to the workers and time consuming. The major stigma on Indian railway is the problem of cleanliness and disposal of human waste. It is also causing other problems such as environmental pollution, spreading of viral disease etc. hence the intention was to develop such system which will automatically dispose the waste and will assure good sanitation habits into railway as an organization. So automatic sewage disposal system brings a new concept for the society which consisting of the automatic track changing mechanism. So this project stands different than the previous sewage disposal methods. This system will help to keep area clean and maintenance free. The wastage or sewage is collected in sewage tank instead of laying down on tracks. This will help to keep tracks clean and hygienic. This system can also be implemented on the other transport vehicles like long journey buses.

## II. LITERATURE SURVEY

As per, S Mohamed Ashiq, K Karthikeyan, S Karthikeyan.[2] "Fabrication of Semi Automated Pressurized Flushing System in Indian Railway Toilet" in International Journal of Engineering and Advanced Technology (IJEAT) has discussed about the toilet cleanliness maintenance because of automated flushing, when the passenger opens and closes the door. As far as the cleanliness is maintained, bad smell and spreading of diseases can be reduced much better. This makes the passenger's journey more pleasant.

Dr. Manoj Hedaoo, Dr. Suchita Hirde, Ms. Arshi Khan[3] in their paper entitled as, "Sanitation in Indian Railway Premises: A Great Cause of Concern" (International Journal of Advanced Engineering Technology of 2011) mentions about sanitation in Railways has become a need of time and an important aspect for Indian Railway's new concepts like modular toilets need to be introduced. Sanitation in Railways though a mammoth task can be achieved only by mutual both. Unless passengers share equal responsibility with the administration the goal of achieving complete sanitation in railways is hard to achieve.

The paper titled as "Methodology for Design and Fabrication of Human Waste Disposal System for Indian Railway" published by Dhanajay G Dange, Dattaprakash G Vernekar, Sagar D Kurhade, Prashant D Agwane[4] in IJSTE. This paper presents the methodology for design and fabrication of human waste disposal system for Indian railway with the related search. The study specifies factors influencing the human waste disposal and recommends a number of design options for human waste disposal system for Indian railway. These are based on a systematic study of the human waste disposal system and testing of a prototype model of it.

As per, Xavier Gibert, Vishal M Patel, Rama Chellappa[1] in their paper titled as "Deep Multi-Task Learning for Railway Track Inspection" has described and discussed about the railway track inspection, multi-task learning, deep convolutional neural networks, material identification. This paper shows that detection performance can be improved by combining multiple detectors within a multi task learning framework. This approach results in better accuracy in detecting defects on railway ties on fasteners which will help in project to take the decision of building the tracks.

## III. SYSTEM DESIGN

### A. System Block Diagram:

The system has to differentiate its modules placed at the train and at the stations. Namely the track changing mechanism module, Sewage disposal mechanism module are based at stations while the tank level check module is placed at the train. So the separate block diagrams corresponding to these modules will be differently presented. Fig.1

shows system block diagram for train circuit to indicate the level of the sewage tank whether tank is empty, medium or full and this signals get transmitted through the RF transmitter. Also the block diagram consists of position sensor to detect the proper place for the sewage disposal and after proper detection the solenoid valve get ON.

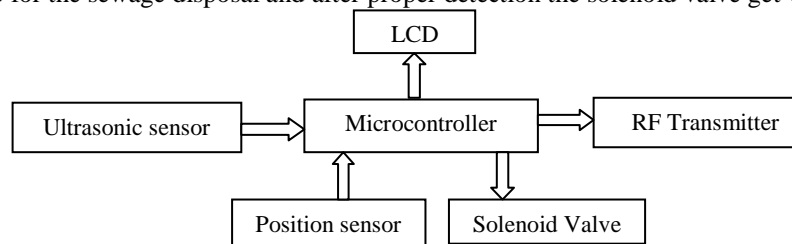


Fig. 1 Block diagram for checking status of the tank

If the proper position identification for the sewage disposal is to be done, then the track changing mechanism will help for it. Fig. 2 represents the block diagram for the track changing mechanism. If the sewage tank is full then train changes the track for the disposal of sewage at proper place, it will be ensured by this block diagram.

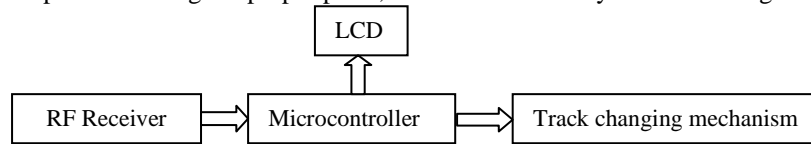


Fig. 2 Block diagram for the track changing mechanism

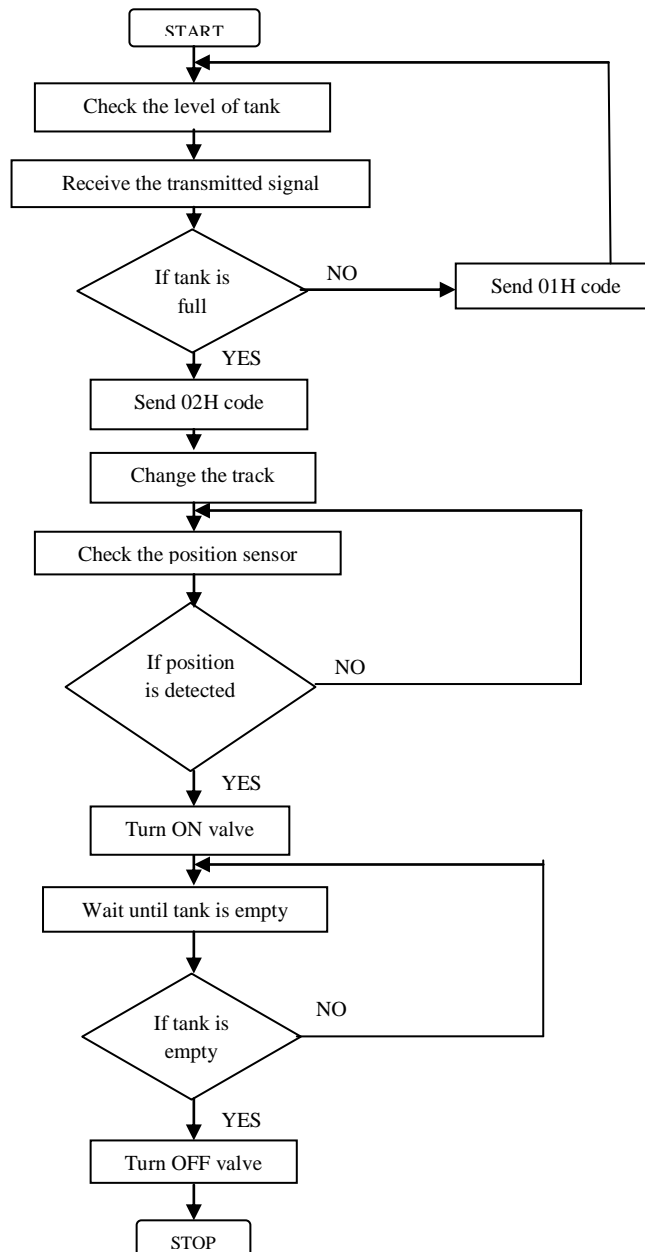


Fig. 3 Overall system flow chart

**B. Overall system flow chart:**

Fig. 3 shows the overall system flow chart for automatic sewage disposal system for train. Initially sewage tank level status is checked whether tank is empty, medium or full. If sewage tank is full then signal gives indication to LED and send these signal to station circuit through RF transmitter, display result on LCD. Station circuit performs track changing mechanism. For proper placement of train sewage tank and station disposal tank system uses position sensor. When the proper detection of IR sensor and photodiode takes place then solenoid valve turn ON and sewage disposes automatically. After emptying tank, signal is given to circuit to off the solenoid valve and train goes to its original track.

**IV. WORKING**

The project is mainly divided into two mechanisms one is automatic track changing mechanism and another one is automatic sewage disposal system.

The wastage or sewage is collected in sewage tank instead of laying down on tracks. This will help to keep tracks clean and hygienic. As the sewage get filled in tank by using the ultrasonic sensor it will detect the level of sewage contain in the tank. The sensor give indication to the train operator and station operator as tank is full or medium or empty. According to the level of tank further procedure is done. If the tank is empty or medium the train will not change its track. It will give the indication to the train operator by using LEDs and to the station operator by using LCD display. And if the tank is full then the red LED glows and through the RF transmitter it will transmit the signal. This transmitted signal will be received by the RF receiver and display the message on the LCD as “TANK IS FULL”. The track will get automatically changed. By using the IR sensor and photodiode, train will stop at proper place where sewage has to dispose. this process can be repeated for all the trains.

**V. RESULTS**

Fig. 4 shows the project setup of automatic sewage disposal system for train. There are different modules are used which are indicated by the square signs. The green square indicates station module. Red square indicates sewage disposer where sewage will be dispose. White lines indicate tracks. Black square indicates train. Yellow ring indicates sewage tank placed on train.

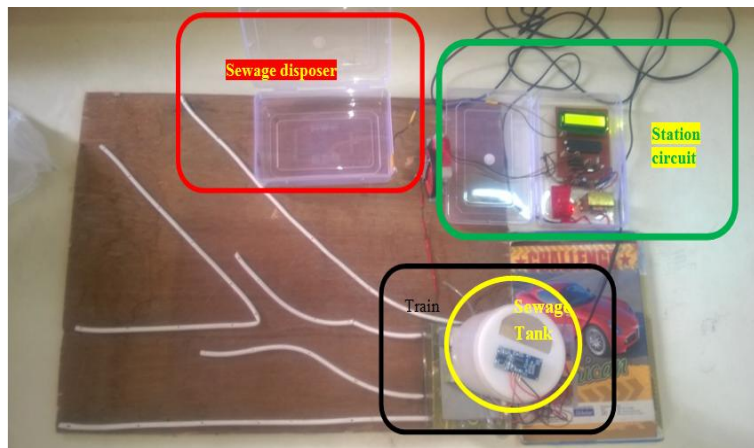


Fig.4 Project setup of automatic sewage disposal system for train.

Fig.5 shows initially tank is empty which is indicated by green LED at train circuit and this signal send to station circuit through RF transmitter module and displayed on LCD as “TANK IS EMPTY”.



Fig. 5 Indication of LED and LCD when tank is empty

Fig. 6 shows medium level of tank. When the tank is medium it is indicated by yellow LED at train circuit and this signal send to station circuit through RF transmitter module and displayed on LCD as “TANK IS MEDIUM”.



Fig. 6 Indication of LED and LCD when tank is medium

Fig. 7 shows tank is full which is indicated by red LED at train circuit and this signal send to station circuit through RF transmitter module and displayed on LCD as "TANK IS FULL".

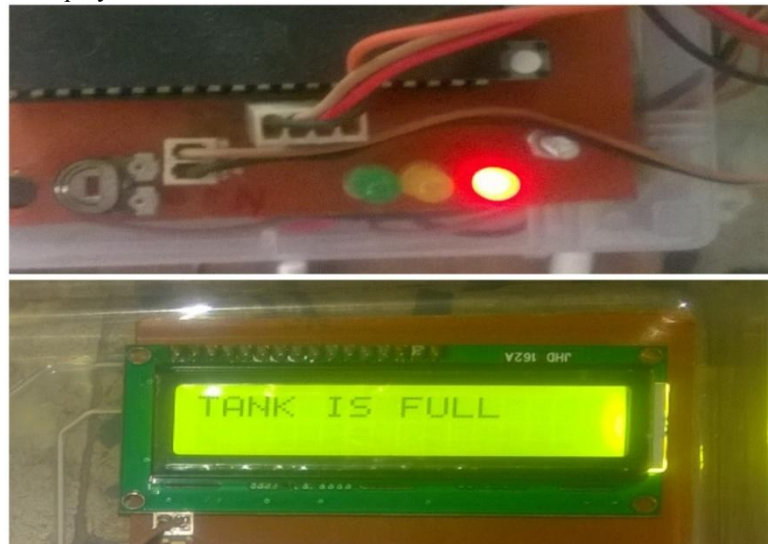


Fig. 7 Indication of LED and LCD when tank is full

Fig. 8 shows track changing mechanism. When the tank is full train circuit sends this message to station circuit and station circuit performs the track changing mechanism .When tank is empty then train goes to its original track. The black square shows the track has been changed.

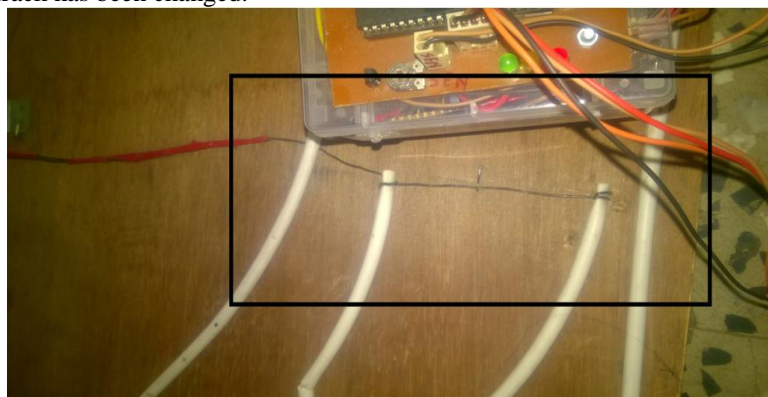


Fig. 8 Track changing mechanism

Fig. 9 shows the detection of position for sewage disposal. In which position sensor is used for detection of proper position. Yellow circle indicates disposing of water (which is used instead of sewage) in the sewage disposer tank placed at platform.



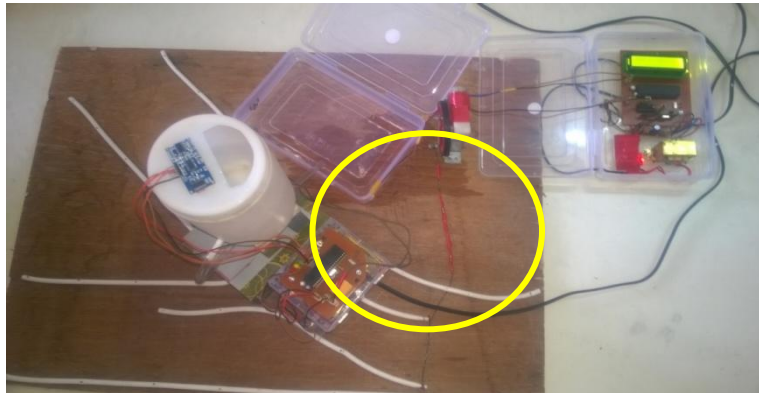


Fig. 9 After position detection solenoid valve is ON and disposes sewage

#### IV. CONCLUSIONS

In the previous sewage disposal systems the sewage has to dispose manually and tracks has to clean manually by workers and this work is unhygienic to workers and time consuming. In the present scenario the sewage will be laid on the track only it will cause other problems such as environmental pollution, spreading of viral disease etc.

The system “Automatic Sewage Disposal System for Train” has been successfully designed and implemented to overcome previous problems. This system brought the new concept of automatically track changing mechanism and automatically sewage disposing system. The level sewage contain in tank is measured by ultrasonic sensor and it will give the indication to the train operator by glowing LED and this signal is transmitted through the RF transmitter. This signal will be received by RF receiver at station operator and displayed on LCD. If tank is full then track changing mechanism is done. The position sensor will help the train to stop at proper place and after proper detection the solenoid valve become ON to dispose sewage from sewage tank. It will wait until emptying after that it will goes to its original track. So this module stood different than the previous sewage disposal methods. This system is helping to keep area clean and maintenance free.

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