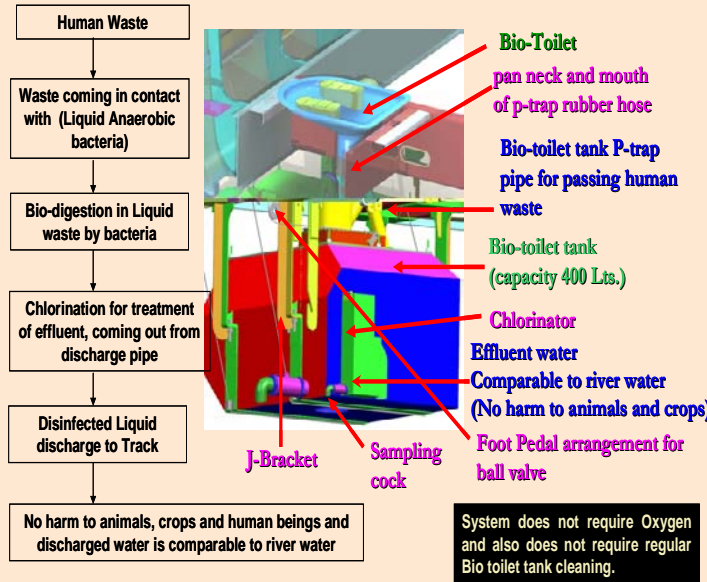


Indian Railway has developed “IR-DRDO” bio-toilets jointly with the DRDO. To establish it in IR conditions, trials on IR is going on. This pamphlet has been prepared for proper monitoring of these bio-toilets and enhancing knowledge of coach maintenance staff.

Working of Anaerobic Bacteria in IR-DRDO Bio-toilet Tank



Advantage of IR-DRDO Bio-Digester Tank

1. Anaerobic bacteria is added in the tank for degrading human waste.
2. No bad smell in toilets from the tanks
3. No infestation of Cockroaches & flies
4. Fecal matter in the tank not visible
5. No clogging of digester

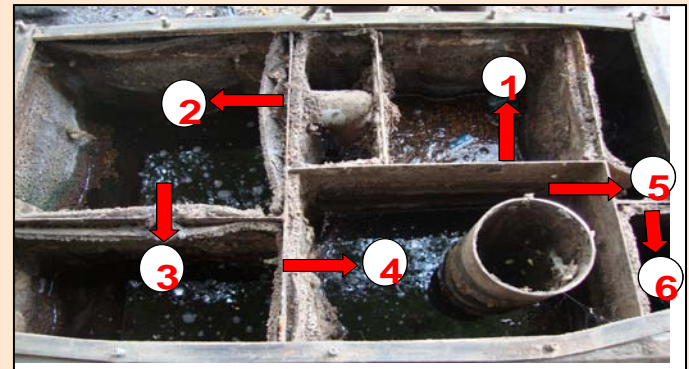
6. Effluent is free from off odour and solid waste
7. No maintenance required
8. Reduction in organic matter by 90%
9. No requirement of adding bacterial culture after 1st charging.
10. No need of removal of solid waste from tank.

Brief about Anaerobic Bacteria

- 120 Lts Inoculum (Bacteria) is charged in the Bio-digester tank.
- 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 sub zero temperature as well as upto 60 degree centigrade.
- 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.

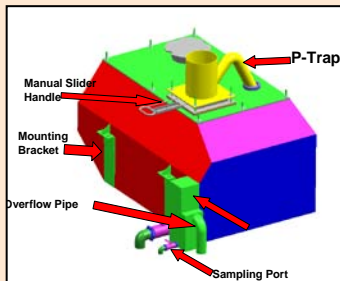
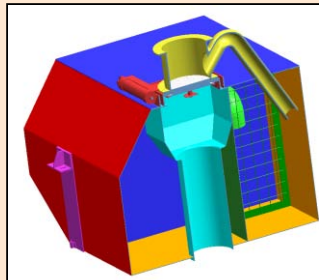
Waste Flow Path for IR-DRDO Bio-toilet



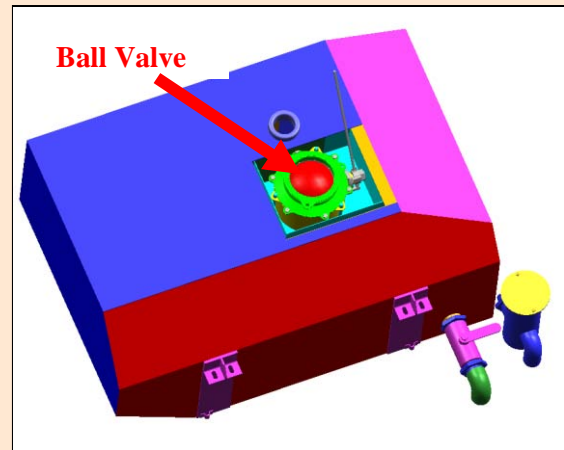
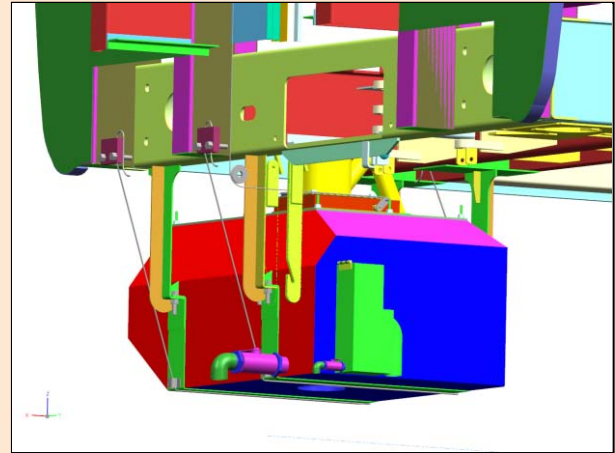
Variants of Bio- toilets

There are four variants of Bio toilets provided in the coaches.

Variants	Brief description	Features			
		Pneumatics	Electrics	PLC	Flush
1.	System with flapper valve	Yes	Yes	Yes	Pressurized
PLC - Programmable Logic Controller PLC is a digital computer used for automation of electromechanical processes, such as control of Mechanism					
2.	System with manual slider/Ball valve	No	No	No	gravity
Fail safe mode exist- chute system can be operated without dismantling of tank.					
3.	System with reduced opening at inlet	No	No	No	gravity
4.	System with solid liquid separator	No	No	No	gravity



Ball Valve arrangement on the tank



Constructional Features of IR-DRDO Bio-digester Tank

These tanks are made of stainless steel and having following constructional features:

- ▶ The size of the tank is 540 X 1150 X 720 mm
- ▶ The provision of 04 Nos mounting brackets at both the sides along the length of the tank.
- ▶ Each bracket is with the provision of 02 nos. M16 Size bolts which are tighten in the under slung on mounting J- brackets.

Main parts of the Bio-digester tank:

- ▶ Stainless steel tank with 06 partition walls in side the tank
- ▶ Poly grass mats for protection of bacteria in side the partition walls.
- ▶ Ball valve with handle for operation during emergency for making toilet direct discharge in case of chocking.
- ▶ SS fasteners in place of MS on tank covers.
- ▶ Stronger bonding of Colonized rubber mat with vertical walls.
- ▶ Chlorinator, Sampling cock, Safety wire rope etc.

Information about Volume & Weight of IR-DRDO Bio-digester Tank

1. - Total Volume of Tank – 400 lt. **2.** - Effective Volume of Tank –300 lt. **3.** - Empty Tank weight –110 Kg **4.** - Full Tank Weight –410 Kg **5.** - Height from Rail level –225 mm.

Testing Scheme for effluent of Bio-Toilets in coaching depots.

1	pH Value Test	In Coaching Depot
2.	Total Solids (TS) Test:	In Coaching Depot
3.	Total Dissolved Solids (TDS):	In Coaching Depot
4.	Total Volatile Solids (TVS):	In Coaching Depot
5.	Chemical Oxygen Demand (COD) Test	Govt. Appd. Lab/DRDE
6.	Fecal Coli Forms count:	Govt. Appd. Lab/DRDE

Other components / fittings of Bio-Digester Tank

- | | | | |
|----|----------------------------|---|--------|
| 1. | Mounting Bracket | - | 04 Nos |
| 2. | Safety Rope | - | 04 Nos |
| 3. | Locking Plate | - | 08 Nos |
| 4. | Hex. Head Bolt (M16 X70) | - | 16 Nos |
| 5. | Hex. Nut (M16) | - | 16 Nos |
| 6. | Spring Washer (B16) | - | 16 Nos |
| 7. | Hex. Head Bolt (M8 X35) | - | 16 Nos |
| 8. | 'U' Bracket(8 X20 X38) | - | 08 Nos |
| 9. | Positive Mounting brackets | - | 04 Nos |

Maintenance of Bio-toilet system and Guidelines for Rake Maintenance Supervisors

- ▶ Visual inspection of complete toilets system including under slung equipments as per Proforma -I
- ▶ Toilet chute to be cleared in bio-toilets if there is chocking.
- ▶ Collection and transportation of sample from retention tanks to DRDE/Gwalior or any other nominated Govt. approved/ accredited lab as per the test scheme.

- ▶ Checking the toilets system for any deficiency in each trip.
- ▶ Charging of chlorine tablets and examination of chlorinator as per testing scheme.
- ▶ Checking of functioning of Ball valve.

Checking of following equipments for proper functioning of Bio-Toilet:

- ▶ Flapper/slider/ball valve.
- ▶ Leakage in piping, flush system, pneumatics, tank etc. valves, PLC, pneumatic valves, ball valves etc.
- ▶ Charging of Bio-culture if required (based on test reports). Culture is supplied by DRDE/GWL.

Guidelines for coaching depots for handling of Bacteria:

- ▶ Wear gloves while handling bacterial culture.
- ▶ Store bacterial culture in containers with lid which can be closed.
- ▶ During transportation, lids should be tightly closed.
- ▶ During storage, lids should be kept loose so that the gas generated inside the container can escape easily otherwise container will get damaged.

DISCLAIMER

THE INFORMATION GIVEN IN THIS PAMPHLET DOES NOT SUPERSEDE ANY EXISTING PROVISIONS LAID DOWN IN RDSO AND RLY. BOARD'S INSTRUCTIONS. THIS DOCUMENT IS NOT STATUTORY AND INSTRUCTIONS GIVEN IN IT ARE FOR THE PURPOSE OF GUIDANCE ONLY. IF AT ANY POINT CONTRADICTION IS OBSERVED, RLY. BOARD/RDSO'S GUIDELINES OR ZONAL RLY.'S INSTRUCTIONS MAY BE FOLLOWED.

The information given in this pamphlet is only for guidance.

If you have any suggestion or comment, please write to:

Director (Mechanical), CAMTECH, Maharajpur,

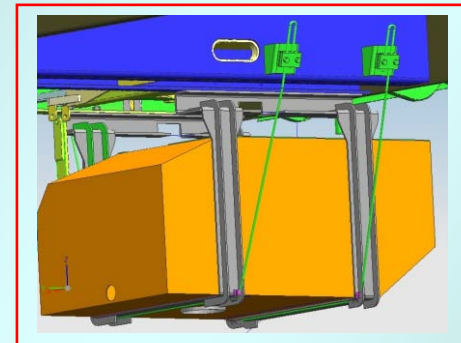
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**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**

**Pamphlet
On
IR-DRDO BIO-TOILET SYSTEM**



**CAMTECH/2013/M/GWL/Bio-Toilets/1.0
June 2013**

Maharajpur, GWALIOR - 474 005

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