

Current Status and Development Trend of Artificial Ecological Floating Island Technology Utilization

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Abstract

Artificial floating island is a kind of sewage ecological restoration treatment technology. This technology uses plant roots, floating island substrates and plant rhizosphere microbial flora to degrade various organic substances in sewage to achieve the purpose of ecological restoration by setting up a floating substrate in the polluted water body to imitate the natural growth law of plants. The artificial biological floating island to be introduced in this article is a water treatment technology that uses the nitrogen and phosphorus in the water body to plant plants on the water surface carrier to repair the polluted water body in situ.

Keywords

Artificial floating island; Technology application; Development trend; Water nutrition.

1. Introduction

Artificial floating islands, as an imitation terrestrial ecosystem on the water, allow aquatic and terrestrial plants to be perfectly combined in one system, so that insects, butterflies, birds, and amphibians live harmoniously in the same ecology that is relatively isolated from the outside world In the system. Compared with traditional artificial wetlands, artificial floating islands have various advantages and broad application prospects. However, there are many aspects that can be optimized for artificial floating islands, such as the improvement of materials to facilitate the adsorption of plants and microorganisms, and the introduction of microorganisms that can degrade specific pollutants. So far, artificial floating islands, as an emerging ecological restoration treatment technology, are mainly used in the purification of eutrophic water. However, with the gradual development and maturity of artificial floating island technology, especially in combination with other sewage treatment technologies, artificial floating islands will be applied to a wider range of sewage treatment and ecological restoration processes.

2. Carrier Selection and Design of Artificial Floating Island

As the carrier of the plant, the floating island carrier is the main component of the floating island technology. It should meet the following requirements as far as possible:

- (1) Stability: The floating island carrier must have a certain strength, and the floating island in the open water must have a certain resistance to wind and waves.
- (2) Durability: The floating island material has been immersed in water for a long time. In the more polluted water body, the water body may still have a corrosive effect. Therefore, the floating island material is required to have strong corrosion resistance.
- (3) Economical: Floating island materials should be as cheap and easy to obtain as possible to facilitate the promotion and application of floating island technology and reduce costs.
- (4) Environmental coordination: The biological floating island should be coordinated with the surrounding environment as much as possible, so as not to affect the landscape.

(5) Simplicity of the structure: The floating island must be simple in structure and easy to build, with good mobility and maintenance requirements.

Design of floating island carrier:

(1) The choice of carrier material. There are a wide range of optional materials for the floating island carrier. Different materials can be selected according to the process and cost, but generally need to meet the following conditions: no secondary pollution, light weight, durable, economical and wide-ranging sources, good strength, and meet The planting density of plants can be spliced into different shapes to meet the requirements of the landscape, and it is also conducive to the attachment of microorganisms to grow and film. At present, most of the buoyancy materials in investment projects are foam, bamboo, wood, old tires, PVC pipes, etc. With the increasing requirements for floating island technology, the development of new floating island carrier materials is imminent.

(2) The choice of floating island substrate. In the application of ordinary floating islands, substrates are not used, but such floating islands often have poor water purification effects, while new artificial floating islands that use the interaction of plants, microorganisms and substrates have better water purification effects. In the new floating island, the choice of substrate is the key. When choosing a substrate, you can learn from the experience of constructed wetlands and choose materials that are not easy to block, such as cinder, vermiculite, ceramicsite, etc. In some low-eutrophic water bodies, plants are often stunted due to insufficient nutrients. At this time, some materials that are enriched in nitrogen and phosphorus can be used to form areas with relatively high concentrations of nutrients in a local area of the floating island. Thereby improving the absorption efficiency of plants.

3. Artificial Floating Island Plant Selection

The selection of floating island plants is the key to artificial floating island technology. Most of the nutrients in the water body depend on the absorption of plants. Dry floating island plants are generally larger woody plants or flowers, etc., and only the landscape effect needs to be considered. The selection of wet floating island plants requires consideration of the water purification effect and landscape effects of plants. There are many studies on the selection of wet floating island plants. In summary, there are generally the following aspects:

(1) The selected plants should be harmless to the environment, and try to choose native plants to prevent the occurrence of alien species invasion.

(2) The selected plants should be easy to domesticate and be able to domesticate quickly to adapt to the local aquatic environment.

(3) The selected plants should be easy to maintain in the later stage and have a high survival rate. The plants with weak vitality will not only have no purification effect, but will be time-consuming and labor-intensive. In special areas, the selected plants must also have a certain degree of cold tolerance.

(4) The selected plant should have a well-developed root system, rapid growth, rapid individual division, and strong purification ability.

(5) The selected plants must have a certain landscape effect, which can not only purify the water body, but also beautify people's vision.

(6) The selected plants should be economical and reasonable to facilitate the development and promotion of artificial floating island technology. Secondly, in the selection of floating island plants, consideration should be given to the fact that the plants should not be too high to affect the stability of the floating island. According to the area of the floating island, it is necessary to select plants of an appropriate height. It is recommended that the plant height is the height of the cultivation base plate. Half of it is more appropriate. Artificial floating island classification

4. Artificial Floating Island Fixing Method

(1) Underwater heavy object pulling fixed type: This fixing method relies on the pulling action of underwater heavy objects to fix the floating island on the water surface. It can adapt to any depth of water body by controlling the length of the drawstring. This fixing method is not restricted by the underwater geological conditions, the cost is relatively low, and there is basically no impact on the environment.

(2) Anchor hook type: Anchor hook type fixing method is more convenient in realizing fixation and transfer. Controlling the length of the draw rope can also realize the fixing of the floating island under various water depth conditions. But anchor hooks have certain requirements for the underwater environment when they are fixed underwater. This fixing method has no exposed part of the water surface, and the landscape impact is basically negligible.

(3) Vertical bar type fixation: Vertical bar type fixation uses vertical bars inserted around the floating island to fix the floating island on the water surface. This type of fixation requires that the water depth is not too large. Because the top of the fixed vertical bar is exposed to the water surface, it will have a certain impact on the landscape. But in the case of shallow water depth, this fixing method is very convenient, and it is also a more fixed method.

(4) Rope pull type: When the water surface is narrow or close to the shore, the floating island is often fixed to the shore fixture by a rope pull. This method does not have any requirements on the underwater geology, but due to the exposure of shore fixed objects and ropes, it may have a certain impact on the landscape.

5. Problems and Development Trends of Artificial Floating Islands

Artificial floating islands play an important role and significance for the improvement of the ecological environment and the improvement of water quality, and they will surely get more rapid development and wide application. However, in the current application of artificial floating islands, the floating island technology highlights some problems:

(1) The reliability and stability of the technology is not very high. The floating island technology has not formed a standard, and the data obtained is also obtained under the respective experimental conditions, and there is a lack of versatility. The selection of floating island plants and the production process of the carrier have not formed corresponding technical standards.

(2) Although the treatment effect is good, it takes a long time, and it is difficult to meet some treatment items with high timeliness requirements. In winter, plants basically stop growing, and the treatment effect is basically stagnant. Therefore, the current floating island technology can only be used as a preventive and improvement measure, and other water treatment measures are needed to fully meet the standards.

(3) The disposal of plant stalks. Floating island technology adopts the method of absorbing nitrogen and phosphorus from the water body into the plant body to bring pollution out of the water body, but the disposal of a large number of plant bodies is another thorny problem.

(4) The issue of floating island materials. The current floating island materials are still lacking in corrosion resistance, firmness and wind and wave resistance. Efforts should be made to find some floating island materials that can be reused, are low in cost, and have no secondary pollution.

(5) The lack of related supporting technologies and facilities also restricts the development of floating island technology. Floating island carriers are basically hand-made on site, with low level and lack of supporting facilities for industrialization.

These problems have largely hindered the promotion of artificial floating island technology. In response to these problems, the majority of researchers should focus on the following aspects:

- (1) Develop economical, environmentally friendly, and practical floating island carrier materials to prevent secondary pollution to the water body and improve the stability of the floating island.
- (2) Carry out research on the substrate, develop materials that have enrichment effects on various nutrients, and improve the treatment effect of artificial floating islands on polluted water bodies, especially the treatment of micro-polluted water bodies.
- (3) Study the nutrient absorption efficiency of single floating island plants, and conduct nutrient absorption dynamics of commonly used aquatic plants and terrestrial plants that are easy to be domesticated, and match plants according to different nutrient requirements, thereby improving the floating island's water body The purification effect. On the other hand, domesticating some crops can create economic benefits while purifying water bodies.
- (4) In view of the low treatment efficiency of artificial floating islands in winter, select cold-resistant plants suitable for winter growth, supplemented by enhanced purification treatment measures to improve treatment efficiency.
- (5) The formulation of relevant technical standards for artificial floating islands is of great significance to the promotion of artificial floating islands.

References

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