

Onsite FSS Containment and Treatment  
Existing & Best Practices  
at  
Anil Agarwal Environment Training Institute  
SFD Week – April 2-4, 2019

**DRDO Bio-Digester Technology**  
**affordable and safe onsite treatment system for**  
**urban and rural**

**Banka BioLoo Limited – Technology Commercialisation Partner**



1. Journey
2. Type
3. Technology
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# DRDO Bio-Digesters: how and where it all began



The Siachen glacier is known as the world's highest and coldest battlefield

At 70 km, it is the longest glacier in the Karakoram and second-longest in the world's non-polar areas

Pakistani Army soldiers carry supplies up the 2,400-metre mountain near the Siachen area.  
- PHOTO: AP



*Journey began from Siachen*



# Low temperature areas – Leh, Ladakh



Temp controlled Metal Biodigesters



Biodigesters at Army Transit Camp  
Pang (Altitude: 15200 feet)



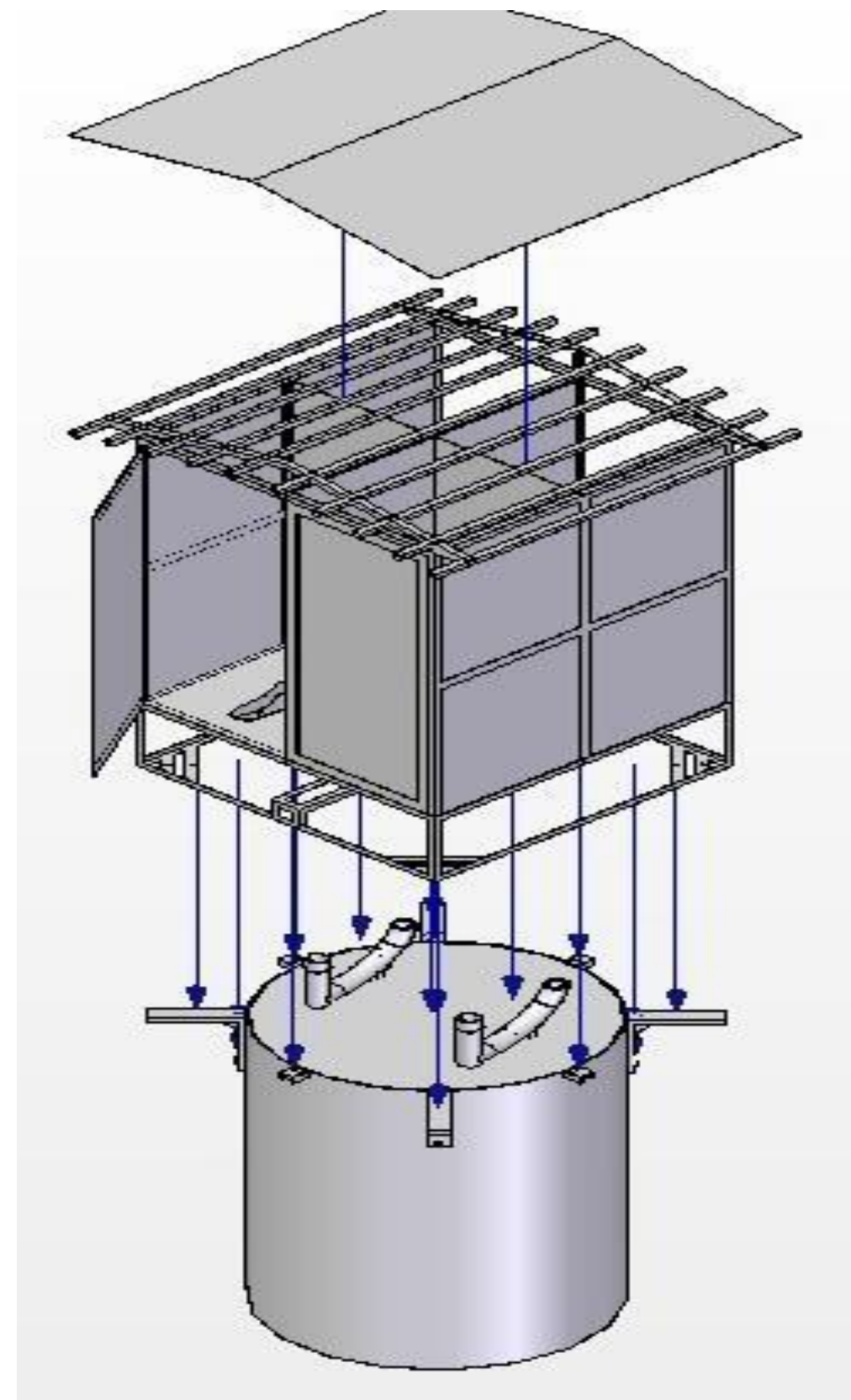
Spot test for inflammability of biogas



Biodigesters at Siachen



# High altitude



*For over 15 years these bio-toilets are functioning in high altitudes*

# Priorities are different

## Story since Banka BioLoo began its journey

- **60% (626 million) India did not have toilet**
- **100 mn people were degrading our environment every day**
- **<10% of gram panchayats in were ODF**
- **<3% people used public toilets**
- **200K open toilets of Railways dropping fecal waste on tracks**
- **99% banks did not have sanitation lending**
- **0% private funding/investment**
- **99% of the toilets were dealt by NGOs and/or governments**
- **100% problem of government**
- **0% technology innovation**
- **<1% private enterprise participation**
- **Not seen as public health issue**





# The Bio-digester Technology

## BACTERIA (INOCULUM)



Anaerobic microbial consortium developed by acclimatization / enrichment of microbes at low temperature and bio-augmentation with critical group of bacteria

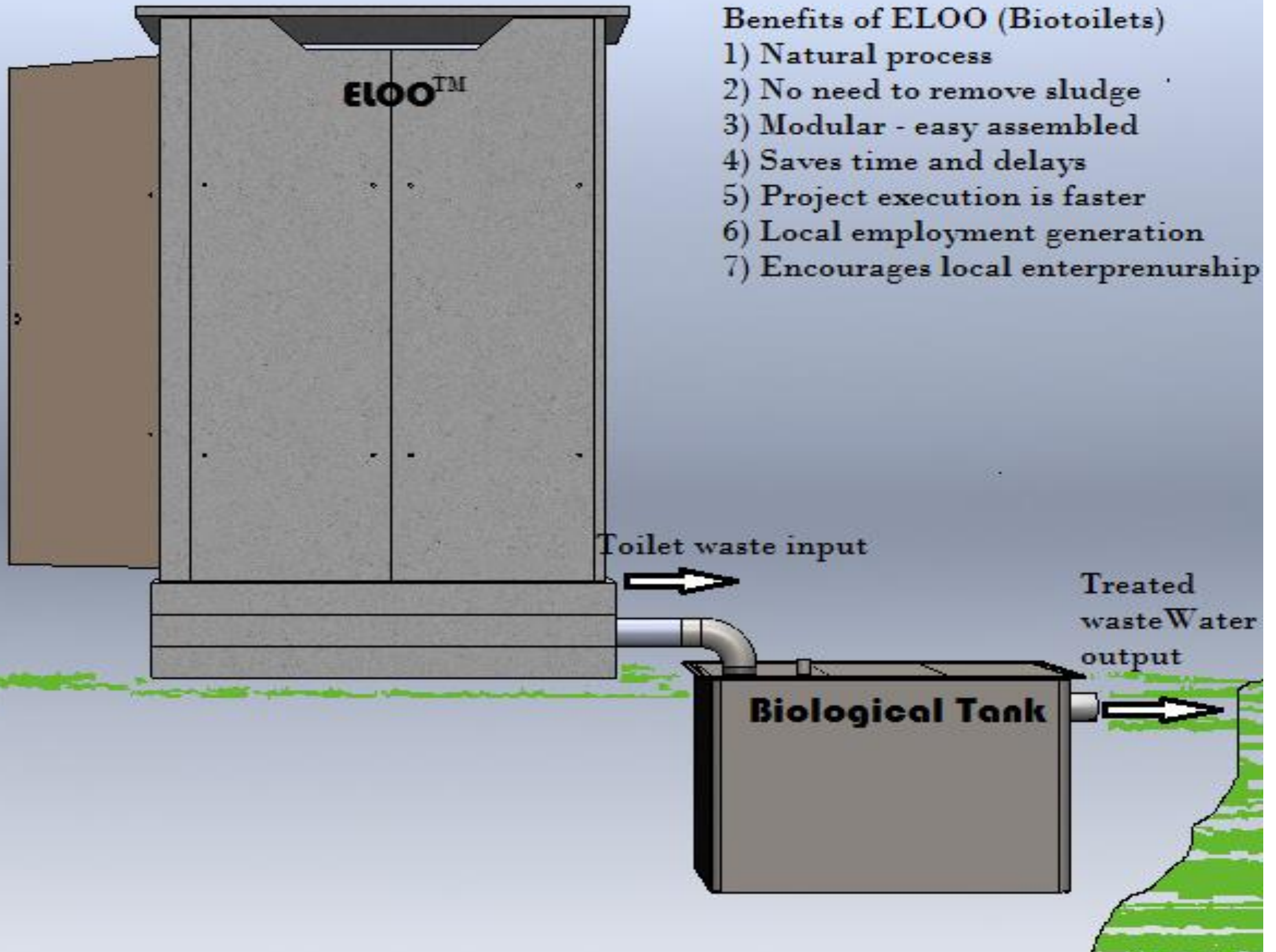
## BIO-DIGESTER



Fermentation container made of mild steel / SS / FRP / bricks

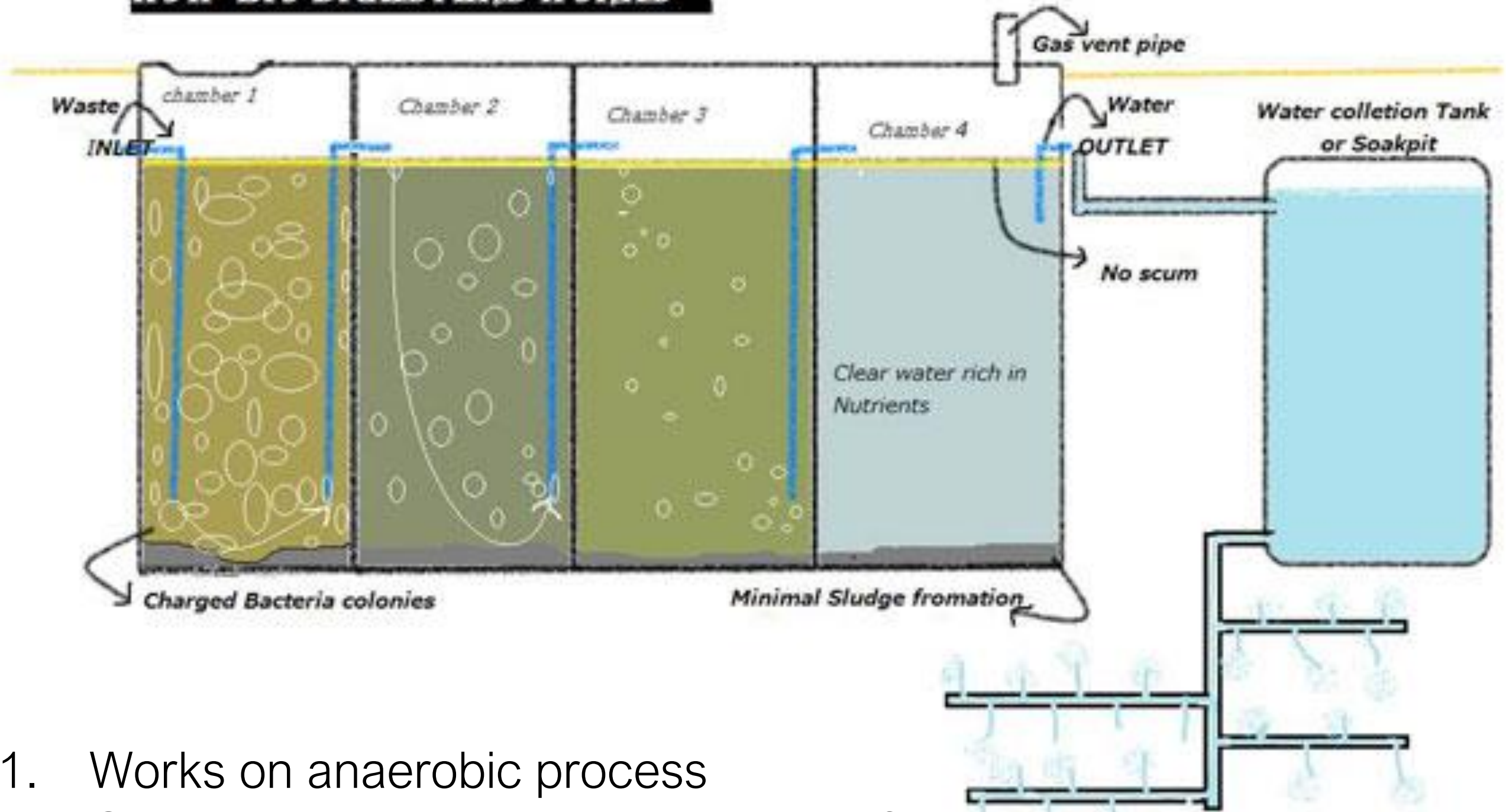
Dimensions and internal designs vary based on number of users, water availability and geo-climatic conditions

# Bio-toilet





## HOW BIO DIGESTERS WORKS



1. Works on anaerobic process
2. Creates bacterial colonies in the bio-film matrix attached on the walls of the digester
3. Multi-chambered tank
4. More solid retention time (SRT)
5. Active inoculated bacteria kick off the whole process

# Effluent Safety Studies

FRP bio-tank 700 liters  
for 5–6 persons

- **Oral toxicity at 0.5% of effluent**
  - **Acute toxicity**
  - **Chronic toxicity**
- **Extensive studies on animals conducted**
- **No clinical signs such as excitability, CNS stimulation, uncontrolled urination, bulging eyes, depression observed**
- **No change in biochemical parameters**
- **No toxicity found in both rat and fish models (Report: DRLT/PT/Tech Report-Biodigester /01 /2012, May 2012)**





# Onboard in Indian Railways

We are “open defecators” too, despite having toilets at home



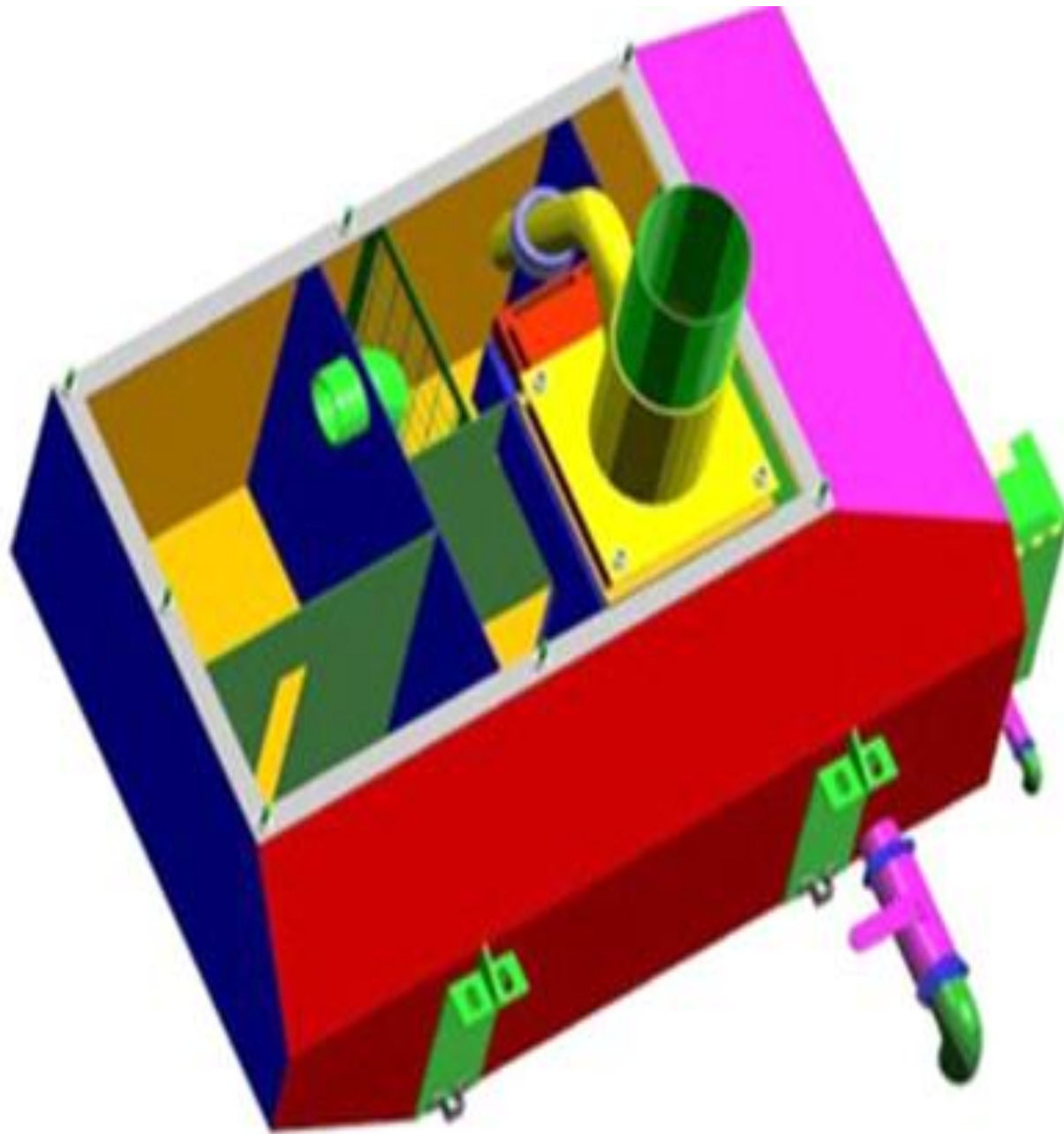
## Indian Railways

- World's largest rail network 115,000 km
- Runs 10,000 trains daily
- 30 million passengers travel by trains every day
- Around 60,000 passenger coaches

30 million passengers travel daily in 60,000 coaches  
dropping 1.64 million tons of solid on tracks



# Bio-digesters in Trains



- **160,000 bio-digesters fitted in 40,000 coaches**
- **By Oct 2019, all coaches to be retro-fitted with bio-digesters**



# Bio-digester: water quality

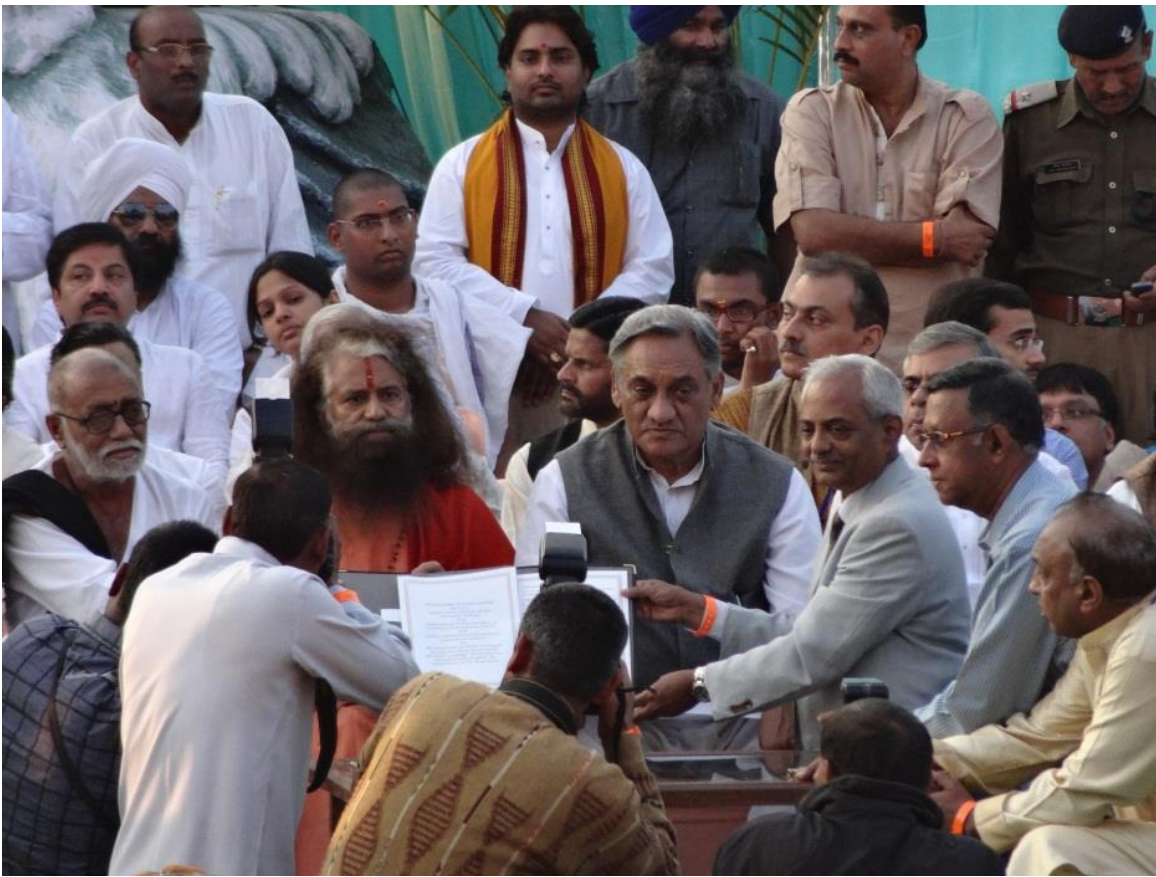
|                               | Septic Tank | Biodigester only | Biotank + Reed bed treatment |
|-------------------------------|-------------|------------------|------------------------------|
| pH                            | 6.7-7.5     | 7.0-7.2          | 7.0-7.5                      |
| Turbidity (NTU)               | 500-800     | 70-90            | 2-5                          |
| Total Suspended Solids (mg/L) | 150-300     | 90-120           | 50-80                        |
| TDS(mg/L)                     | 500-850     | 350-450          | 100-300                      |
| VS (mg/100ml)                 | 50-60       | 20-30            | 5-12                         |
| COD (mg/L)                    | 1200-2000   | 250-300          | 15-25                        |
| BOD 5 (mg/L)                  | 350-500     | 70-120           | 2-4                          |
| Coliforms (MPN/ml)            | >3000       | 300-350          | 0-12                         |

# Cost analysis – Containment & Treatment

| Onsite Sewage Treatment System | Space requirement | Sludge disposal | Maintenance (10 years) | Life (years) | Eco-freindly | Cost (INR) (Family size) |
|--------------------------------|-------------------|-----------------|------------------------|--------------|--------------|--------------------------|
| Septic tanks                   | Large             | Yes             | Yes                    | 20           | No           | 30,000                   |
| Leach pit system               | Small             | Yes             | Yes                    | 5            | No           | 6,000                    |
| Packaged STP                   | Small             | Yes             | Yes                    | 10           | No           | 35,000                   |
| Bio-digesters                  | Small             | No              | No                     | 15           | Yes          | 13,000                   |



# LANDMARKS



MOUs with various ministries for Implementing this technology

1. Indian Railways
2. Ministry of Drinking Water & Sanitation
3. Ministry of Urban Development



# DRDO Technology for Clean Ganga Initiative



**3 Nov 2012**

# Banka BioLoo at a Glance

Sanitation solution provider using biotechnology for human waste treatment onsite and builds sustainable sanitation infrastructure using innovative precast technology for toilet shelter

- Incorporated in August 2012
- Pan-India operations and installations
- Manufacturing and inoculum generation facilities in Telangana and Rajasthan, with regional offices across India
- Namita Banka – Founder is a women entrepreneur
- 1st sanitation company to raise funds for growth through IPO
- Upholds triple P – people, planet, profit



# Banka BioLoo's Sustainable Journey

## 1. Built & installed

- 10,000 bio-digester based bio-toilets across 20 states in India
- 2,000 stainless steel bio-digesters for Indian Railways
- 100 demo units across India
- 2 FSTPs using GeoTube technology in Warangal (TS) and Rajam (AP)

## 2. Explained

- 40,000 school children on usage of bio-toilets in Alwar District (Rajasthan)

## 3. Employs full time

- 700+ youth to operate and maintain bio-toilets in trains

## 4. Research & Development

- Developed robust implementation and delivery mechanisms
- Field research led to development of quality infrastructure and bio-digester
- Developing lab and testing for quality monitoring and resource recovery for reuse of solids and treated water

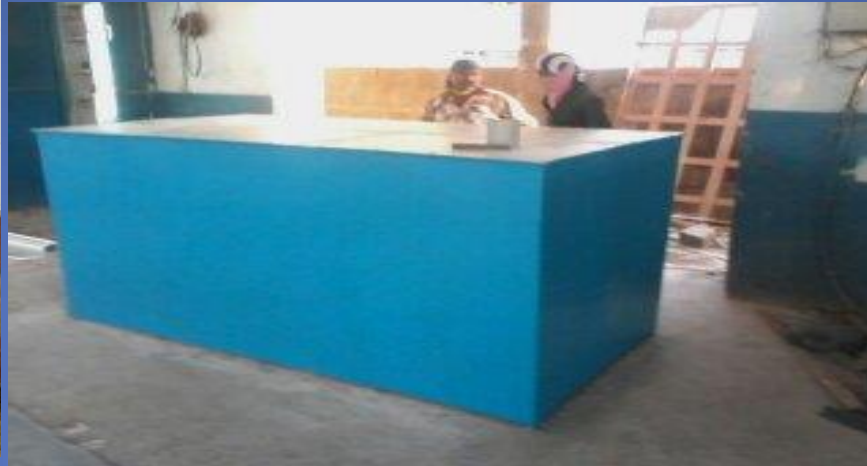
## 5. Secured and running

- 21 Contracts for O&M of bio-toilets in trains
- 21 FSTPs to be built in next 6 months in AP & TS

# Our Product Profile



**Bio-Toilet**



**Bio-Digester**



**Mobile Bio-Toilet**



**FSTP – GeoTube Technology**



**Railways sanitation system**



**Micro honey sucker**



# Different types to suit each person





# Fecal Sludge Treatment Plant (FSTP)

Designed affordable FSTP using innovative and eco-friendly process combining anaerobic digestion and Geotube® technology to treat and manage fecal sludge







Fly ash Brick Toilet –30k , time taken 1 wk

Precast panels Toilet – 38k time - 1 day





**SCHOOL SANITATION**



## CLUSTER MODLE FOR LABOUR COLONIES – MIGRANT WORKERS







BIO DIGESTER TANK

Sanitation for temporary requirement



# TRAIN SANITATION







**BIO-SEPTIC TANKS AT REMOTE LOCATIONS (100 uses)**



**Banka BioLoo Limited**

**[www.bankabio.com](http://www.bankabio.com)**

**This is proven and tested technology to address the problem of human waste treatment and end open defecation.**