



## Automatic Discharge Toilet System [ADTS] in Indian Railway

<b>Dr. Vijay Kumar</b>	Department of Mechanical Engineering, IIMT College of Engineering Greater Noida
<b>Kamal Yadav</b>	Department of Mechanical Engineering, IIMT College of Engineering Greater Noida
<b>Kaushal Yadav</b>	Department of Mechanical Engineering, IIMT College of Engineering Greater Noida
<b>Naveen choudhary</b>	Department of Mechanical Engineering, IIMT College of Engineering Greater Noida

**ABSTRACT** Toilet currently used on passenger coaches of Indian railway are of flush type , in which human waste is discharged directly on the tracks. This makes the ecosystem unhygienic, besides resulting in corrosion of track fitting. To overcome this problem, we make a prototype of environment friendly green toilet. By use of such toilets, we will have no human waste on railway tracks and therefore, cleaner and greener station premises and tracks. Our designed system works in several phases to short out this problem. First we will collect the wastes in a chamber. Then it will be passed through sever lines on stations. During collection and transportation till sever lines our system will work.

**KEYWORDS** Indian railway, green toilet, sever line, solenoid valve, ADTS.

**INTRODUCTION**

The basic purpose of introduction of Automatic Discharge toilet system in Indian Railway is to eliminate the practice of spillage of toilet waste on to railway station area & in the populated area of city. This system is fully automatic so there is no man power required. Each store chamber is fitted in train toilet through pipe and one non return valve is fitted in pipe so that when we flush the waste gets stored in chamber. Sever line is connected with each halt according to our design for transportation of waste. And when the trains are stopped in halt station then automatic extraction system gets connected with these transportation lines to clean the storage chamber.

**Advantages**

1. Tracks are kept free from corrosion because the wastes are too much responsible for the corrosion which is eliminated by this system.
2. We are not using any types of bacteria and acids.
3. Cleaning of chamber at stations is quite easy and also takes least time.
4. This system keeps the toilet free from arrogant smell.

**SALIENT FEATURE OF AUTOMATIC DISCHARGE TOILET SYSTEM :-**

1. It's easily programmable and reprogrammable
2. Less Air, Water and electricity
3. Easy to clean.
4. Hygienic, improves environmental conditions at Railway stations.

**REQUIRED COMPONENT IN THESE SYSTEM :-**

1. Storage chamber.
2. Non-return valve.
3. Connectivity with sever line at halt station.

4. Sensor
5. Rack and pinion
6. DC motor
7. Solenoid valve

**1) Storage chamber: Function**

Storage chamber is used for collecting the waste.

This box is made by Mild steel sheet and this box is fitted under the railway bogies and connected to the toilets.

**2) Non-return valve: Function**

Non return valve is fitted between the storage and toilet pipe.

This valve is automatically operated by a spring. It is one side automatic opened valve.

It stops the arrogant smell from the chamber to reach the toilet room.



**3) Connectivity with sever line at halt station: Function**

Connecting pipe is hollow pipe generally made by fibre and this pipe is used to Connect the toilet seat to the storage chamber.



**4) Sensor:**

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light.



**5) Rack and pinion:**

It is use to move the P2 (Movable pipe) up and down.



**6) DC motor**

12V DC Motor .It is use to drive the rack and pinion.



**7) Solenoid valve**

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports.

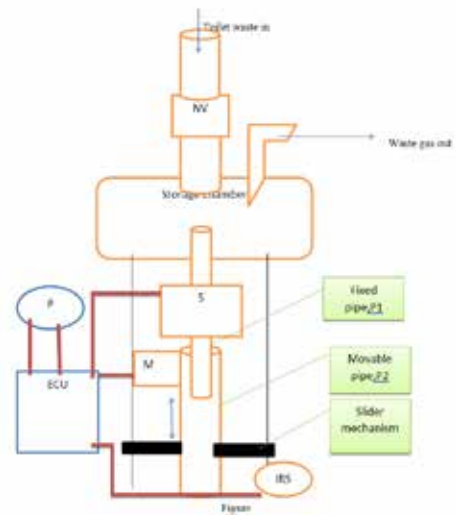


**Construction of these system is in two part :-**

- 1) Store chamber in trains
- 2) Connectivity with sewer line at each halt station.

**Working Principle Of ADTS :-**

This system works on electrical arrangement. Each store chamber is fitted in train toilet through pipe and one non return valve is fitted in pipe so that when we flush the waste gets stored in chamber .The storage tank which stores waste has two openings. Upper opening opens every time the user operates the flush button, whereas lower opening at a predetermined time. The solenoid valves control the opening of the exit waste pipe,P1.when train stop on the railway station then after a predetermined time sensor sense the white mark on the railway track and send signal to the motor. Motor start rotate and movable pipe goes down and attached with sewer line .After that motor stop and solenoid valve open .All the waste goes down to sewer line automatically. After a predetermined time motor start to run and take movable pipe upside. Solenoid valve close and system at an initial state.Sewer line is connected with each halt according to our design for transportation of waste . And when the trains are stopped in halt station then automatic extraction system gets connected with these transportation lines to clean the storage chamber.



- S – Solenoid valve,
- M – DC motor
- P1 – Stationary pipe
- P2 – Movable pipe
- IRS – Infrared sensor
- ECU – Electronic control unit
- P – Power
- NV – Non return valve

**TIME OF EMPTYING THE STORAGE TANK :-**

$$T = \frac{2 \cdot A}{c \cdot a \cdot \sqrt{2g}} (\sqrt{H})$$

- a- Cross-sectional area of tank
- b- Cross-sectional area of solenoid valve orifice
- c- Coefficient of discharge
- H- Hight of tank
- g- Gravitational acceleration

**Effect on environment**

1. No use of any type of bacteria so there is no bad impact on environment.
2. No dispatching of waste on tracks or field but direct to sewer lines.

**Applications:-**

In long route buses having toilet facilities.  
In Indian railway coaches.

**COMPARISON BETWEEN OURPROPOSED SYSTEM AND**

**OTHER EXISTING SYSTEM :-**

Our system	Bio-degradable toilet system	Automatic flushing system
Store chamber is used.	Store chamber is used.	No one store chamber is used.
Waste is throw on sewer line.	Waste is direct throw on railway tracks after degradable process.	Waste is direct throw on railway tracks.
People awareness is not necessary.	People awareness is necessary because bacteria is in used.	People awareness is required to close the gate for flush.
In this type of system smell chance is very less.	Smell chance is more.	Smell chance is occurred.
Required maintenance is very less.	More maintenance is required.	Maintenance is necessary.

**CONCLUSION**

We have Asia largest train network and we feel very proud on that But it is very shamed when we look our railway platform and railway tracks which are full of shit and many types of dirt. And the rusting Produced by it leads to a great loss for the railways. So we need to Install that system in Indian railways.Because after that produced waste by human during the railway journey can throw on the waste disposal place through the sewer line.

**REFERENCES :-**

1. A study on controlled discharge toilet system, G Bhagvaniprasad