Applied Research & Development

Our Applied R&D activities are targeted at improving the performance of our implemented systems. Regular monitoring of our systems helps us to identify key challenges and thus introduce innovative design elements. We also setup pilotsin order to efficiently replicate them at-scale. Our work is thus a balanced blend of research and management to help meet the ground realities of providing improved Water and Sanitation services to all.

Key R&D Activities

- Continuous assessment of treatment efficiency of systems implemented for Wastewater Treatment, Faecal Sludge Management and Waterbody Rejuvenation in order to improve their efficiency and generate inputs for future design assumptions
- Innovating to help upgrade technology/product development:
  - **Improving the performance of DEWATS™** with regards to – Pollutant removal, biogas production, sludge production, compliance with the effluent discharge standards etc.
  - **Testing different tertiary treatment options for DEWATS™** – Vortex, Sand and Carbon Filter, Vertical Planted Gravel Filter, Horizontal Planted Gravel Filter, ECO2 Aerator, Aerobic Ponds, Floating Treatment Wetlands, Trickling Filter, Gabions etc.
  - **Testing options for different parts of the faecal sludge treatment process** (solid-liquid separation, pathogen reduction and stabilization of solids) Planted Drying Beds, Solar Drying Beds, and Dewatering bags with polymer
  - **Better understanding** of the design of **Floating Treatment Wetlands** for Waterbody Rejuvenation

Facilities

The facilities available in order to support our R&D activities include:

Laboratory

Our Laboratory was established in 2010 to provide high-quality and cost-effective **water and wastewater testing services** to support CDD Society's internal research. In 2017, it was expanded to include **faecal sludge testing** abilities as well.

In 2020, it was accredited by The National Accreditation Board for **Testing Laboratories (NABL) for water and wastewater testing.**

Weather Gauge – Automatic Weather Station and Evaporation Pan

In order to get reliable research data, **incorporating weather data into our research** is important. Hence, we have setup an Automatic Weather Station and Evaporation Pan at our office premises. Real-time data* from both instruments is being used in our R&D activities.

The automatic weather station gives daily temperature, relative humidity, rainfall, pressure, wind velocity and wind direction data. The evaporation pan provides evaporation rate data.

Automatic weather station

Evaporation pan

* the data has also been made available online for others to access

Pilot systems: DEWATS, FSTP, PDB, Lab-scale models

Decentralized Wastewater Treatment System (DEWATS™)

In 2016, we modified the DEWATS™ unit setup in 2006 at Beedi Worker's Colony (close to our office premises) to enable **research aimed at enhancing the overall performance of the system.**

At 18m^3/day of capacity, the pilot DEWATS™ unit has been designed to treat wastewater generated by 600 people (120 houses). It comprises of the following modules: Settler, an Anaerobic Baffled Reactor, an Anaerobic Filter and a Planted Gravel Filter.

DEWATS at Beedi Workers Colony, Bangalore

Faecal Sludge Treatment Plant (FSTP)

This pilot setup (3m^3) was done prior to the large-scale FSTP set up at Devanahalli (6m^3) with the aim of **assessing the suitability of DEWATS™ in treating faecal sludge.** It comprises of the following modules: Feeding Tank, Biogas Digester, DEWATS™, Collection Tank and Sludge Drying Bed.

Faecal Sludge Treatment Plant (FSTP)

Planted Drying Bed (PDB)

In mid-2018, we setup a PDB (3m^3) to **evaluate its efficiency in terms of the drying process and optimize the space required for the system**. The PDB has a design area of 20m^2, with capacity of 3m^3, where the bed size is 4×5 m, and 8-10 plants are planted per square meter. A free board of 1.6 m has been provided.

We are conducting regular quantity and quality checks of the byproducts - sludge and effluent - for pathogen reduction and organic removal.

Planted Drying Bed (PDB)

Lab-scale models

Through lab-scale models, we **test initial research hypothesis.** Lab-scale models allow for easy and fast modifications to the setup. Once finalised, the same is replicated for pilot testing on-the-ground. Our lab-scale models include DEWATS™, M-sand bed model and Siphon.

Vortex at CDD Society office, Bangalore

Research Projects:

Small-Scale Sanitation Scaling-Up (4S)

The first systematic assessment of small-scale sanitation systems in South Asia (India, Nepal, Pakistan, Bangladesh), this research was aimed at developing evidence-based policy recommendations for improved design, implementation, and operation and maintenance (O&M) of small systems. It seeked to provide sound empirical evidence for future small-scale investments in South Asia; allowing decision-makers to make informed strategic decisions about sanitation and water management and to accelerate the provision of collection and treatment services for used water in South Asia.

We evaluated 400 small-scale sanitation systems in India, Bangladesh, Nepal and Pakistan, covering lifecycle analysis, technical performance, institutional assessment and socio-economic factors. We also provided policy recommendations for improvement of the regulatory framework, sanitation system designs and implementation and O&M guidelines based on our findings.

A Sewage Treatment Plant (STP) at a residential apartment

Floating Treatment Wetlands (FTWs)

Floating wetlands are believed to reduce organic loads and absorb nutrients and heavy metals. Though numerous studies have been conducted for establishing the removal efficiencies of floating wetlands, none of these has been conducted under the Indian context.

In early 2019, in collaboration with Bharat Electronics Limited (BEL), we began **research to better understand the design of FTWs; by implementing three FTWs** at Bharat Electronics Limited's (BEL) Sewage Treatment Plant. The wetlands are manufactured using different media, plants and substrates. Our research covers treatment efficiencies, understanding the treatment processes and validating available design models.

FTW setup at BEL, Bangalore

Quality and Quantity (Q&Q) study of Faecal Sludge

Estimation of qualities and quantities (Q&Q) of faecal sludge (FS) plays a very crucial role in designing Faecal Sludge Management (FSM) solutions for a city or town. Assessing Q&Q helps to understand what quality and how much of faecal sludge will need to be managed; and this has a bearing on infrastructure design and financial resources requirement. However, the importance of FSM in the Indian context has been realized very recently and therefore, this data is not completely available.

This research thus aims to fill this data gap by aiming to understand Sludge Accumulation Rate (SAR) in different containment types across households, commercial establishments, and institutions, to validate the approach for determining FS i.e. the Q&Q approach (recently) developed by EAWAG.

By providing insights on the SAR in containment systems, this study - the first to be conducted specifically for the Indian context - throws light on how treatment systems can be better designed, helping make better estimations for FSM interventions in India. Ultimately, this aids to frame better policies and programmes to improve activities along the sanitation value chain.

Government of India
Department of Science
& Technolgy
Ministry of Science
& Technology

CDD Society has received Scientific and Research Organizations (SIRO) recognition by the Department of Science and Technology, Government of India.

Consortium for DEWATS Dissemination Society

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