HIGH PERFORMANCE ENVIRONMENTAL BIO-FIBER

Bio-Fiber

Description

The bio-fiber is considered an internal fixed packing for attached growth process and is installed in the aeration tank of the activated sludge. It is made of polypropylene and vinylon. The bio-fiber is very elastic and therefore can be made into a rope or curtain arrangement for simple installation in any system. Besides that it can be adapted to a wide range of water volume and concentrations and also has high resistance to shock loading.

Microorganisms will attach and grow on the surface of the bio-fiber to break down contaminants in the waste water. The specific surface area of the bio-film is fully utilized to populate the system with as much useful microorganism as possible because the geometry of the bio-fiber minimizes the weak solid-liquid interface between a surface and an aqueous medium to prevent the formation of a blind angle, common in conventional fixed packing method. Once the bio-film is well established, it effectively removes BOD, nitrogen as well as phosphorus by nitrification and denitrification which results in a decrease in the excess sludge produced.

To maintain effective contaminant removal in a biological treatment process, the bio-film has to be constantly replaced over time. In this case, the external surface of the bio-film is shed regularly due to the impacts of shock loading and the effects of gravity to accelerate the formation of new bio-film.

Performance Parameters and Design Structure

Model	Material	Specific Surface	BOD Loading	Applications
PV-Ⅱ	**Polypropylene (PP) & Vinylon (deformed material)**	**2.85 m^2/m** 	**0.3 – 1kg BOD/m^3d**	- **Bio-filtration** - **Water Purification of river, lake and dam** - **Wastewater management of fish farming** - **Municipal and industrial wastewater management** - **Water purification for agriculture and underground water**

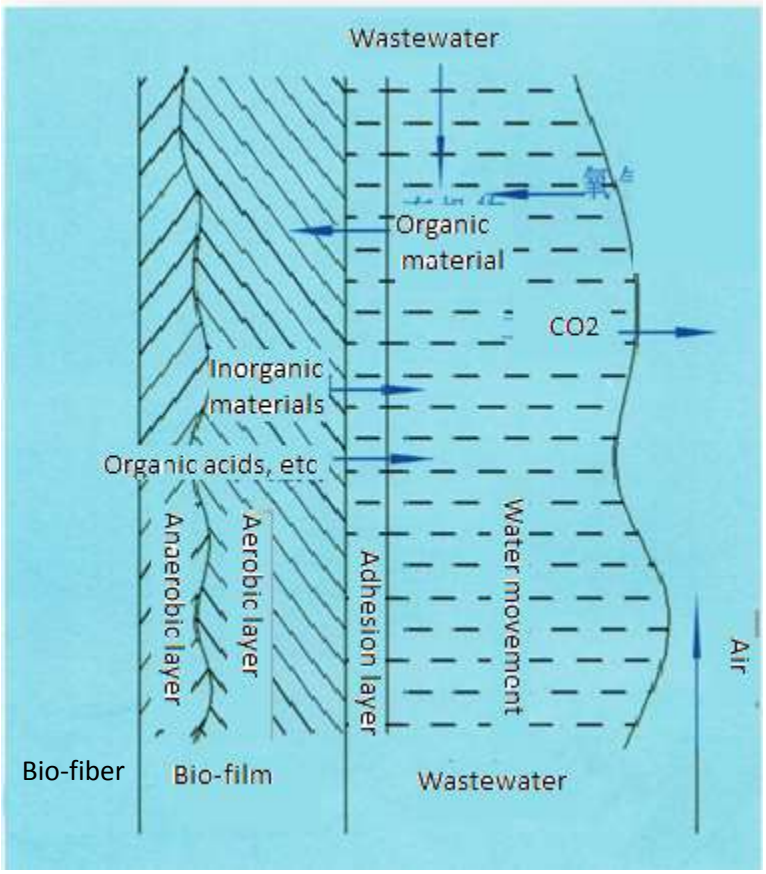
- Special fiber is used and is manufactured to have a specific elasticity
- This "hanging rope" structure is completely different to conventional packing which is usually in a stacked form, flake or a bundle with a series of spacing; this rope structure maximally reduce the area of short circuit in conventional packing to avoid the formation of an edge.
- Every system can be designed with various fiber thickness and uniform alignment with different density to cater to various water quality concentrations and the required bio-film environment condition.

Characteristics of Packing:

1. Able to maintain a large amount of microorganisms because of the fast regeneration of biofilm as new microorganisms can adhere easily and old ones can be removed easily from the bio-fiber.
2. A natural ecosystem of microorganisms will be established, forming a food chain of aquatic microorganisms.
3. Can be manufactured as individual ropes, or curtain-like to be used in various configurations.
4. Excess sludge can be reduced.
5. Highly efficient in nitrogen and phosphorus removal.
6. Can adapt to changes in water quality and concentration
7. High resistance to shock loading

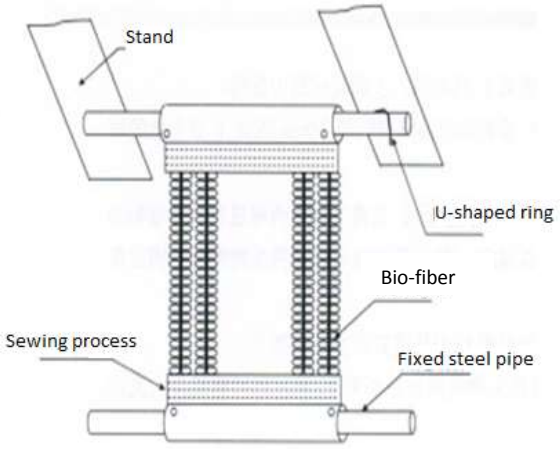
Mechanism of Biodegradation:

1. Microorganism food chain: the organic material is broken down by the bacteria, bacteria by protozoa and protozoa by metazoans.
2. Contaminants: from heavy to light
3. Oxygen is supplied by a microporous diffuser or perforated aeration.
4. Mass transfer and degradation:
   i) The organic materials are mainly degraded in the aerobic layer of the biofilm.
   ii) The degradation of some specific organic materials is carried out in both the aerobic and anaerobic layer of the biofilm.
5. Regeneration of biofilm: water scouring action helps the outer layer of the biofilm to be regularly regenerated to maintain a healthy biological activity.



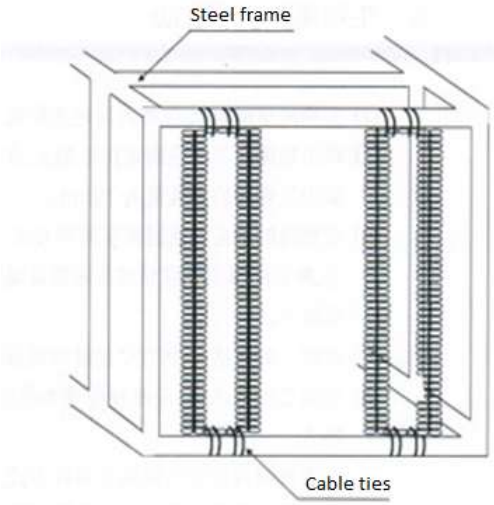
Bio-fiber Setup:

Setup 1



Advantage **:** Easy installation and convenient
Disadvantage: High cost

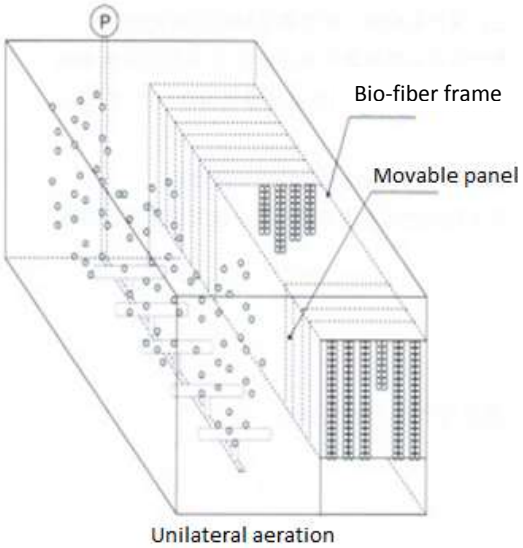
Setup 2



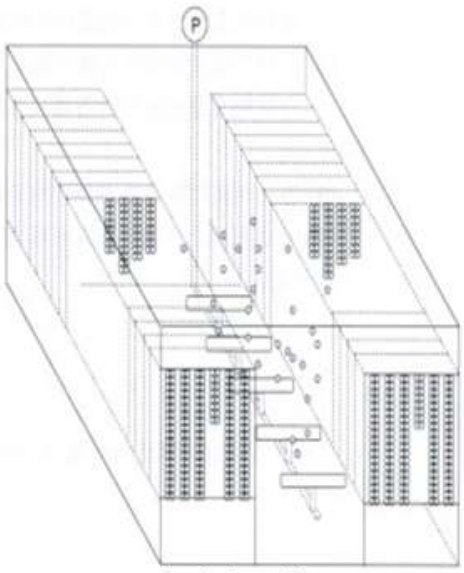
Advantage : Lower cost
Disadvantage: Complex and time consuming installation

Aeration Process:

There are three aeration methods namely, unilateral aeration, central aeration and bottom aeration. The first aeration processes are especially for level 3 wastewater, and the last process is the most common application in China.



Unilateral aeration



Central aeration

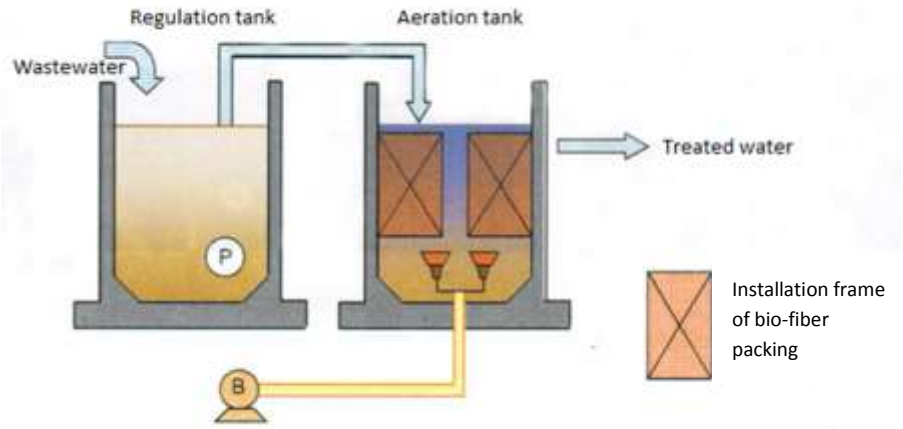
Process Flow

Various processes can be designed to match the waste water treatment requirements, to maximize the efficiency of biological treatment.

Primary Treatment Using bio-fiber

Suitable to treat low BOD concentrations, for example river restoration and aquaculture water purification

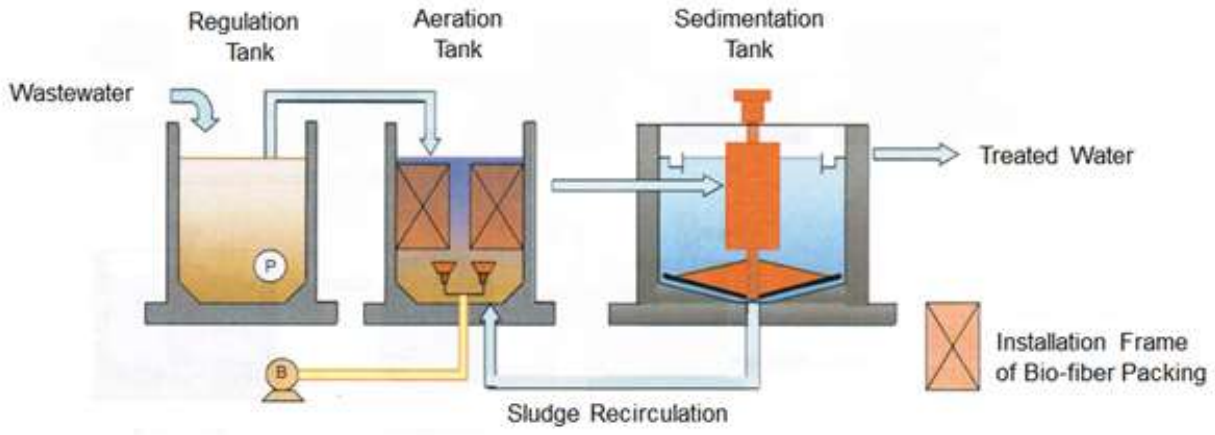
Features: High treatment efficiency, strong resistance to shock loading, simple maintenance management.



Upgrade Existing Installations

Able to enhance the efficiency of existing sewage treatment, through the microorganisms attached on the bio-fiber packing by forming a food chain.

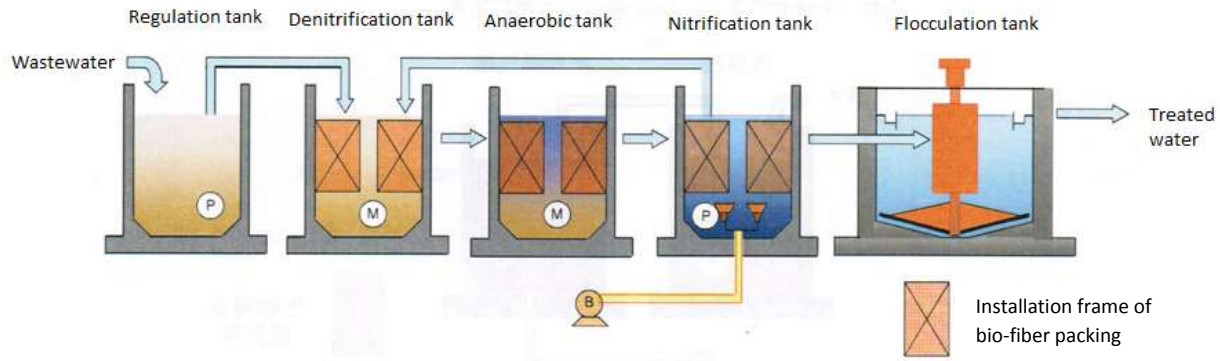
Features: maximize the capacity of existing wastewater treatment system; significantly reduce the amount of sludge produced.



Nitrification, Denitrification and Phosphorus Removal Using Bio-fiber

This bio-fiber can be used to efficiently remove organic matter, nitrogen and phosphorus. Nitrifying and denitrifying bacteria with slow growth rate will adhere and populate the bio-fiber thus providing good results.

Features: Highly effective denitrification and phosphorus removal increase the performance of sewage treatment.



Applications

Water purification in rivers and lakes:




Industrial wastewater treatment:


Water treatment for aquaculture and ornamental fish:

Underground biological treatment facility for iron removal

Soilless planting with water treatment facility

Biological treatment facility of cooling water

Maintenance of Bio-Fiber

- Normally, the bio-fiber will not need regular cleaning service because part of the bio-film will be shed by the force of gravity in order to regulate the biological activity as well as the efficiency of treatment process.
- If there is a situation where the parameters of treatment process such as BOD value, concentration of ammonia and others are no longer stable and the biofilm is not shed by gravity, then the maintenance of the system has to be done manually.
- First, the bio-fiber is removed from the treatment plant and then the structure of the bio-fiber is vibrated or a high-pressure water jet is applied to clean up the biofilm for improve efficiency.