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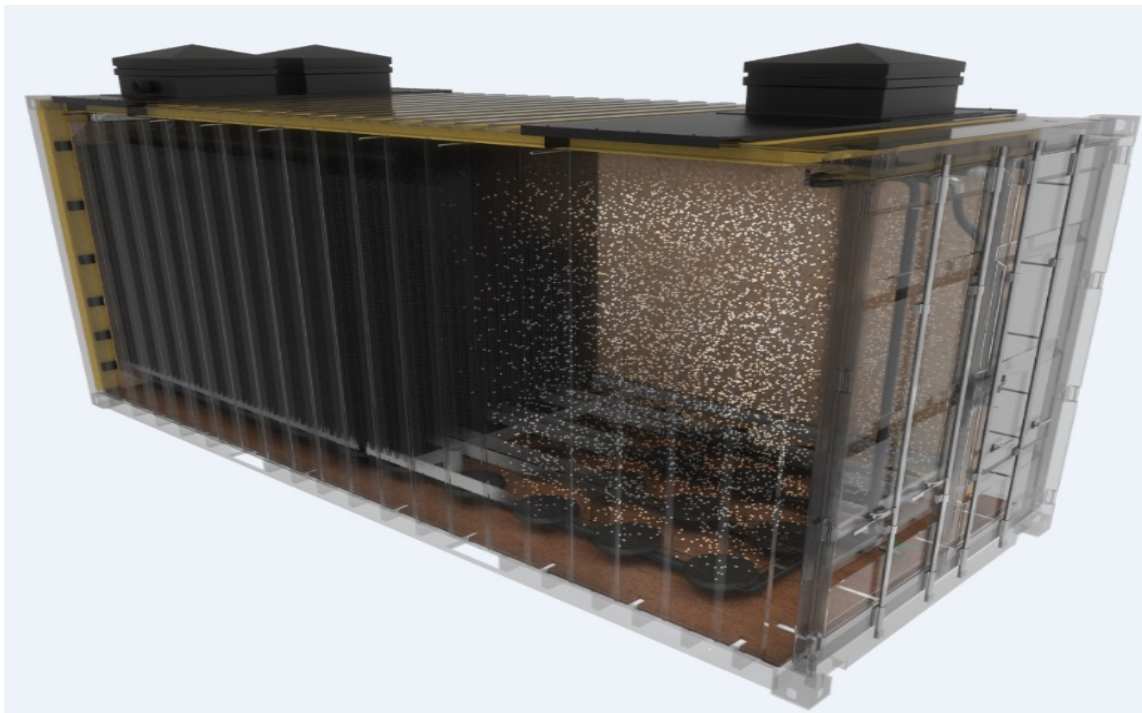
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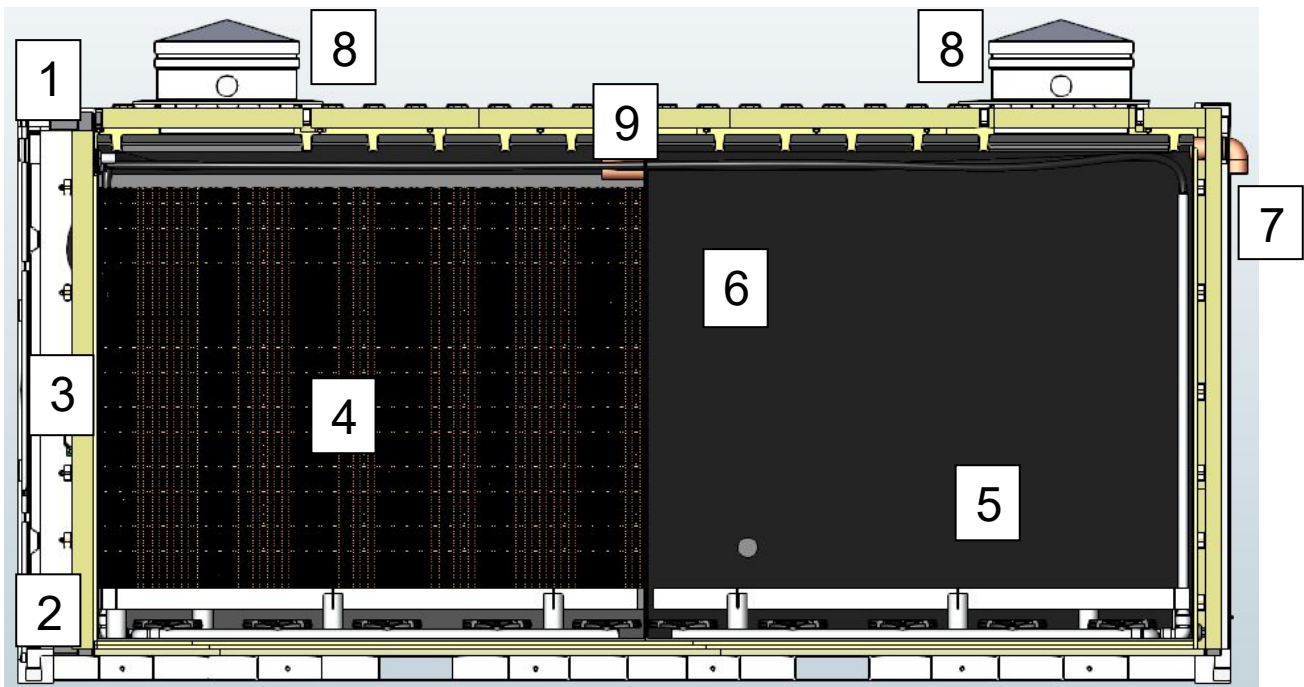
ClearFox® Fixed Bed Biological Reactor Module

The ClearFox Fixed Bed Reactor is a self container modular biological reactor. The special fixed bed process arrangement used on our design utilises multiple cascades and a controlled water flowpath to achieve market leading degradation levels for BOD and COD. The process technology has been independently tested and verified by PIA GmbH – Europes leading test facility. The fixed bed module can be applied to a range of wastewater types, from industrial to municipal.

The process technology has significant advantages over MBR and MBBR with regard to reliability of the process, ability to deal with highly variable loadings and treatment capacity.

The fixed bed attached growth process also does not require regular operator input, resulting in a fully automatic biological process step. The ClearFox fixed bed reactors are now installed globally on a range of project types and sizes. The modular nature of the reactors means that they can be configured to deal with any project size.





Annotated diagram of FBR Container:

1. 20ft sea container (FBR reactor).
2. Inlet connection, DN50 PVC for pressure inlet (adjustable to clients demand), incl. manual flow –meter.
3. Air supply distribution manifold with isolator valves.
4. Fixed bed cascade 1 (100m²/m³).
5. Fixed bed cascade 2 (150m²/m³).
6. Fixed bed cascade 3 (200m²/m³).
7. Outlet, DN100 to clarifying container.
8. Dome-shaft extensions for entry to each cascade [x 3].
9. Foam and gas vent from the reactors, DN100.

Description:

The biology of the wastewater treatment plant works on the principle of a submerged fixed bed of carrier material for micro-organisms.

Operators cannot be expected to optimise the treatment plant themselves with sludge (dry matter content) or similar measurements, since wastewater has a different dilution factor at different times. The clearfox fixed bed container plant is able to regulate itself to a large extent. This is only possible with fixed growth media (fixed beds) since the condition and the quantity of the submersed sludge is of less importance. A sewage treatment plant working on the principle of a submerged fixed bed is therefore superior to many other technologies.

A biological layer (micro-organic colonisation) forms on the fixed-bed material after the start-up period. This transforms the organic contaminants contained in the wastewater into sedimentary and mineral substances. This is mainly an aerobic process.

The aeration system installed underneath the fixed-bed material supplies the organisms with sufficient air. In addition, the rising air causes a current that, owing to the geometry of the fixed-bed material used, results in the contents of the tank being completely (horizontally and vertically) mixed.

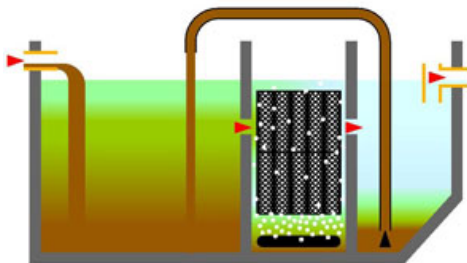
The fixed-bed substrate is made up of UV-stabilised polyethylene which is non-porous, squeeze-resistant and will not biodegrade in the foreseeable future. It has a specific surface (depending on the type of treatment plant) of 100-200 m²/ m³.

It has no toxic or recognisable chemical or physical effects on the process of biodegradation. The fixed bed consists of stable individual tube-like elements that are arranged vertically and which are sideways permeable (tube network) and that are welded to one another at the head ends to form rectangular blocks. The meshed structure also allows the material to be intermixed horizontally.

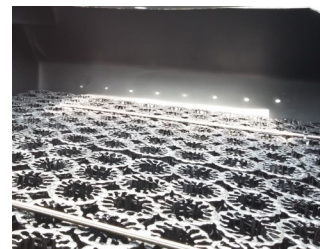
The low installation height means that the arrangement of tubes in a block must ensure that the fixed-bed material can flow in all three directions.

Sufficient stability and rigidity against static and dynamic stresses are assured for the entire fixed bed. Individual blocks are fixed in the tank by supporting, spacing and holding structures.

Schematic diagram



Fixed-bed



Advantages:

- The process technology for biological treatment is especially suited for fluctuating loading such as underload, overload, holiday-modes, (fixed bed technology is recommended by the leading German Water Associations when robust technology is required)
- Maintenance is possible without special equipment
- System is capable of easily being extended with further modules in parallel or in series
- Operation of the plant with untrained personal
- Possibility to relocate the container plant
- Every item/piece of equipment with contact to wastewater is non corrosive
- Low noise as everything is housed within an insulated container
- Low costs for projecting and construction management

Maintenance:

The ClearFox fixed bed module has been specifically designed for longterm trouble free operation. However, maintenance has been considered fully in the design. Each zone or cascade within the container system is accessible from the container rook by manhole access point. This access point is sized to permit the removal of media blocks for access to the diffuser manifold.

For cleaning of the media surface [e.g after an extended period of power failure where biomass needs to be removed from the media surface] then the process is simple. Each cascade or zone is supplied on a separate aeration system. To clean the media, all air supply valves are closed to all but one zone. The aeration process is then activated and the media is cleaned by air sparging. This process is complete din each zone. It is therefore possible to completely flush and clean each zone without the need to drain the system or access the container tank.

Construction:

The ClearFox fixed bed module is a highly engineered solution. The external housing comprises a 20ft high cube ISO container which has all CSC approvals and has significant load bearing capacity.

Inside this is a specially designed layout of reinforcement steel designed to deal with the load in all direction applied to the container when the system is filled with water.

Below this steel reinforcement is a layer of insulation. This is necessary to regulate temperature and to make sure variations in temperature [seasonal and daily] do not affect the treatment process.

After the insulation is the HDPE tank. This is a single piece monolithic HDPE part manufactured from our unique mould. As this tank has no welds and is a single piece structure leaks are not possible over the lifespan of the system [unlike many systems that utilize welded polyethylene sheets]. Also – the wastewater is not in contact with any metal surface [unlike competitors that use steel tanks] so there will never be any corrosion.

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