# On Wheels Human Secretion Management

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**Abstract -***Railways are an efficient transport in India. On an average, 2.3 crores of people travel by train daily, generating 4000 tones of waste. This tremendous amount of waste is disposed off on the tracks without considering the surroundings, risking the health & hygiene of the localities nearby. This project is a basic prototype of the ideas of collecting & discarding human waste in an environmentally sound way, without imposing serious maintenance charges & issues in order to keep the stations clean with the help of solenoid valve. It is time to upgrade system by implementing the on wheels human secretion management in railways. Our project focuses on avoiding the disposal of waste around the platforms, which in turn, ensures healthy environment for locals as well as commuters. This idea will help our stations look cleaner, hygienic & sanitized. Above all our project focuses on maintaining a public hygiene in hassle free & environmental friendly manner.*

***Keywords***- *Microcontroller, Proximity sensors, Bio toilets, IR sensors, Signal conditioning, Solenoid valve.*

## 1. INTRODUCTION

All humans are entitled to clean environment & sanitation. For cleaner tracks near stations, there is an arrangement done which uses microcontroller controlling power to synchronize the train motion & valve movement in order to keep the tracks clean. Our project supports Nirmal Bharat Abhiyan**.** Indian Railway is Indians national railway system operated by the ministry of railways. India has the fourth largest railway network in the world by size, with 67,368km route. It runs more than 20,000 passenger trains daily, on both long distance & suburban routes from 7,349 stations across India carrying 8.26 billion passengers, generating an estimated 4,000T of human waste which is traditionally discharged on tracks, causing wide spread diseases in the localities near the stations putting the general health and hygiene of passengers in danger. Treating of the waste is essential as this waste contains pathogen that ruins the travel experience.

In order to save gallons of water and for ease in maintenance of the sewage tank that is otherwise used to clean the tracks near the station, also to save the efforts of workers who do the cleaning and to overcome health related issues the need of the hour is to implement the ON WHEELS HUMAN SECRETION MANAGEMENT system. Thus showing that it is possible to make systematic changes in waste disposal procedure & can be implemented as a cost effective solution, while it also uplifts the rural areas if implemented.

## 2. LITERATURE REVIEW

Currently the existing system in trains uses Bio toilets. Tests have found out that the organic matter collected in these digesters do not undergo any kind of treatment despite being expensive which was proved in an IITian study on bio toilets. Replacing these bio toilets by our on wheels human secretion management makes the system less bulky, simple and cheaper.
➢ To provide a better alternative to bio toilets.
➢ To maintain a cleaner environment around the station.
➢ To provide completely domestically assembled products against international products.
➢ Minimize the odour around the platforms.
➢ Our system is an improvised version of the currently used bio-toilets and a better alternative in terms of cost.
➢ Implementation cost of one bio-toilet is about 2.5 lakh.
➢ The bacteria used to process the human waste are imported from Antarctica.
➢ The processed matter is even more acidic than the actual human waste which is no good as it leads to degradation of tracks anyways.
➢ We have used a different concept for the treatment of waste in our project. We are using chlorination process, which is simply mixing sodium hypochlorite with human waste to produce methane gas ($CH_4$).
➢ In this way, we are segregating the waste that is otherwise dumped on tracks, while producing useful gases.

## 3. PROBLEM STATEMENT, METHODOLOGY, PROPOSED WORK.

### 3.1 PROBLEM STATEMENT

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## 3.2 METHODOLOGY
➢ It consists of Proximity sensor, IR sensor, microcontroller AT89S52, signal conditioning, solenoid valve.
➢ This system works on the principle of two stage detection. The stages are speed measurement and platform detection. Proximity sensor and IR sensor are used for this motive.
➢ Proximity sensor measures the speed of train in RPM and displays on LCD. When speed goes above set point, relay is activated.
➢ IR sensor is used to detect the platform. After station detection relay is activated.
➢ When both the relay coils are energized, solenoid valve is actuated.
➢ Buffers present at the end will help to drive output to enough level that it sets solenoid to function causing the valves to make required movements.

## 3.3 PROPOSED WORK
➢ Proximity sensor is used for speed measurement.
➢ It consists of Proximity sensor, microcontroller AT89S52, signal conditioning circuitry & solenoid valve.
➢ Proximity sensor measures the speed of train in RPM and displays on LCD. When speed goes above set point, relay is activated.
➢ When the relay coil is energized, solenoid valve is actuated.
➢ Buffers present at the end will help to drive output to enough level that it sets solenoid to function causing the valves to make required movements.
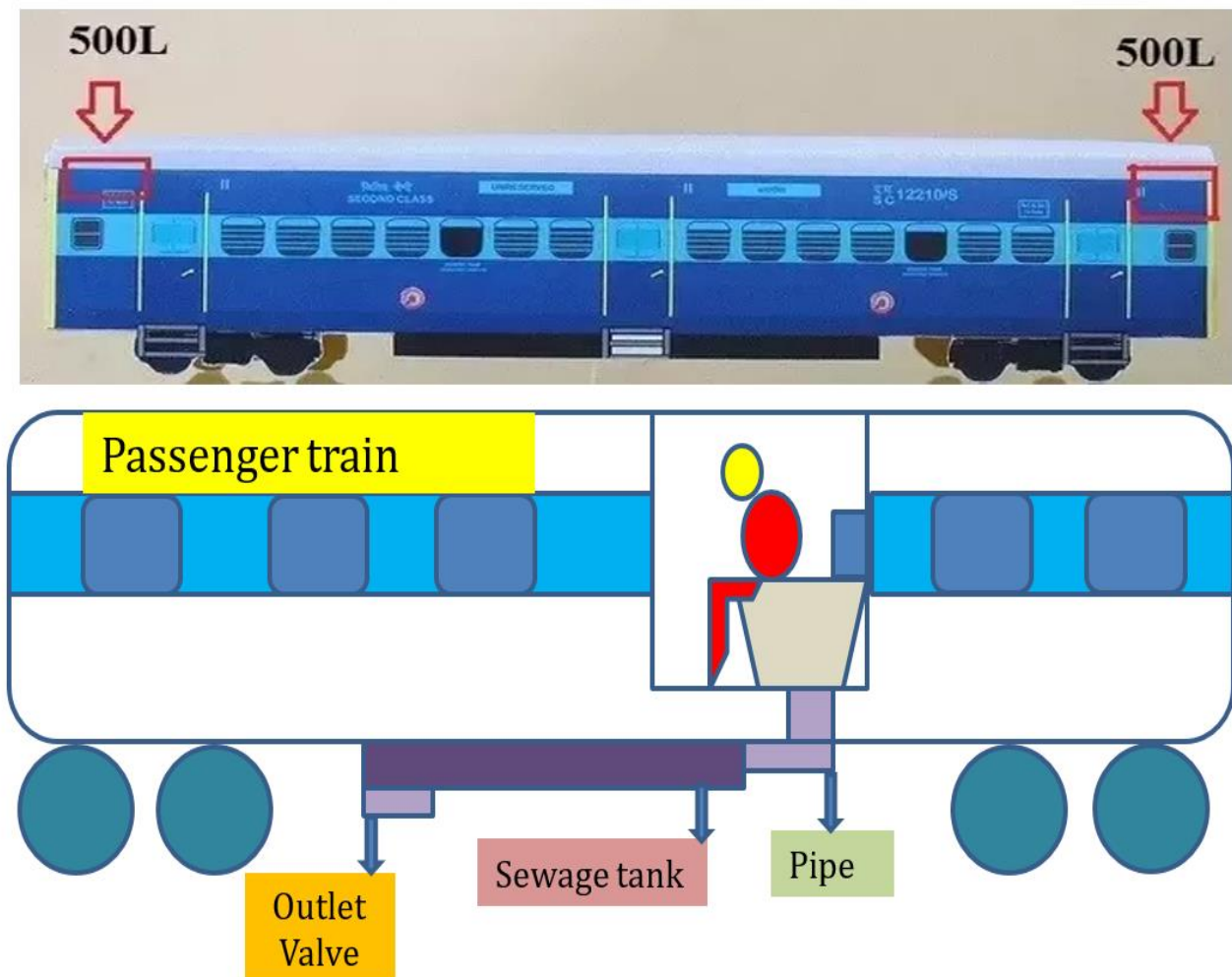
## 4. SYSTEM DEVELOPMENT
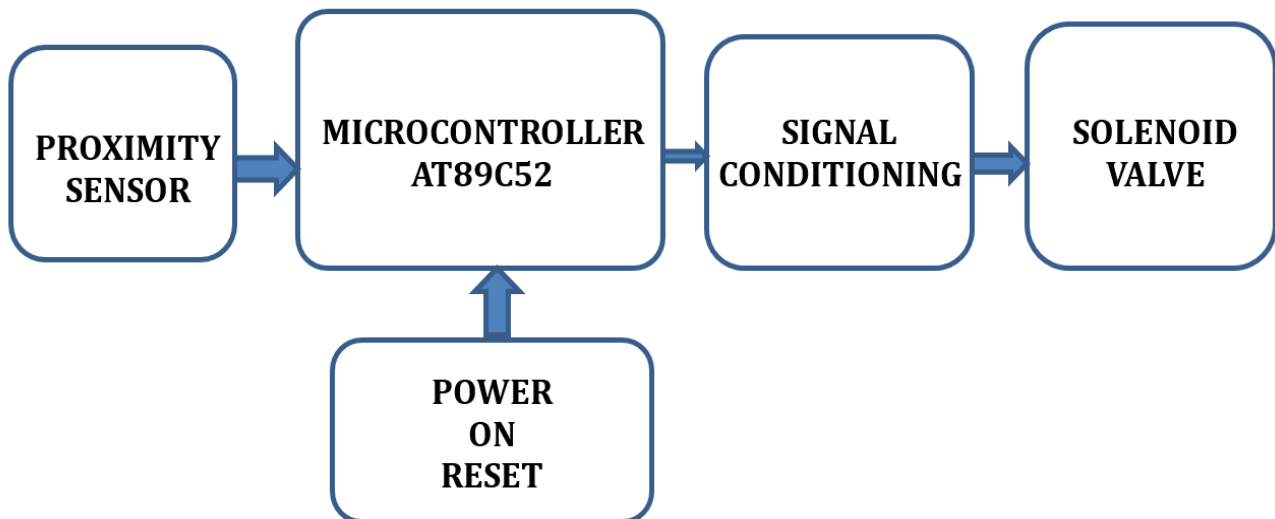


**Figure4.1 Smart Glass**

**Figure.4.2 Block Diagram**

## 5. LIST OF COMPONENTS

| SR. NO. | NAMES OF COMPONENTS |
|---------|---------------------|
| 1 | COMPILERS |
| 2 | PROXIMITY SENSORS |
| 3 | MICROCONTROLLER 89s52 |
| 4 | 16*2 LCD DISPLAY |
| 5 | 4050b NON INVERTING HEX BUFFER |
| 6 | ULN 2803 |
| 7 | RELAY |
| 8 | SOLENOID VALVE |

### 5.1 COMPILERS

Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a specific processor like x86 (underlying microprocessor within the computer). compilers for Dos platform and unix platform are different.

### 5.2 PROXIMITY SENSOR

A proximity sensor could also be a sensor able to detect the presence of nearby objects with none physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic wave (infrared, for instance), and appears for changes within the world or return single.

➢ Operating voltage: 5v to 30v
➢ Detection range: 10mm
➢ Type: inductive proximity sensor
➢ Wire connections: Red wire- power supply
   Black wire- ground
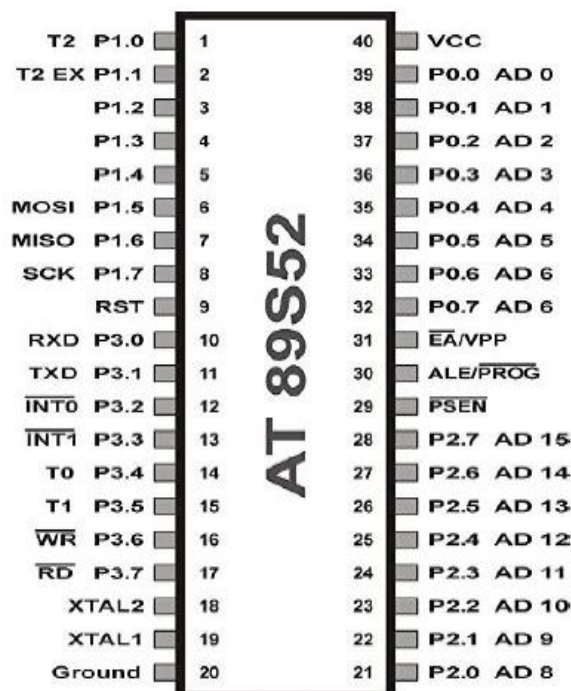   Green wire- output (connected to pin no. 14 of microcontroller)

### 5.3 MICROCONTROLLER 89s52

The AT89S52 may be a low- power, high-performance CMOS 8-bit microcontroller with 8K Bytes of in-system programmable non-volatile storage.
The AT89S52 provides the following standard features:
➢ 8K bytes of Flash
➢ 256 bytes of RAM
➢ 6 interrupt sources
➢ 32 I/O lines
➢ Three 16-bit timer/counters
➢ Full-duplex serial port
➢ Framing error detection
➢ Automatic address recognition
➢ On-chip oscillator and clock circuitry.
➢ Power control modes:
➢ Idle mode
➢ Power down mode
➢ Clock can be stopped & resumed
➢ Operates on 5v supply
➢ Power dissipation: 1.5w
➢ Input: pin no.14 of controller (sensor output)
➢ Output: pin no.25 of controller is connected to pin no. 5 of 4050 buffer
➢ Crystal: crystal circuitry is connected to pin no. 18 & 19 to provide crystal frequency of 11.059 mhz

```
T2    P1.0 [  1        40 ] VCC
T2 EX P1.1 [  2        39 ] P0.0  AD 0
      P1.2 [  3        38 ] P0.1  AD 1
      P1.3 [  4        37 ] P0.2  AD 2
      P1.4 [  5        36 ] P0.3  AD 3
MOSI  P1.5 [  6        35 ] P0.4  AD 4
MISO  P1.6 [  7        34 ] P0.5  AD 5
SCK   P1.7 [  8        33 ] P0.6  AD 6
      RST  [  9        32 ] P0.7  AD 6
RXD   P3.0 [ 10        31 ] EA/VPP
TXD   P3.1 [ 11        30 ] ALE/PROG
INT0  P3.2 [ 12        29 ] PSEN
INT1  P3.3 [ 13        28 ] P2.7  AD 15
T0    P3.4 [ 14        27 ] P2.6  AD 14
T1    P3.5 [ 15        26 ] P2.5  AD 13
WR    P3.6 [ 16        25 ] P2.4  AD 12
RD    P3.7 [ 17        24 ] P2.3  AD 11
      XTAL2[ 18        23 ] P2.2  AD 10
      XTAL1[ 19        22 ] P2.1  AD 9
    Ground [ 20        21 ] P2.0  AD 8
                AT 89S52
```

### 5.4 16*2 LCD DISPLAY

A 16x2 LCD display 16 characters per line. In this LCD each character is displayed within 5x7 pixel matrix. There has been two registers namely Command and Data.
➢ Operating Voltage is 4.7V to 5.3V
➢ Current consumption is 1mA without backlight
➢ Alphanumeric LCD display module, meaning can display alphabets and numbers
➢ Consists of two rows and each row can print 16 characters.
➢ Each character is build by a 5×8 pixel box
➢ Can work on both 8-bit and 4-bit mode
➢ It can also display any custom generated characters
➢ Available in Green and Blue Backlight
➢ Port pins of port0 are connected to D0-D7 data bits of LCD through pull up register
➢ Count of pulses at the output of sensor is displayed on LCD

### 5.5 4050b NON INVERTING HEX BUFFER

The HEF4050B provides six non-inverting buffers with high current output capability suitable for high capacitive loads. Since input voltages in additional than the buffers' supply voltage are permitted, the buffers also can be used to convert logic levels of up to fifteen V to plain TTL levels.

➢ High sink current for driving 2 TTL loads.
➢ High to low level logic conversion
➢ 100% tested for quiescent current at 20V.
➢ Maximum input current of 1µA at 18v over full package temp range; 100nA at 18V and 25°c.
➢ 5V, 10V and 15V parametric ratings.
➢ Input from microcontroller: pin no. 5 Output to ULN2803: pin no. 4
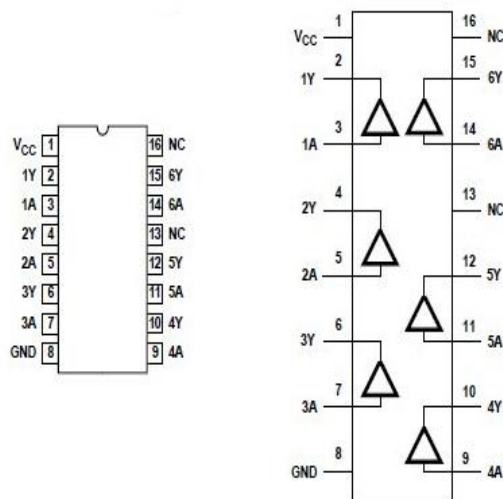


### 5.6 ULN2803

ULN2803 may be a High voltage, high current Transistor Array IC used especially with Microcontrollers where we'd like to drive high power loads. Thic IC consists of a eight NPN Darlington connected transistors with common Clamp diodes for switching the hundreds connected to the output.

➢ Maximum voltage allowed between COLLECTOR and EMITTER of each
➢ DARLINGTON TRANSISTOR: 50V
➢ Maximum current allowed trough COLLECTOR of each DARLINGTON
➢ TRANSISTOR: 500mA
➢ Maximum voltage allowed between BASE and EMITTER of each DARLINGTON
➢ TRANSISTOR: 30V
➢ Maximum current allowed trough FLYBACK DIODE of each DARLINGTON
➢ TRANSISTOR: 500mA
➢ Typical Rise Time: 130ns
➢ Typical Fall Time: 20us
➢ Operating temperature: -65°C to 150 °C
➢ No additional power needed to be applied for chip for making it work.
➢ Input from 4050B hex buffer: pin no. 2 i.e. 2B
➢ Output to relay: pin no. 17 i.e. 2C
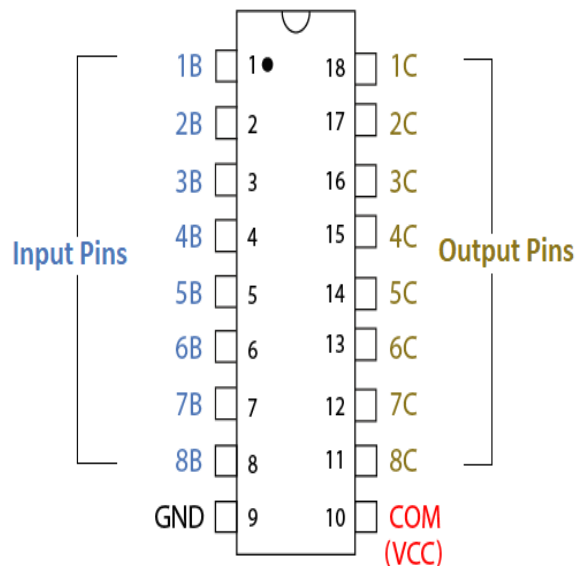
## 5.7 RELAY

Relays are switches that open and shut circuits electromechanically or electronically. Relays control one circuit by opening and shutting contacts in another circuit. As relay diagrams show, when a relay contact is generally open (NO), there's an open contact when the relay isn't energized.

- ➢ Trigger Voltage (Voltage across coil): 5V DC
- ➢ Trigger Current (Nominal current): 70mA
- ➢ Maximum AC load current: 10A @ 250/125V AC
- ➢ Maximum DC load current: 10A @ 30/28V DC
- ➢ Compact 5-pin configuration with plastic moulding
- ➢ Operating time: 10msec Release time: 5msec
- ➢ Maximum switching: 300 operating/minute (mechanically)
- ➢ Input: from pin no 17 of uln2803
- ➢ Output to solenoid valve
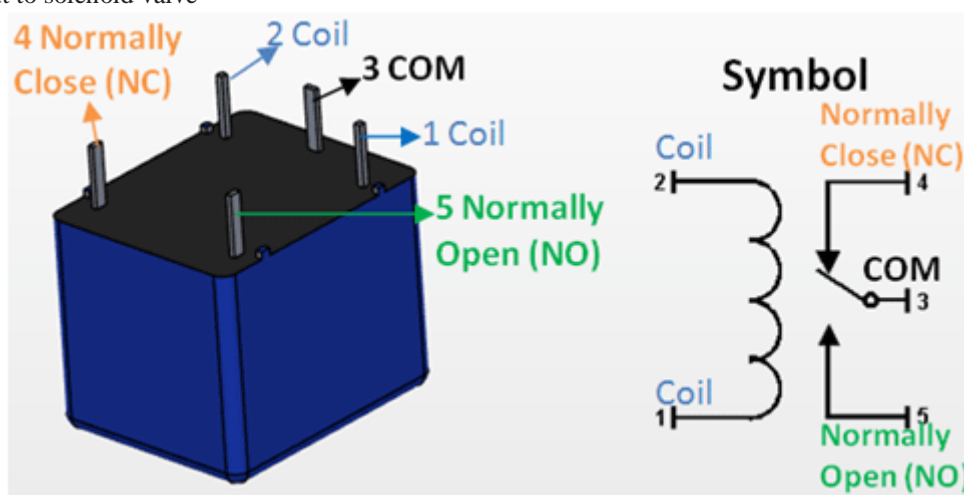


## 5.8 SOLENOID VALVE

A solenoid valve is an electromechanical device in which the solenoid uses an electric current to generate a magnetic field and thereby operate a mechanism which regulates the opening of fluid flow in a valve.

- ➢ Body material: Polyvinyl Chloride
- ➢ Disc material: Polypropylene

- ➢ Control style: Liver handel/mounted gear box
- ➢ Coil Voltage (volt) 24V
- ➢ Automation Grade Automatic
- ➢ Temprature range 15 to 250° F / -10 to 120°C
- ➢ Pressure range 0 - 115 PSI
- ➢ Power 1.25 amps
- ➢ Position normally closed
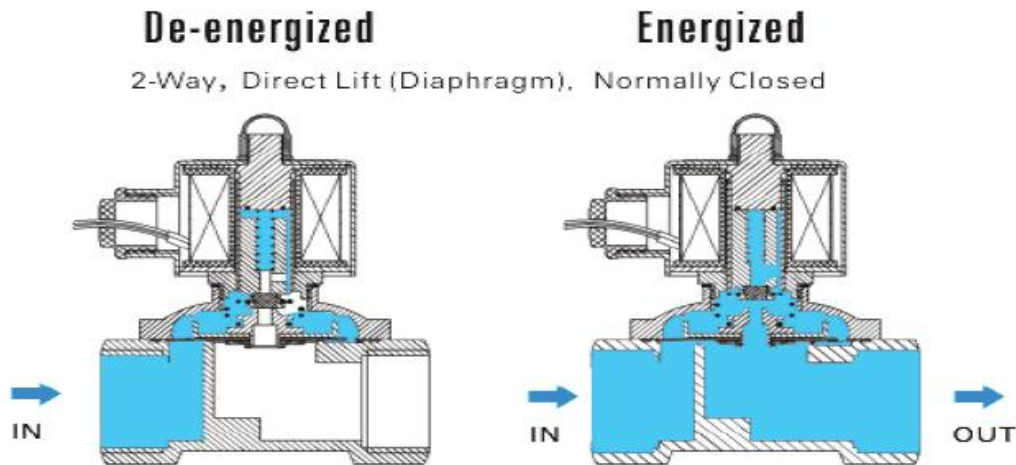


## 6. ADVANTAGES DISADVANTAGES & APPLICATIONS

### 6.1 ADVANTAGES

- ➢ Suitable for mobile toilet applications.
- ➢ Eliminates the need of expensive methods of waste disposals.
- ➢ Effectively saves gallons of water.
- ➢ Economic.
- ➢ Less complex.
- ➢ Easy to maintain.
- ➢ Stations are more clean and sanitized.
- ➢ Doesn't require skilled technicians.
- ➢ Chlorination makes this waste eco friendly & pathogen free.

### 6.2 DISADVANTAGES

- ➢ Discarding of bottles cans and plastic etc can choke the system.
- ➢ Tracks, except for stations, are excluded from this project.

### 6.3 APPLICATIONS

1. Trains
2. Mobile toilets

## 7. CONCLUSION AND FUTURE SCOPE

This project is a basic prototype of the ideas of collecting and discarding human waste in a environmentally sound way without imposing serious maintenance charges & issues in order to keep the stations clean with the help of solenoid valve. Not only will this idea help our stations look cleaner, hygienic and sanitized but also helps in the upliftment of the rural

areas by the secondary products obtained from this waste. Above all our project focuses on maintaining public hygiene in a hassle free way & environment friendly manner.

➢ Sewage can be periodically extracted and put into bio gas plant for the generation of methane.
➢  Zero discharge toilet system can be introduced with few changes in the existing mechanism.
➢ Sewage water after proper treatment can used for irrigation purpose.
➢ The sewage collected in these tanks can be periodically extracted at stations located at rural areas where a biogas plant preexist giving methane gas an alternative to traditional stove, fertilizers for farmers to increase their produce & for power generation.

## 8. REFERENCES:

[1] A Tribal Community-based Discussion on Economic Repercussions of a Twin-pit for pour-flush model Toilet Construction.
[2] A Review of Solid Waste Management Techniques using GIS and Other Technologies
[3] Justification of the Common Information Space Components for the Solid Waste Management
[4] D.Q.Jiang"Z.P.Xu, L.Ruan. The Physicochemical Characteristics Changes of Green Waste during Its Composting and therefore the Effect of Compost on the expansion of Some Trees [J]. Chinese Gardens, 20048!:63-65.
[5] Experimental Study of Bean Stalks as Bio-toilet Conditioner for Treating Human Feaces.