Technical Specification for Decentralized Wastewater Treatment System (DEWATS)

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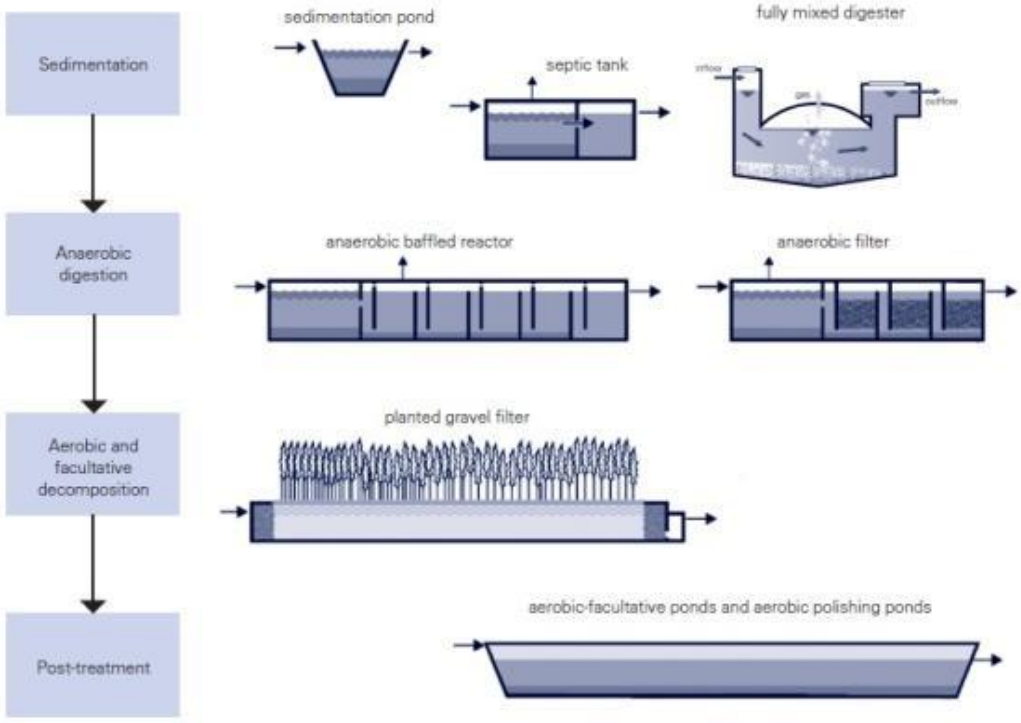
1. Introduction:

Decentralized Wastewater Treatment System (DEWATS) were developed by an international network of organizations and experts. The term DEWATS may be applied in singular or plural from, referring to a single specific system, to the modular systems approach or the whole range of systems. The approach incorporates lessons learned from the limitations of conventional centralized and decentralized wastewater-treatment solution, thereby assisting to meet the rapidly growing demand for on-site-wastewater management. DEWATS are characterized by the following features:

- DEWATS encompass an approach, not just a technical hardware package. Besides technical and engineering aspects, the specific local economic and social situation is also taken into consideration.
- DEWATS provides treatment for wastewater flows with COD/BOD ratios from 1 to 1000 per day and unit.
- DEWATS can treat wastewaters from domestic or industrial sources. They can provide, secondary and tertiary treatment for wastewaters from sanitation facilities, housing colonies, public entities like hospitals, or from businesses, especially those involved in food production and processing.
- DEWATS are can be an integral part of comprehensive wastewater strategies. The systems may be used for complementary treatment in addition to other centralized and decentralized wastewater-treatment options.
- DEWATS can provide renewable water for irrigation. Depending on the technical layout, biogas supplies energy for cooking, lighting or power generation.
- DEWATS are based on a set of design and layout principles. Reliability, longevity, tolerance towards inflow fluctuation, cost efficiency and, most importantly, low control and maintenance requirements.
- DEWATS usually function without technical energy inputs. Independence from outside energy source and sophisticated technical equipment provides more reliable operation and, thereby, fewer fluctuations in effluent quality. Pumping may be necessary for water lifting.
- DEWATS are based on a modular, technical configuration concept. Appropriate combinations of treatment modules can be selected, depending on the required treatment efficiency, costs, land availability, etc.
- DEWATS units are quality products which can be constructed from indigenous materials and with local workforce. High quality standards in planning and construction for sound DEWATS design are based on a good comprehension of the process of wastewater-treatment.
- DEWATS require few operation and maintenance skills. While most operational tasks can be carried out by the users, some maintenance services might require a local service provider. In some cases, both operation and maintenance can be delivered by a service provider.

- DEWATS can reduce pollution load to fit legal requirements. Like all other wastewater - treatment systems, generated solid waste (sludge) must be handled, treated and disposed of in accordance with hygiene and environmental standards.
- DEWATS consider the socio-economic environment of a location. Neglecting these conditions will result in the failure of the technology.



2. Fundamental Requirements:

2.1 Excavation:

The following list summarizes work tasks commonly performed during land excavation. These tasks help to ensure proper completion of the land work and compliance with common manufacturer and vendor warranty requirements. Make sure that either you or your service provider takes responsibility for each of these tasks. All service provider task responsibilities should be clearly called out in the written contract or work orders.

- Determine if permit is required for Land Excavation by local building authority, before any work begins
- Verify that planned Land Excavation will comply with DEWATS System requirements
- Complete written contract, including scope of work, quality checks, warranty, timing and payment terms; ensure that contract is signed before work begins

- Review and approve detailed layout / plan that shows location, orientation and placement of land, before any work begins
- Confirm date (and time) for project start with subcontractor - one week and two days prior to project start
- Obtain a permit for land excavation from local building authority; post permit on the jobsite as required
- Review site access, safety precaution, work hours, bathroom use and other jobsite rules with all subcontractors and laborers before they begin work
- Prepare area for safe, efficient work; move items that restrict work access or are vulnerable to damage; cover and protect items that cannot be moved
- Inspect installation quality and verify proper operation for land using the Quality Checklist on this page; create a punch list of final tasks that must be completed prior to final payment
- Remove debris, dirt and dust from all work areas; unless otherwise agreed, all demolition debris and construction waste will be removed from the site within 24 hours
- Photograph or videotape the work area before work begins, to document the location of structural elements and condition of existing finishes and materials

The earthwork in excavation is for the ordinary soil (OS).

2.2 Gravel Bedding:

The gravel bedding crash must be clean of any comical materials and not from river. The shale in the bedding of DEWATS system has to be minimum 2 inches and maximum on 4 inches.
The gravel bedding under the bottom slab should be proper compacted and watered.

2.2.1 Work process:

The process of the gravel bedding is to bring exact to site. After that it must be used on the specific area which is excavated for the DEWATS System. It needs to be compact for next steps of installation.

2.3 Form work:

Form work shall be completed and approved. Debris and foreign materials shall be removed from interior of farms before start of concrete placing.

2.4 PCC process:

In this process we have a specific mixing ratio, which is (1:2:2). It may be used to cover top and bottom slab, beams, column and CMU filling. PCC must get watered for 28 days.

2.4.1 Partition Wall:

When a partition wall is used to divide the prefabricated tanks into different compartments, assumptions regarding the arrangement of liquid loading shall cause the most critical effects such as:

a) Particular attention shall be paid to possible sliding and overturning due to differential moment;

b) The partition shall be structurally sound and fixed without diminishing the integrity of the tank;

c) The tank partition wall during pumping out shall not collapse, or get permanently deformed.

2.4.2 Joints and edge:

The joints of the DEWATS system must be construct in a proper manner, plastered well, water tied, and also the edge of the DEWATS system should be chamfer at each wall corners.

2.4.3 Septic Tank:

Septic tanks provide suitable conditions for the settlement, storage and partial decomposition of solids which need to be removed at regular intervals. The discharge can still be harmful and further treatment from a percolation area, percolation mound or intermittent filter will be required.

An effluent screen on the outlet is optional but is recommended as it gives extra protection to the percolation/filter system and gives early warning of the need for de-sludging. They can incorporate an alarm system.

2.5 RCC:

Providing and laying reinforced cement concrete (RCC) 1:2:2 including provision, supply and fixing steel reinforcement (Fe 415) with bending placing in position and binding GI wire, cost of the binding wire, excluding cost of the formworks for top slabs and beams in perfect line & level with proper compaction using vibrator and curing all complete.

2.6 CMU:

Providing and laying cubic masonry units with cement mortar in perfect line & level and curing all complete. For standard CMU which is found in cities as local engineering materials can be used. Which there size is (20x20x40) cm, and between two CMU it must be contain 1.5cm with mixing concrete material, cement and sand (1:4).

2.7 Plaster work:

After separating material from sand that will be used on plaster work by mixing (1:4). Plaster must be 2.5 cm on both sides. Plastering has to be soaked for 7 days at the end of the every working day.

2.8 Piping System:

The piping system for the package shall comply with the following criteria:

a) All baffle pipes into the anaerobic reactor should be provide accurate well and in one level and should be checked into the three directions (X, Y, Z).

b) The arrangement of the piping system and interconnection pipes in the prefabricated tanks shall not obstruct maintenance work of the equipment in the tanks;

c) All the buried piping shall be properly bedded and supported with the selected compacted fill material;

d) The arrangement of the above ground piping shall minimize obstruction and maneuverability;

e) Any on-site installation or assemblies of pipe support to the prefabricated tank shall not be allowed;

f) No bending is allowed at any sewage distribution pipe excluding the force main piping. Instead, a chamber shall be provided to any change of direction in sewage flow.

2.8.1 Inlet and Outlet pipe:

All opening for pipe connections of the prefabricated tanks shall be pre-fitted at the factory with a socket, a spigot, a flange or a 300 mm length short piece of pipe. On-site drilling of openings for pipe connection shall be prohibited.

2.8.2 Vent Pipe:

The vent pipe shall be provide and construct at the beginning of anaerobic systems (Settler, ABR) to remove CH4, S2O… gases from the DEWATS system, where it should construct well protected with concrete around the pipe and should install higher than the buildings height.

2.9 Rebar:

Different kinds of rebar used for construction have to be in good condition not damage by corrosion. The size of designed rebar is 10mm, 12mm, 14mm and 16mm and the grade of these rebar must be (Grad 60).

2.10 Cast iron manhole cover:

Cast iron manhole cover must be ordered during construction as designed in drawing details. The manhole cover design should be ideally being in size of (60x60), (65x65) and

(70x70). In case of deviation from given size, all manhole covers should have perfect fit for cast iron covers.

2.11 Pumps:

The minimum control mechanism for the pumps installed within the package shall be:
a) Automatic by float switch for sewage transfer pump;

b) Automatic by timer and interlock with solenoid valve for return and waste sludge pump in sedimentation tank;

c) Manual by push button for sludge transfer pumps to remove the sludge from sludge holding tank.

2.12 Backfill Material:

The backfill material for the DEWATS system shall be of particle size and grading that allow the specified relative compaction to be achieved with the intended compaction methods. The material shall not contain organic matter that affects the backfill material performance. It should be free of materials that are physically and chemically harmful to the system. The support and overlay material shall be placed in layers of appropriate thickness for the method of compaction, to achieve the relative compaction or soil modulus.