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Solid-Liquid Waste (Residue) Utilization and Way Towards Zero Discharge/Disposal Communities



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Salient Points



- Definition of sanitation - Safety, Privacy and Dignity but conservation and protection of natural resources → water bodies and soil
- Handling of human excreta/solid residues is a must - scavenging?
- Safety and Aesthetics - No Smell; No See; No Touch
- Not of Technology Problem alone
- Philosophy, Principles and Choice of Technology are important
- Should not repeat mistakes done in urban sector – A paradigm shift

Salient Points



- A paradigm shift -
- Segregation at source and complete isolation of human excreta and other solid residues (wastes) from fresh water bodies until it becomes usable
- Utilization of Organics – Quality Organic Manure versus Biogas, Effective Organisms for odor and pathogen control – Carbon Credits
- See energy in a different form
- Should be made labour intensive
- Link with National Rural Employment Scheme/Swarn Jayanti Rozgar Yojana
- Pay rather than charge

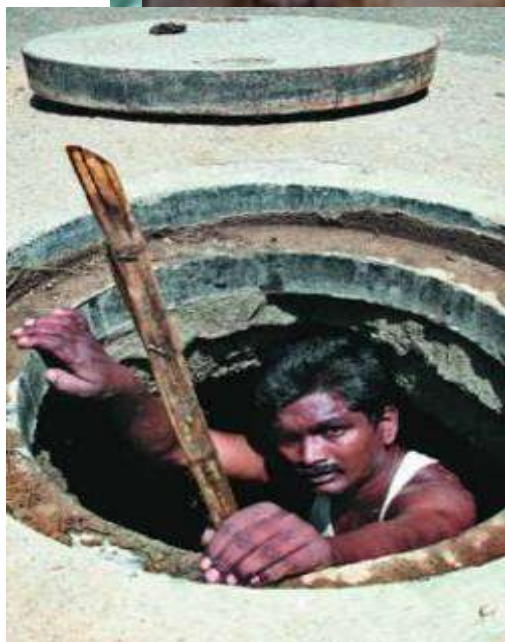
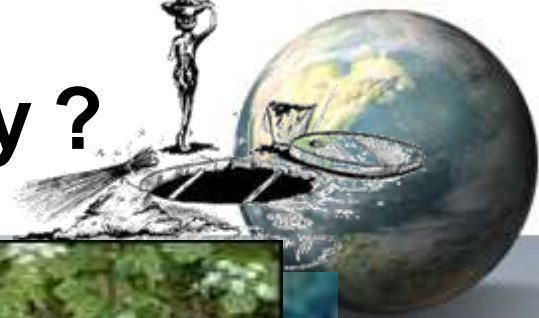
Status of our Water Bodies



- Causative Agents
- Solutions
- Realization – P Ban



Scavenging: Is this the right way ?



Defecation – Is this the right way!

Political economy of defecation is a topic nobody talks about.

Sewage systems constitute an ecologically mindless technology.

Consider first the large amount of water that is used just to carry away a small quantity of human excreta.

Big Dams and tube-wells are needed to bring this water home leading to enormous environmental problems.

Then large quantities of water that get flushed down the toilet pollute rivers and large water bodies.

This.... Nobody talks about. It is neither rational, just or sustainable.”

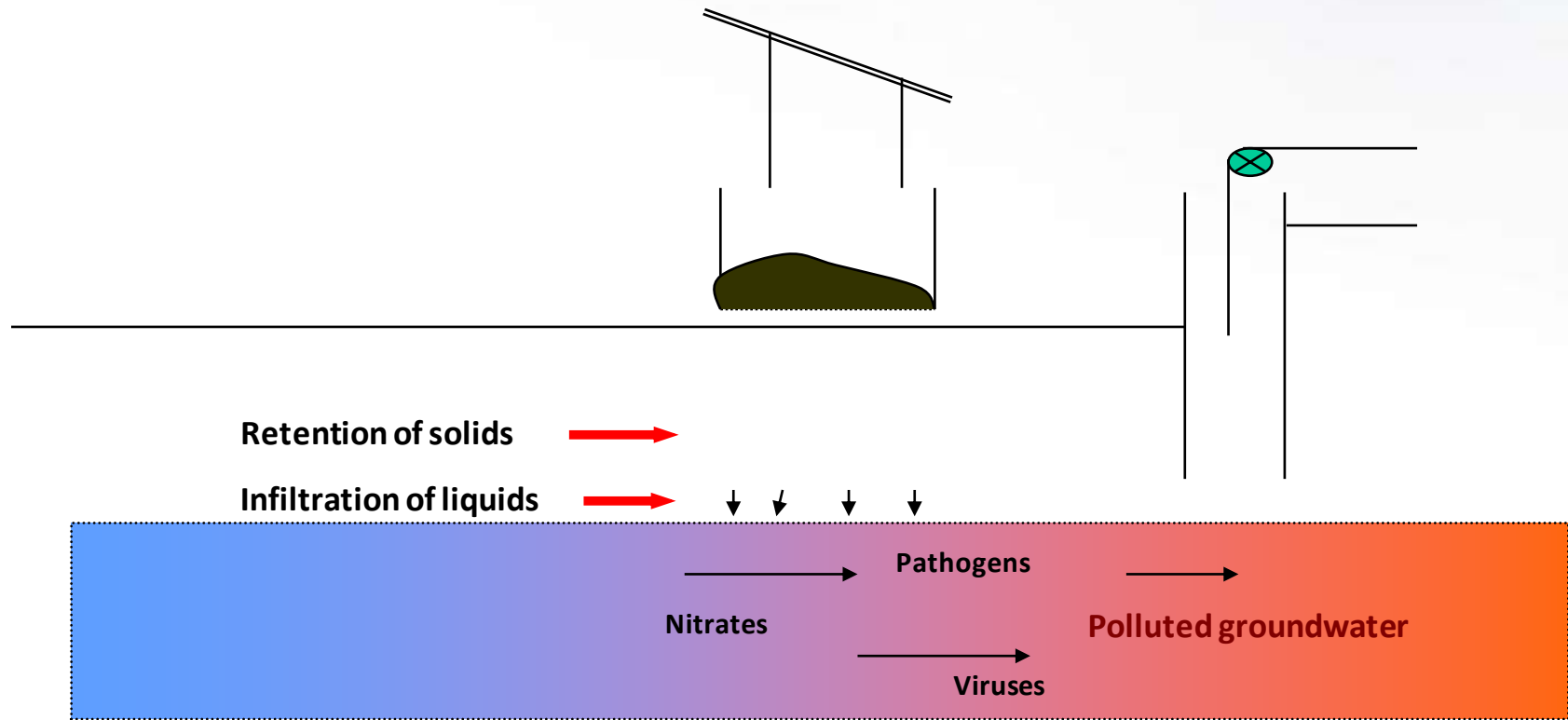
Dr Anil Agrawal,
Founder Director CSE
1947 - 2002





Sanitation and Waste Management

The idea, that human excreta are wastes with no useful purpose is a modern misconception. It has led to the development of so-called “drop and store” or “flush and forget” sanitation solutions, where precious drinking water is used to transport excreta into the water cycle misusing our rivers, oceans and aquifers as a sink for untreated waste.



गंगां पुण्यजलां प्राप्य त्रयोदश विवर्जयेत् । शौचमाचमनं सेकं निर्माल्यं मलघर्षणम् ।
गात्रसंवाहनं क्रीडां प्रतिग्रहमथोरतिम् । अन्यतीर्थरतिचैवः अन्यतीर्थं प्रशंसनम् ।
वस्त्रत्यागमथाघातं सन्तारुचं विशेषतः ॥ इति मानन्दपुराण (८०० ई०)

Thirteen actions must be prohibited on arrival at the sacred water of the Ganga, namely: Defecation, ablutions,

- This doctrine has been misunderstood/inappropriately followed!

Brought the concept of BOD/COD limits → 30 mg/l/250 mg/l.

Legalized defecation in water bodies

A Paradigm Shift in Human Excreta Management Practices: Blend of Advanced Technologies with Traditional Wisdom

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

-Alvin Toffler

“Rethinking the Future”

Environmental Revolution



Eco-sanitation ... Is the Answer

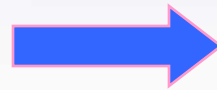
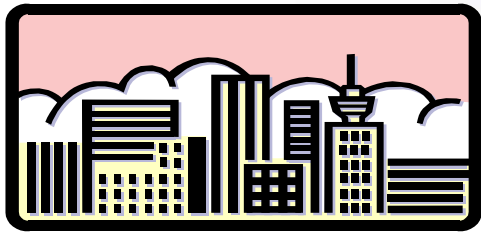


EcoSan...

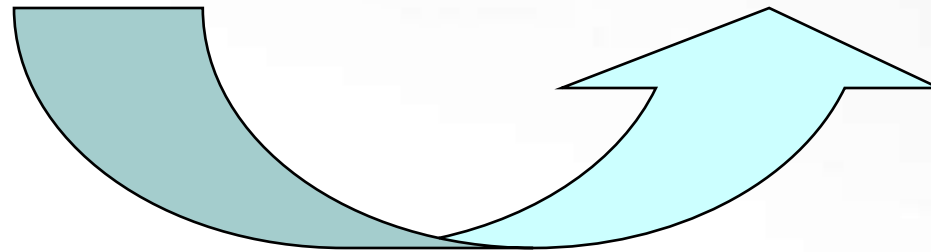
- ... is not a specific technology, but a philosophy - based on an eco-system-oriented view of material flows
- ... applies the basic natural principal of closing the loop by using modern and safe sanitation and reuse technologies
- ... opens up a wider range of sanitation options than those currently considered.

➔ Human excreta and domestic used water are not wastes but are important natural resources!

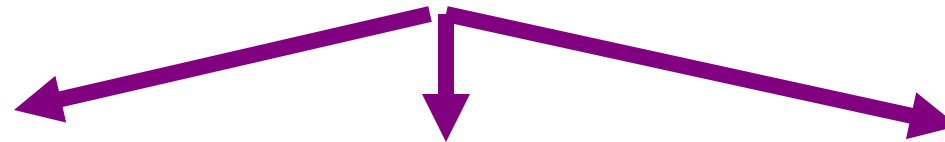
Waste → Wealth



Compost



Modern Night Soil Industry



Employment

Agriculture boost

Environmental Protection



Eco-sanitation ...Impediments

Unfortunately,

- EcoSan Concept is considered appropriate for poor/rural people
- For modern societies/urbanites it is a buzz word
- Label EcoSan to existing practices/technologies

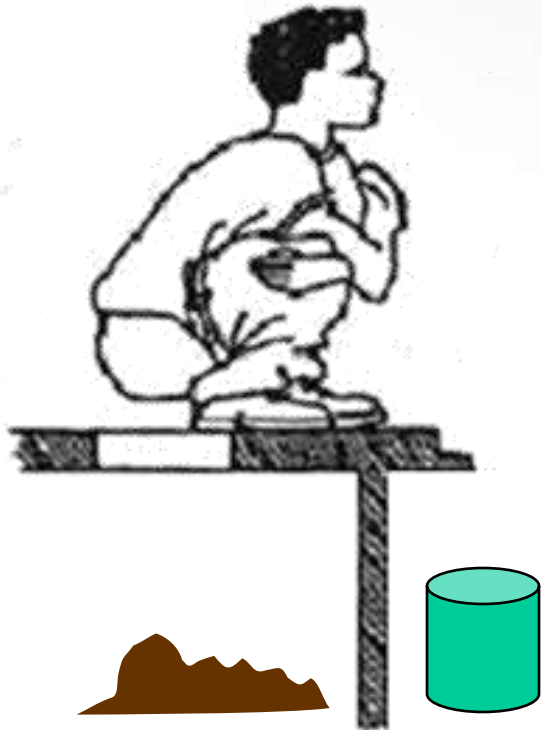
Two guiding principles for adopting EcoSan systems:

- Flow streams with different characteristics, such as faeces and urine must be collected separately.
- The unnecessary dilution of the flow streams must be avoided, for example by using dry, low flush or vacuum transport systems. Or recycle the flush water i.e. **DO NOT** use fresh water for flushing.

This minimises the consumption of valuable drinking water and produces high valued concentrations of recyclables.

A Paradigm Shift

Pay rather than Charge



Use Rather than Waste

Do business and not only Service



Approach



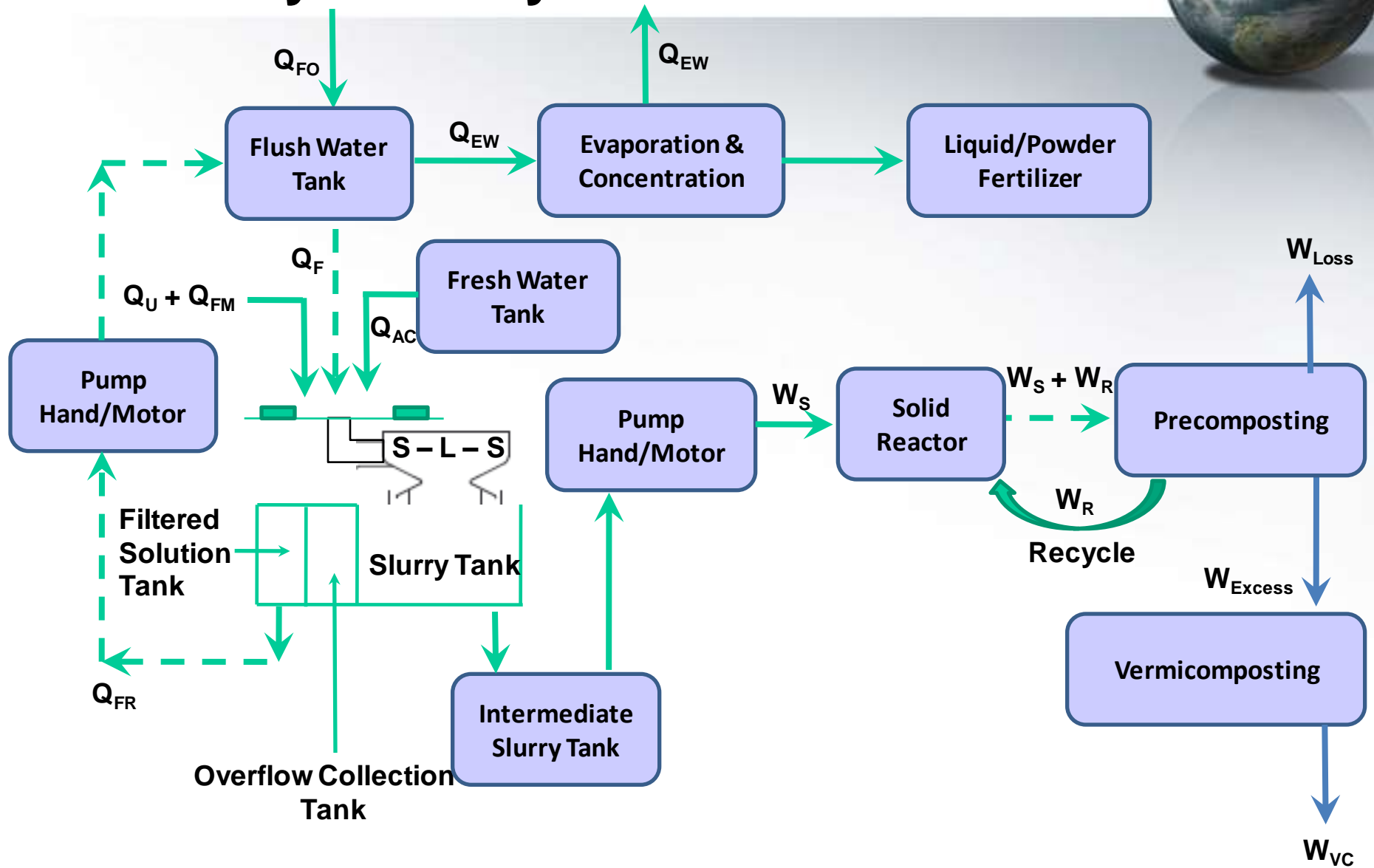
**Use of
Advanced Technologies
with
Traditional Wisdom**

Characteristics of an Ideal Toilet



- ✓ Hygienic
- ✓ Easy To Use
- ✓ Not many usable parts
- ✓ No odors
- ✓ Should be aesthetically pleasing
- ✓ No insect menace
- ✓ Require minimum user intervention
- ✓ Waste should be processed to a usable form

Schematics Representation of a Typical Community Toilet System



Start: First Toilet at IITK Campus



Start: First Toilet at IITK Campus



Community Zero Discharge Toilet @ Delhi Gate Police Station Aligarh



ZDT in a Congested Locality at Aligarh



Zero Discharge Toilet @ Aligarh



At the Toilet site



Treatment Plant or Humanure Plant?



Mixing and Pre-composting shade



Vermibins

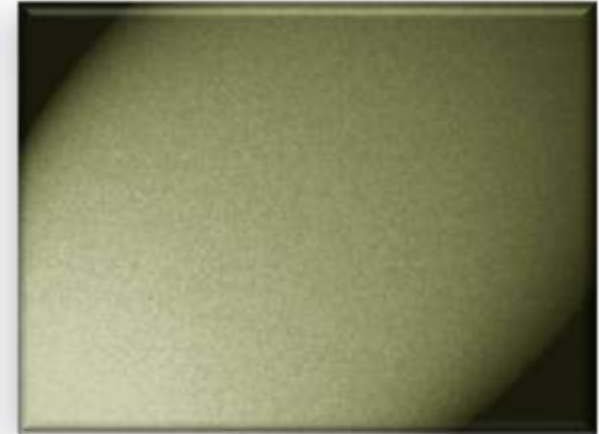
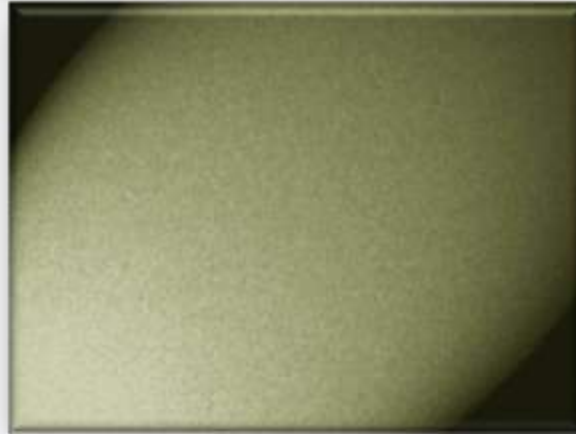
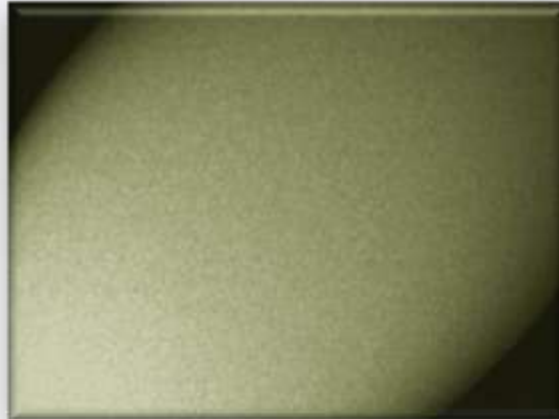


Enhanced Solar Evaporation Pond

Hummanure Plant



Aligarh Community Toilet System



Zero Discharge Toilet System (ZDTS)



Environment-Friendly Railway-Coach Toilet System



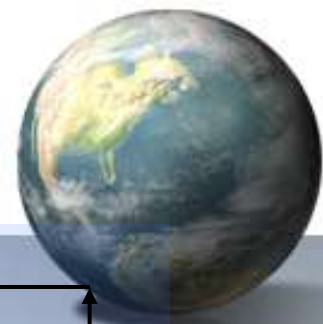
RDSO



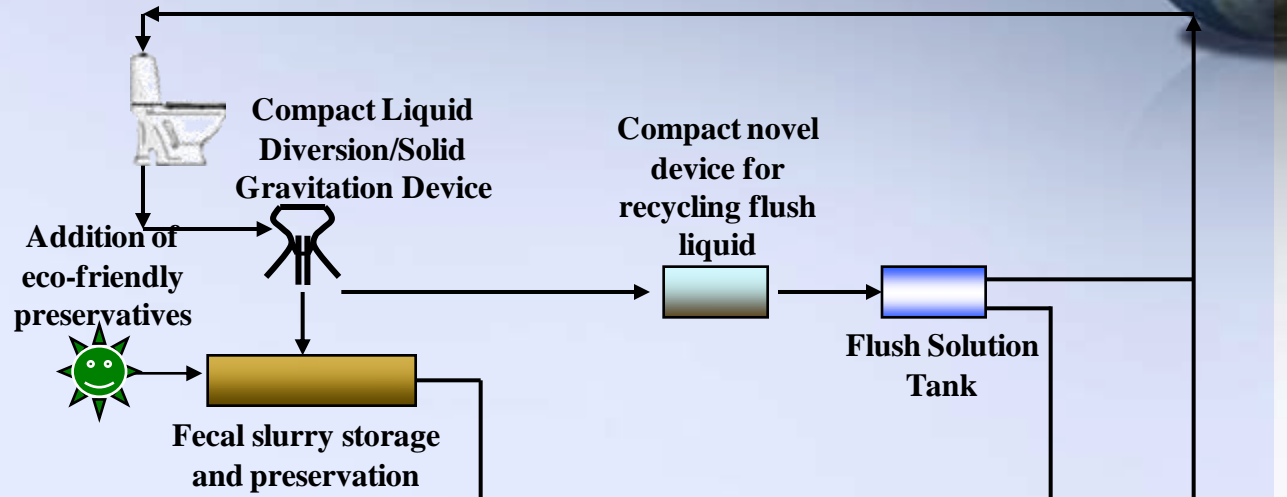
IITK

Urbane Industries, Chennai

Schematics Representation of the System



ON BOARD

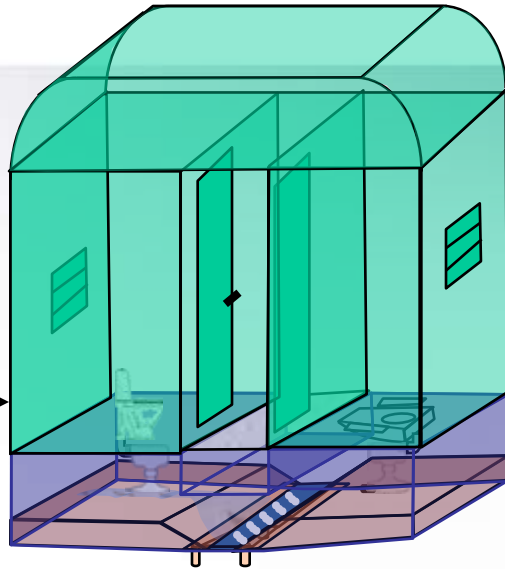


AT SICK LINES
AND
YARDS

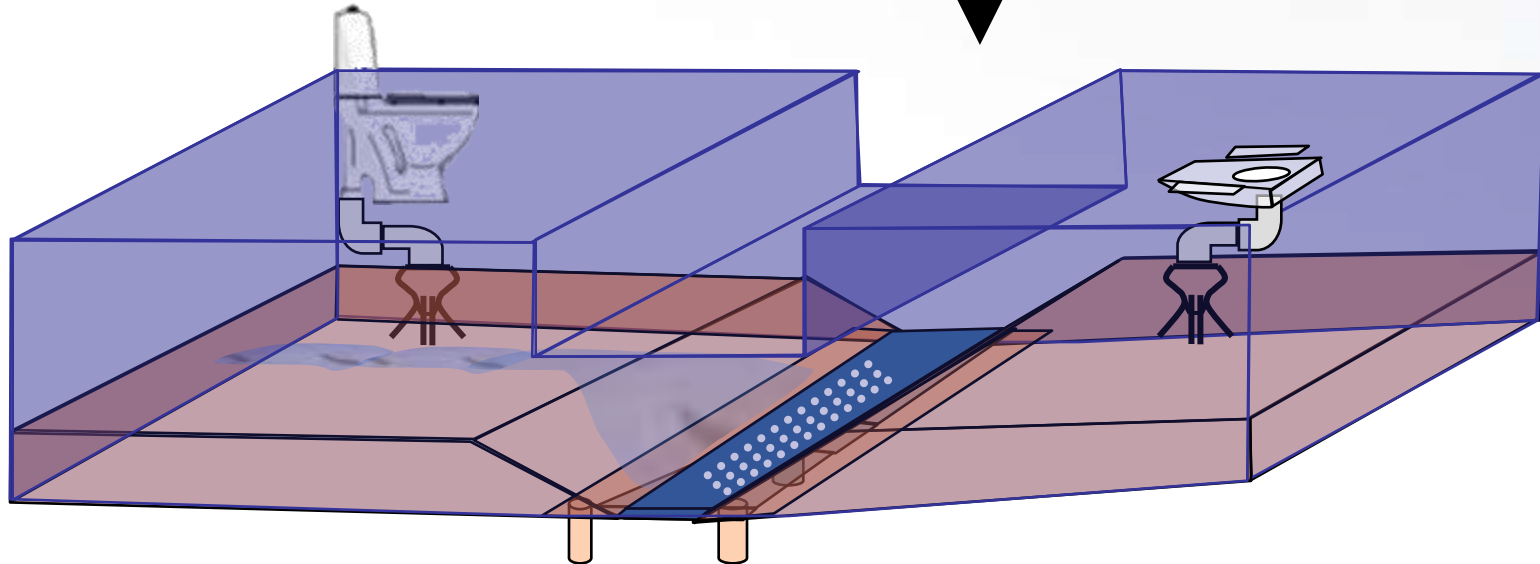


Schematics of

Environment-Friendly Railway-Coach Toilet System



Schematics of Coach Toilet System



Model of the On-board System for Liquid Diversion and Recycle

Residue Evacuation and Handling



First Prototype Mounted on SR 08224



Paradigm Shift

Energy from waste is waste of energy

Biogas to Quality Organic Manure

Get Urea, Ammonia, Potash and Phosphate from Urine than Fertilizer Industries





Business!

	Plausible Recovery MT	Energy Savings MW	Equivalent Reduction in CO₂ Emissions (Carbon Credits) MT
N	1.5	2835	9.2
P	0.12	172	0.2
K	0.75	285	0.4
Total		3292	9.8



Thank You !

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