



DEWATS™

Decentralised Wastewater Treatment System

An alternative to centralised wastewater treatment

Decentralised Wastewater Treatment Systems (DEWATS™) is a nature-based technology and approach. It recommends building many smaller systems to treat wastewater close to the point of generation, enabling water to be effectively reused for gardening and toilet flushing.

How DEWATS™ was developed?

DEWATS™ was collated and standardized (in the 1990s) by engineers at Bremen Overseas Research and Development Association (BORDA) after studying wastewater treatment systems in other developing countries.

They developed Decentralised Wastewater Treatment System (DEWATS™) as a solution most suitable for India's unique conditions i.e. where electricity and skilled manpower are not easily available.

Key Features

- Simple design; using natural bacteria and plants
- No chemicals
- No/ low electricity required, can work on gravity
- Minimum maintenance
- Easy to integrate with landscaping
- Produces reusable biogas and nutrient-rich water and sludge
- Adaptable to a variety of organic wastewater characteristics
- 80% lower O&M costs than comparable technologies

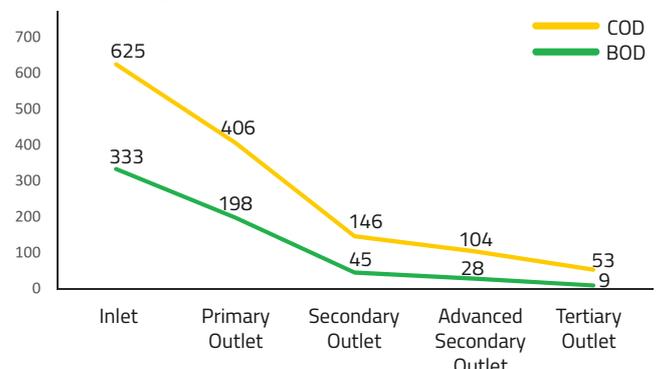
Comparison with other technologies

	Space Required	CapEx	O&M Costs	Use of chemicals	Use of electricity
Sequential Batch Reactor	Green	Green	Red	Yellow	Red
Membrane Bioreactor	Green	Green	Red	Red	Red
Stabilization Pond	Yellow	Yellow	Red	Yellow	Red
Reed bed Systems	Yellow	Yellow	Red	Yellow	Yellow

- Green: Lower than DEWATS™
- Yellow: Same as DEWATS™
- Red: Higher than DEWATS™

Treatment Efficiency

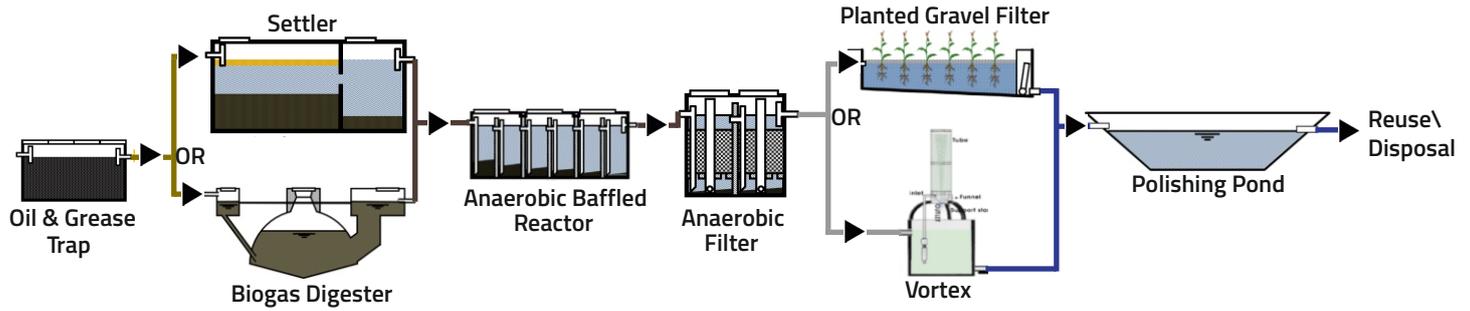
BOD and COD levels at each treatment stage of DEWATS™



Today DEWATS™ is a proven technology, which has been implemented in over 17 countries. CDD, its trainees and partners have implemented over 400 systems across India, which treat 15,000 m³ of wastewater, generated by 2 lac people everyday.* (*as of January, 2021)

DEWATS™ - Flow Diagram

The right combinations and dimensions of the modules make DEWATS™ successful



DEWATS™ Modules

Oil & Grease Trap

Used for capturing floating materials, it is provided only in cases where there is a high amount of oil and grease in the wastewater. Eg: Restaurants.

Stage	Preliminary Treatment
Maintenance	<ul style="list-style-type: none"> ▪ Remove trapped content - twice a month

Settler

The settler is a closed tank of two or three chambers with 2-3 hours of retention time that traps a significant portion of heavier solids and floating particles while letting the rest pass into the following modules.

Stage	Primary Treatment
Efficiency*	20-30%
Maintenance	<ul style="list-style-type: none"> ▪ Monthly inspection of wastewater flow ▪ Monthly removal of scum ▪ Removal of sludge- once in 1-2 yrs

Biogas Digester

An improvised sedimentation tank as an alternate to the settler, it is suitable for wastewater with high organic content. It decomposes organic particles by anaerobic digestion and generated bio gas which is used as fuel.

Stage	Primary Treatment
Efficiency*	50-60%
Maintenance	<ul style="list-style-type: none"> ▪ Monthly inspection of WW flow ▪ Operation of water trap ▪ Removal of sludge- once in 1-2 yrs

Anaerobic Baffle Reactor

Consists of multiple chambers in series, connected with downtake pipes. The wastewater is made to pass in an up-flow fashion, thereby establishing a contact with sludge blanket formed at the bottom. The combination of sedimentation and anaerobic sludge digestion ensures removal of suspended and colloidal particles.

Stage	Secondary Treatment
Efficiency*	75 - 90%
Maintenance	<ul style="list-style-type: none"> ▪ Monthly inspection of WW flow ▪ Desludging every 2-3 yrs

*Mentioned efficiency is a cumulative efficiency of preceding modules.

Anaerobic Filter

Consists of up-flow chambers connected in series, partially filled with filter media. The biofilm formed on filter media traps and degrades finer suspended organic particles when wastewater passes through it. The filter media can be cinder, gravel, rock aggregates, corrugated pipes, specially designed plastic media etc.

Stage	Secondary Treatment
Efficiency*	75 - 90%
Maintenance	<ul style="list-style-type: none"> ▪ Monthly inspection of wastewater flow ▪ Desludging every 3-5 yrs ▪ Washing of filter media- when treatment efficiency reduces

Planted Gravel Filter

A shallow tank of graded gravel or pebbles and selected species of plants (such as Reed, Canna indica or Cyperus papyrus) to treat remaining pollutants by biological conversion, filtration and surface aeration. It can be integrated into the landscape.

Stage	Advanced Secondary/ Tertiary Treatment
Efficiency*	80 - 95%
Maintenance	<ul style="list-style-type: none"> ▪ Monthly removal of weeds from top ▪ Trimming of plants once in 3 months

Vortex

Vortex is a post treatment module used for increasing oxygen levels in anaerobically treated water and for aiding nutrient removal. The water pumped from the tank undergoes a spiral movement inside the vortex which diffuses oxygen and also expels odor. It can be used as an alternative to the planted gravel filter.

Stage	Post Treatment
Efficiency*	80 - 95%
Maintenance	<ul style="list-style-type: none"> ▪ Regular maintenance of pumps ▪ Cleaning the apparatus

Polishing Pond

A shallow pond that ensures aerobic treatment where pathogens are removed mainly due to exposure to natural ultraviolet rays in sunlight.

Stage	Tertiary/ Post Treatment
Efficiency*	95 - 97%
Maintenance	<ul style="list-style-type: none"> ▪ Cleaning of pond once in a year

DEWATS™ at IIT Gandhinagar



Started in 2015, a DEWATS™ of 3.5 MLD is planned, which will be implemented phase wise (In the 1st phase, a 0.6 MLD DEWATS™ has been implemented for the wastewater generated by faculty, staff and students on campus.)

The design of IIT Gandhinagar's new campus was driven by three basic conditions – an exceptional aesthetic feel, function, convenience and resource efficiency such that the campus can achieve GRIHA ratings for buildings.

Keeping this in mind, there was a need for a wastewater treatment system, which enabled reuse of water. DEWATS™ was selected for its simple O&M and low maintenance costs.

DEWATS™ at Pristine Temple Tree Apartment, Bangalore



Set up in 2019, the DEWATS™ treats 15 KLD wastewater generated by 40 flats of Pristine Temple Tree Apartment.

DEWATS™ was selected as it enabled treatment at one location as well as reuse for gardening/landscaping (with safe disposal of remaining wastewater into nearby municipal sewer line).

Sectors of Application

System sizes from 1,000 - 1 million litres-per-day (1-1,000 KLD) can be set up. CDD, along with its trainees and partners has set up DEWATS™ at:

- Apartments and housing colonies
- Communities
- Colleges/Universities
- Schools
- Institutions
- Factories and food processing units
- Hospitals
- Temples

DEWATS™ at Aravind Eye Hospital, Pondicherry



Built in 2003, the DEWATS™ treats ~307 KLD of wastewater, generated by 1,500 patients and residents of the hostels and staff quarters.

The treated wastewater is reused for irrigation of the rich surrounding landscape and a garden, where vegetables and fruits are grown. A substantial quantity is re-used for toilet flushing. This helps the hospital save more than 100,000m³ of fresh water every year — equivalent to the requirement of over 2,000 people.

DEWATS™ for Kuttiyadur Community and Kadampadi Rehabilitation Colony, Tamil Nadu

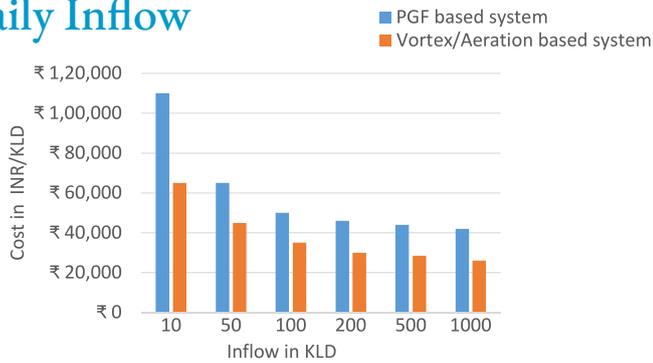


A DEWATS™ system with simplified sewer lines for treatment of wastewater generated by:

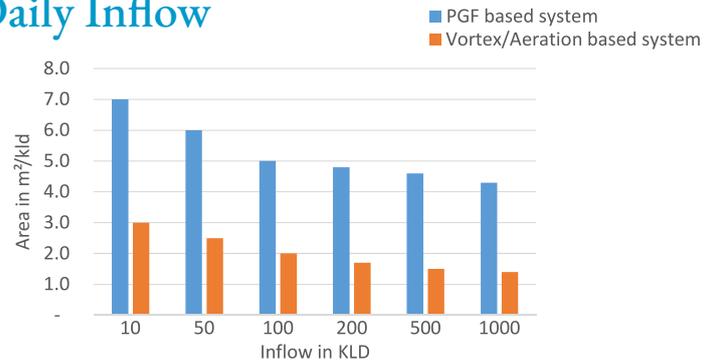
- Kuttiyadur community rehabilitated in new houses (175 houses, 875 people); and
- Kadampadi Rehabilitation Colony (225 houses, 1,225 residents) after their houses were swept away by the 2004 Tsunami

We provided wastewater treatment plant designs for 23 settlements in 5 districts of Tamil Nadu - 7 of these have been implemented.

DEWATS™ Cost variation with Daily Inflow



DEWATS™ Area variation with Daily Inflow



Operation and Maintenance of DEWATS™



Key Operations & Maintenance Activities:

- | | |
|--|------------------------|
| 1 - Cleaning blockages from the sewer line | 4 - Trimming of plants |
| 2 - Cleaning of inspection chamber | 5 - De-sludging |
| 3 - Measuring the level of swivel pipe top | 6 - Removal of scum |

DEWATS™ is low in O&M and does not require skilled labors to operate the system. Unskilled labour for 1 shift is sufficient to carry out operations. There are simple regular checks and periodical maintenance activities that need to be carried out to ensure the treatment performance of the system.

The annual cost of maintenance for DEWATS™ ranges from Rs.70,000 to 6,20,000 /year.

Reuse Applications

Treated Water

- Gardening
- Construction
- Flushing
- Subsurface Irrigation

Biogas

- Cooking/Fuel
- Biogas Lamp

Solids

- Fertilizer
- Soil conditioner

The surface area above the underground modules of the DEWATS™ can be used for a playground, parking etc. and the planted gravel filter becomes a part of the landscape area.

Accreditations

Dr. Mashelkar Committee

DEWATS™ is recognised as one of the technologies accredited by the Dr. Mashelkar Committee, a committee set up by the Prime Minister's Office to recommend clean technologies in India.

CPHEEO Manual

DEWATS™ has been mentioned in the Central Public Health and Environmental Engineering Organisation's (CPHEEO) manual on Sewerage and Sewage Treatment.

Suchitwa Mission

Empanelled as Engineering Consultant for DPR preparation and handholding in project execution for Wastewater/ Septage Treatment projects taken up by the Local Self Government Institutions, Kerala.

DEWATS™ Trademark

DEWATS™ is a certified trademark of CDD Society under the Trade Marks Act, 1999 (Government of India).

Other Notable Clients

- Bangalore Metro Railway
- DMA, Karnataka
- Good Earth, Bangalore
- MMRDA, Mumbai
- Pune Municipal Corporation
- Seven Hills Hospital, Mumbai
- Tamil Nadu Water Supply and Drainage Board
- Kalmeshwar Municipal Corporation
- Karnataka State Habitat Center



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