



# DEWATS | Decentralized Wastewater Treatment Solutions



**Demand-based technical solutions to reduce water-pollution by small and medium enterprises and settlements in densely populated areas**



**BORDA**

Treatment Systems |  
DEWATS Service Package

Developed and disseminated by  
BORDA & BORDA BNS Network

# About DEWATS

**DEWATS stands for "Decentralized Wastewater Treatment Solutions". DEWATS is rather a technical approach than merely a technology package.**

DEWATS applications are based on the principle of low-maintenance since most important parts of the system work without technical energy inputs and cannot be switched off intentionally. DEWATS applications provide state-of-the-art-technology at affordable prices because all of the materials used for construction are locally available.

- DEWATS applications provide treatment for both, domestic and industrial sources
  - DEWATS applications provide treatment for organic wastewater flows from 1-1000 m<sup>3</sup> per day
  - DEWATS applications are reliable, long lasting and tolerant towards inflow fluctuation
  - DEWATS applications do not need sophisticated maintenance
- Without considering facilities for necessary chemical pre-treatment of wastewater from industries, DEWATS applications are based on four basic technical treatment modules which

are combined according to demand:

- Primary treatment: sedimentation and floatation
- Secondary anaerobic treatment in fixed-bed reactors: baffled upstream reactors or anaerobic filters
- Tertiary aerobic treatment in sub-surface flow filters
- Tertiary aerobic treatment in polishing ponds

DEWATS applications are designed and dimensioned in such a way that treated water meets requirements stipulated in environmental laws and regulations.

# The Challenge

The demand for reliable, efficient and low-cost wastewater treatment systems is increasing world wide especially in densely populated urban regions where adequate wastewater treatment systems do not exist and uncontrolled discharge of wastewater endangers environmental health and water resources. Many Governments have passed new environmental regulations stipulating that dischargers of wastewater such as small and medium enterprises and housing estates will be held responsible for wastewater pollution and must therefore treat wastewater adequately on-site before it is discharged into the environment.

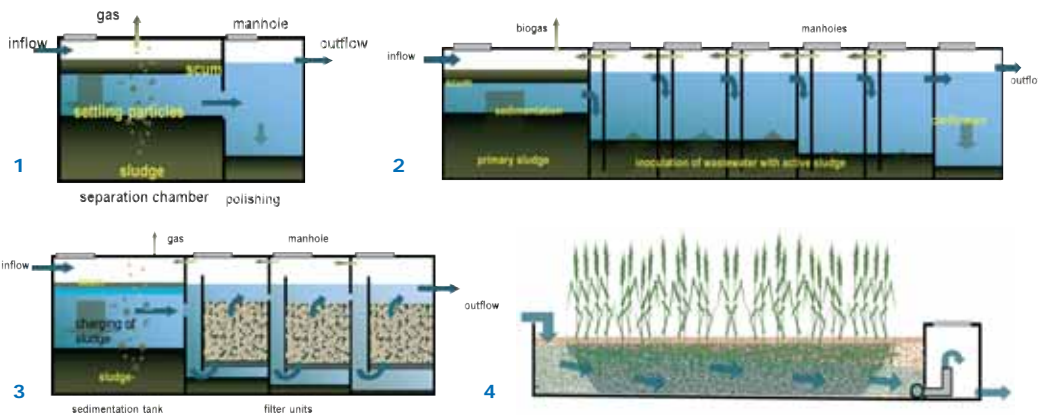
## Appropriate Wastewater Treatment for SMEs

### Advantages of DEWATS technology

- Providing treatment for domestic and industrial wastewater
- Low primary investment costs as no imports are needed
- Efficient treatment of daily wastewater flows up to 1000m<sup>3</sup>
- Modular design of all components
- Tolerant towards inflow fluctuations
- Reliable and long-lasting construction design
- Expensive and sophisticated maintenance not required
- Low maintenance costs

### Hence

DEWATS technology is an effective, efficient and affordable wastewater treatment solution for small and medium sized enterprises (SME).



Main DEWATS-modules for physical and biological wastewater treatment:

1. Settler
2. Anaerobic Baffled Reactor
3. Anaerobic Filter
4. Planted Gravel Filter

## Common Wastewater Problems within Small and Medium Enterprises



Many SME are not able to pay high investment and maintenance costs required for sophisticated wastewater treatment system.



Maintenance of sophisticated wastewater treatment systems require high-skilled personnel.



Due to lack of investment capital and technical knowledge SME often adapt non-effective low-cost „solutions“.



Wastewater discharged by SME often does not meet environmental standards.

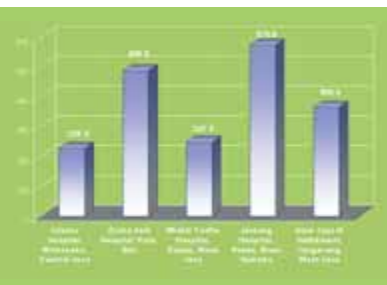
## Demand

For many small and medium enterprises and housing estates, conventional wastewater treatment systems are technically sophisticated and costly, often require high energy inputs for operation and rely on sophisticated maintenance services to ensure continuous operation. In most cases, such requirements are unsuitable for SME.

For these potential clients, BORDA and its network of partner organisations started in 1994 to develop reliable and cost-efficient wastewater treatment systems which could efficiently treat non-toxic organic wastewater according to legal environmental standards. Successful efforts to standardize main components of the DEWATS approach, such as multi-stakeholder approach, modular design of

systems, project planning, implementation and quality control has resulted in a significant increase of implementation capacity and dissemination of technical know-how.

Today, more than 1000 stakeholders from the private sector, governments and NGOs have been trained by the BORDA-Network to facilitate dissemination, implementation and maintenance of DEWATS



DEWATS ensures state of the art treatment results at affordable cost, low maintenance and limited space requirements

system resulting in the sustainable operation of more than 250 DEWATS plants. The success of DEWATS has fostered cooperations with numerous government departments, municipalities and international donor agencies to increase capacities and technical implementations.

## Dissemination

To assure sustainable dissemination of appropriate wastewater treatment infrastructure in the long-term, a mere focus on technical aspects has proven insufficient.

The approach for implementation of DEWATS projects includes not simply the construction of hardware but a whole comprehensive set of integrated measures such as:

### Information seminars and workshops to introduce DEWATS to key-stakeholders

Early information of key-stakeholders is vital to ensure continuous support for programme on macro-level.

### Co-financing of demonstration projects

Financial support during the start-up phase of a demonstration project enhances the achievement of desired results and impacts.

### Sector specific information-seminars

An early focus on specific priority-sectors supports an exchange of ideas between experts and potential clients that have similar professional experiences.

### Technical training

Long-term DEWATS experts facilitate comprehensive training programmes for qualified staff of partner organisations and take on a supervisory role during first technical implementations.

### Project planning

Project planning includes technical feasibility studies, detailed engineering designs and cost-estimates.

### Project implementation

Service provision depends on preferences of clients and network-partners and may include supervision of construction, contractor services or turn-key operation. To ensure high quality standards, major tasks are always carried out by qualified experts.

### Technical support and monitoring

Staff responsible for operation and maintenance of DEWATS plants are adequately trained by technical experts during the first year of operation.

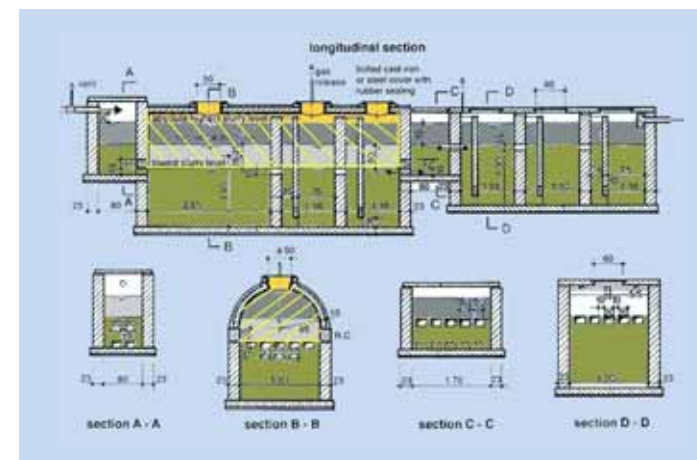
### Quality Control

All DEWATS systems constructed are designed and have a guarantee to fulfill specified discharge standards. Effluent tests are conducted at regular intervals.

### Research & Development

Continuous efforts are made by members of the DEWATS partner-network to improve efficiency and effectiveness of treatment systems.

Dome shaped anaerobic baffled reactor for biogas recovery





# Good Practices

## DEWATS for Hospitals

### Characteristics:

- 250 beds with outpatient department
- untreated wastewater discharge into nearby stream
- complaints of neighboring communities
- limited funds
- limited technical skills of staff
- sufficient space

### Technical Solution:

- Treatment system for 150 m<sup>3</sup> wastewater/day
- Sedimentation + anaerobic filter + horizontal sandfilter + purification pond
- Pumping chamber after anaerobic filter
- Total construction cost: \$ 50.0000
- Training of maintenance staff and 1 year guarantee



## DEWATS for Agroindustries

### Characteristics:

- More than 100 cattle slaughtered per day
- Extreme fluctuation of waste water composition
- extremely high organic load
- limited space for construction near stream
- unreliable responsibility and maintenance

### Technical Solution:

Separation of wastewater components:

- De-watering, sedimentation & floatation

Treatment system components:

- Screening
- Sedimentation
- Composting
- fully-mixed digestion in biogas reactor
- Anaerobic filter

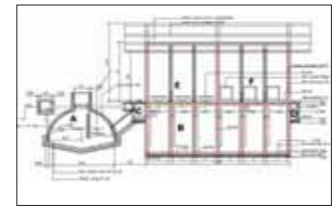


## DEWATS for Communities

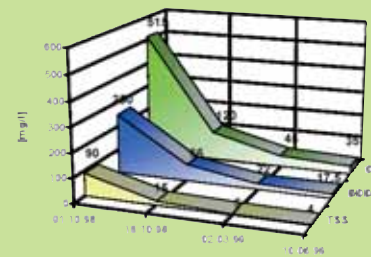
### Characteristics:

- Open waste water lagoon within community
- 6 public toilets/6 bathrooms for 500 people
- Unwillingness of landlords to upgrade sanitation infrastructure
- Willingness to provide lagoon space
- Willingness of people to pay for use of proper sanitation infrastructure
- People willing to manage sanitation infrastructure

- Fully mixed digester (fixed-dome biogas plant)
- Baffled reactor
- Landscaping
- rehabilitation of WW ditches
- MOU between NGO and CBO regarding maintenance of Sanitation/DEWATS infrastructure



## Laboratory Test Results



Effluent Quality during first months of DEWATS operation

## DEWATS Treatment Efficiency

No	Parameter	Unit	Anlytical-Results Inlet	Outlet	Reduction [%]
1	Temp.	°C	27	27	-
2	pH	-	7,6	7,3	4 %
3	BOD 5	mg/l	290	53,6	83 %
4	COD	mg/l	590	84	86 %
5	Phosphate	mg/l	18,33	3,67	80 %
6	TSS	mg/l	172	84	51 %
7	Ammonia	mg/l	0,19	0,07	63 %

Source: Graha Asih Hospital Bali, Anaerobic Filter + Horizontal Sandfilter + Purification Pond

# Benefits of DEWATS

- Establishing of multi-stakeholder networks to combat water pollution
- Building up implementation capacity on various levels
- Providing treatment for both, domestic and industrial wastewater at affordable price
- Fulfillment of discharge standards and environmental laws
- Wastewater pollution reduced by up to 90%
- Providing treatment for wastewater flows up to 1000 m<sup>3</sup> / day
- Reliable and long lasting applications
- Tolerant towards inflow and load fluctuation
- Materials/ inputs used for construction are locally available
- Minimal maintenance and long de-sludging intervals
- Low operation and maintenance costs



- Resource efficiency and non dependence on energy
- Resource recovery through wastewater re-use and biogas generation

## DEWATS Service Packages

- |  |                                    |                            |
|--|------------------------------------|----------------------------|
| o Treatment Systems                      | o Emergency Sanitation             | o Health Impact Assessment |
| o Community Based Sanitation             | o Sanitation for Prisons           | & Hygiene Education        |
| o School Based Sanitation                | o Sanitation for Real Estates      | o Capacity Development     |
| o Sanitation for Hospitals & Hotels      | o Sanitation Mapping               | o Standardisation          |
| o Wastewater Treatment for Agro-Industry | o Municipal Sludge Treatment Plant | o Research & Development   |

## DEWATS – Decentralized Wastewater Treatment Solutions

Developed & disseminated by BORDA and over 20 BORDA BNS Network Partners in South and South East Asia & Southern Africa



**BORDA**

**Bremen Overseas Research and Development Association**

**BORDA Germany**  
**Head Office**  
 fon: + 49 - 421-137 18  
 e-mail: office@borda-net.org  
 www.borda-net.org

**BORDA South East Asia**  
**Programme Office Indonesia**  
 fon: + 62 - 274 88 82 73  
 e-mail: yogya@borda-sea.org

**BORDA South Asia**  
**Programme Office India**  
 fon: + 91 - 80 41 52 75 54  
 e-mail: bang@borda-sa.org

**BORDA SADC**  
**Programme Office**  
 fon: + 255 - 681204991  
 e-mail: dar@borda-sadc.org