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**INTEGRATION OF TRADITIONAL CULTURE  
AND MODERN TECHNOLOGY: AN EXPLORATION  
OF THE OPTIMIZATION OF CULTURAL ELEMENTS  
AND WATER SELF-PURIFICATION SYSTEMS  
IN THE TRADITIONAL CHINESE WATERSCAPE DESIGN**

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*Traditional Chinese waterscape design is a profound cultural symbol and a perfect embodiment of the natural landscape. The philosophical ideas, aesthetic concepts and cultural connotations embedded in traditional Chinese culture have played an important role in the design of traditional water features. However, traditional water features have struggled to maintain their lasting beauty due to their impact on the environment and ecology. With the development of modern technology and advances in water management theory and techniques, modern water treatment systems have become an important means of solving water management and ecological and environmental problems. Combining traditional cultural elements with modern water self-purification systems has become an effective way to optimise traditional water features.*

*This paper focuses on the cultural elements and water self-purification systems embedded in the design of traditional Chinese water features, and ways to optimise them with the help of modern technology. Firstly, the cultural background of traditional Chinese garden water features is analysed in terms of their unique traditional cultural elements, design methods and characteristics. Then, through the analysis and study of modern water management theories and technologies, the principles of realisation and optimisation strategies of water treatment are discussed. Finally, the combination of traditional cultural elements and modern*

*water purification is used to explore in depth how traditional Chinese waterscape design can integrate traditional and modern elements, making it convenient for people while having a positive impact on the natural environment and ecology. The findings of this paper help to promote the combination of traditional culture and modern technology, and provide references and lessons for the environmental development of traditional Chinese waterscape design.*

**Keywords:** *traditional Chinese water feature design; Chinese culture; water self-purification system; water feature design*

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### **The concept and significance of traditional Chinese waterscape design**

Traditional Chinese waterscape design is an important part of ancient Chinese garden culture, and its concept and meaning are closely related to nature, culture and philosophy, with profound philosophical connotations and cultural significance.

Traditional waterscape design means taking inspiration from nature and using it as a basis to transform it into a waterscape landscape in the garden, such as springs, ponds and streams in the garden. The design of these water features marks the aesthetic interest of Chinese garden culture, emphasising the philosophical idea of the unity of heaven and man, giving the garden a tranquil, beautiful and harmonious character.

Traditional Chinese waterscape design is rich in philosophical connotations and values. It embodies the ancient Chinese philosophical thought of “the unity of heaven and man” and is a symbol of the harmonious coexistence of man and nature. The flexibility of water features not only make the garden appear more dynamic and free, but also highlight the pursuit of natural harmony and balance in Chinese philosophical thought, and the natural design is given a deeper spiritual connotation.

In addition, traditional waterscape design also has cultural significance. In ancient Chinese culture, water was not only a material form in nature, but also closely related to people's lives and culture, such as the legendary dragon boat race and the lantern Festival water lantern show. In traditional Chinese waterscape design, these cultural elements are often incorporated into the design of the garden, further enriching the cultural connotation of the waterscape design and making it richer in cultural value.

In short, traditional waterscape design is an important part of ancient Chinese garden culture, with rich philosophical connotations, cultural significance and aesthetic value. By designing water features in nature to reflect the essence of traditional Chinese aesthetics and philosophy, it represents an important aesthetic concept and attitude to life in traditional Chinese culture.

### **The importance of self-purification systems for water bodies**

The importance of self-purification systems for water bodies in modern garden design still cannot be ignored. Especially in the today's rapidly advancing urbanisation process and the increasing demand for urban landscape design and ecological protection [8]. The water self-purification system has become an effective means of ensuring the safety and health of urban water systems. Specifically, it has the following important aspects of its role and significance:

Having a water purification function. The water body self-purification system can purify the water of harmful substances such as organic matter and heavy metals, as well as sediment and suspended matter, thus improving water quality.

Protecting aquatic organisms. Water self-purification systems can provide a suitable water quality environment and nutrients to safeguard the health and survival of aquatic organisms, making urban water systems secure in maintaining aquatic organisms.

Building ecosystems. Water self-purification systems can build a series of complete aquatic communities and support systems, forming a good ecosystem, providing ecological protection, social and economic benefits for urban landscape construction.

Beautify urban landscape. Water self-purification systems play an important role in urban landscape design and planning, creating a beautiful and comfortable ecological landscape, improving the quality of the urban environment and meeting people's increasing demand for quality of life while contribute to achieving sustainable development.

Therefore, water self-purification systems are receiving increasing attention and importance in the practice of modern landscape design and should be commonly used in various landscape designs, with a view to achieving the unity of ecological protection, urban improvement and sustainable development goals.

### **Characteristics and content of traditional water feature design**

Traditional waterscape design often refers to the category of ancient garden architecture design, which is often regarded as an important part of Chinese garden culture and is widely used in ancient palaces, temples, gardens and other locations. Its basic features and contents are as follows:

Emphasis on the integration with the natural landscape. Traditional waterscape design attaches great importance to the integration with the natural landscape, focusing on the cooperation between water and mountains, water and forests, reflecting the philosophical idea of "the unity of heaven and man", while also emphasising man's respect for the natural landscape.

Efforts to create mood. Traditional waterscape design focuses on creating a high degree of mood, usually through the selection of specific imagery, special design techniques and details with the way to convey the feelings and emotions of human beings.

Focus on style and rhythm. Traditional water features are designed with a focus on style and rhythm, often using techniques such as symmetry, mirroring and circulation to emphasise the constraints and impact they have on the human psyche.

Reflecting culture and history. Traditional water feature design usually combines cultural and historical elements to reflect the historical landscape and culture characteristics of a particular era and region, better reflecting the profound heritage of Chinese culture.

The pursuit of beauty and harmony. Traditional waterscape design pursues beauty and harmony, focusing on both the visual effect of the water surface and the sensory experience of sound effects and smells, seeking to show a realm of unreal beauty and Zen.

Overall, traditional waterscape design emphasises the experiential and emotional nature of the landscape, while also focusing on its cultural and historical connotations, and is an important part of traditional Chinese garden culture.

### **Cultural symbolism and allegory in traditional water features**

Traditional Chinese water features are an important part of Chinese garden culture and are rich in cultural symbolism and allegory. In water features, water is seen as a manifestation of the harmonious relationship between man and nature, as well as a symbol of unity, flow, vastness and freshness. In the design of traditional water features, water is often combined with elements such as stone, sculpture, architecture and plants to form a colourful waterscape layout. In addition to water, buildings such as bridges, pavilions, buildings and pavilions are often added to traditional water features, and appropriate vegetation is used with appropriate light and music to give a stunning aesthetic to every angle [6].

In addition, the artistic design of traditional water features is also rich in cultural symbolism, which is often related to historical stories, myths and legends, religious beliefs, etc. For example, Confucius, an important cultural figure of the Chinese nation, is worshipped at Pen-jiao Mountain, and the “Immortal Cave” at Wu Hang scenic spot in Herchun, etc. These cultural elements not only increase the historical and ethnic cultural connotations of the water features, but also express the beauty of the water features. In traditional water features, not only do they express the harmonious composition of architecture, plants, stones, water, light and sound, but they also have profound cultural symbolism, conveying the essence of traditional Chinese culture and ideas through natural landscapes, architecture, decoration or writing.

### **Self-purification systems for water bodies**

Self-purification of natural water bodies is a common phenomenon in natural systems, which includes the following principles:

**Biodegradation.** There are a large number of microorganisms in natural water bodies, these microorganisms can break down organic matter and reduce the amount of organic matter in the water body.

**Photosynthesis.** Plants and algae in water bodies can use sunlight synthesis to absorb carbon dioxide and release oxygen, which helps to maintain the oxygen content of the water.

**Sedimentation.** Suspended and some dissolved substances in water combine with other substances to form sediment in the water and settle to the bottom, thus reducing the amount of impurities in the water.

**Dissolution.** Water can dissolve some substances such as oxygen, carbon dioxide and inorganic salts, etc. The content and proportion of these substances have an important influence on the quality of water.

**Flow and bubble action.** The flow of water and the formation of bubbles can increase the oxygen content and convection in the water, promoting the exchange and circulation of substances in the water body [3].

The combined effect of these principles allows self-purification to occur and good water quality to be maintained in the water body. However, in the course of human activity, water bodies can be affected by various pollutants, making it difficult for natural water bodies to recover naturally. Therefore, the protection and management of water resources should be strengthened to reduce water pollution, so as to maintain the water ecological balance and human health.

### **Modern water self-purification techniques and methods**

In addition to natural water self-purification, modern technology and engineering techniques can also be used for water treatment and water resource management through a range of technologies and methods, including the following:

**Biological methods.** These include activated sludge methods, biofilm reactors, artificial wetlands, etc. These methods purify wa-

ter bodies of pollutants such as oil and grease, organic matter and ammonia and nitrogen by adding or using the metabolic capacity of aquatic organisms [2].

Physical methods. These include methods such as depth filtration, ultrafiltration and reverse osmosis. These methods use the principles of physical processes to remove suspended matter, colour, odours, heavy metals and other pollutants from water through filtration and adsorption.

Chemical methods. These include chemical precipitation, oxidation reduction and other methods. These methods purify the water of pollutants, such as heavy metal ions and drug residues of drugs, by adding chemicals.

Photocatalytic methods. The use of light to degrade and decompose pollutants in water, such as the use of ultraviolet light photocatalysis, visible light catalysis and other methods.

Treatment equipment. Such as sewage treatment equipment, pure water equipment, etc. These devices remove pollutants from water by creating specific physical, chemical or biological conditions.

Water management. These include industrial wastewater treatment, rainwater harvesting and reuse, water scheduling, etc. These management measures allow the rational use of water resources, reduce water pollution and safeguard the health of the water environment.

In conclusion, modern water self-purification techniques and methods are diverse, and different techniques can be flexibly selected to achieve the best purification effect according to different pollutants and pollution scenarios.

### **The integration of traditional water feature design with water self-purification systems**

The integration of traditional water feature design with water self-purification systems can achieve the dual value of decorative and purification functions of water features, in the following ways:

Landscape design. When designing a water feature, a reasonable water circulation system and filtration system should be designed so that the sewage can be recycled after filtration, making the water feature not

only have decorative value but also have the function of purifying the environment.

Fish tanks, fountains, etc. Incorporating purification systems into traditional water feature designs for fish tanks and fountains, through aquatic plants, biofilm, activated carbon, UV sterilisation, etc., the purification and reuse of sewage in fish tanks and fountains can be achieved.

Air-infused fountains. Natural oxygen and light are introduced into the water, allowing the water to purify itself under the action of oxygen; and as the water vapour produced by the fountain is able to come into full contact with the air, it also helps to maintain a suitable settling rate in the water, allowing for better settling of suspended solids and sludge at the bottom.

Overall, through design and clever arrangement, the traditional water feature design can achieve a perfect combination with the self-purification system, which can beautify the urban environment and at the same time enhance environmental protection and give more value to its use.

By integrating traditional water feature design with a water body self-purification system, traditional water features can add to the landscape effect and aesthetic appeal, making the water body both ornamental and recreational, as well as self-purifying. Waterscape facilities can increase economic benefits such as increased pedestrian flow and a boost to the surrounding commercial area, and the self-purification system can achieve the effect of water purification and ensure water safety.

At the same time, the water self-purification system requires appropriate technical support, and some traditional waterscape elements will have an impact on the purification system [1], requiring reasonable consideration of technical difficulties and other factors that need to be considered in the design and construction process. Self-purification systems require regular maintenance and inspection, which increases the cost of operation and maintenance, and can reduce self-purification performance and even have an impact on humans if maintenance and inspection are not attended to. Compared to traditional water feature design, adding a self-purification system will increase construction costs and make the project more difficult. Therefore, in practical application, comprehensive consideration should be given to reasonably select a water feature



design that matches the function and cost according to market demand and usage, and at the same time reasonably plan the self-purification facilities and operation and maintenance plans to achieve the effect and economic benefits in practical application.

### **Practical case study**

A case of a traditional Chinese water feature project is the Humble Administrator's Garden in Suzhou. The Humble Administrator's Garden is a classical Chinese private garden, built during the Qing Dynasty Qianlong period, covering a total area of 5.6 hectares, of which 1.27 hectares is covered by water. There are several ponds, water pavilions and water features in the garden, which is a typical landscape of the south of the Yangtze River. The garden is designed with a self-purifying water system called the 'Clear Water Secret'.

This is a new eco-friendly technology that naturally purifies the water and maintains its transparency. It has been used extensively in the Humble Administrator's Garden. A complex water ecosystem is created by placing terracotta materials and a variety of aquatic plants in the water body. The terracotta material acts as an ecological filtration material, filtering out suspended particles and germs from the water, while also providing nutrients for healthier plant growth. At the same time, the aquatic plants are able to absorb nutrients such as nitrogen, phosphorus and organic matter from the water, making the water more pure.

The Environment Protection Bureau of Suzhou conducts regular water quality monitoring on the effectiveness of the Clearwater Secret Technology in the Humble Administrator's Garden. The results show that the Clearwater Secret Technology is indeed effective in purifying the water and improving water quality. By comparing the monitoring data, it is clear that the water quality in the park has improved, with significant improvements in water quality indicators and increased species diversity. At the same time, the transparency of the water body has also been improved, making the entire waterscape more scenic. Therefore, the effect of the application of the Clearwater Secret Technique in the Humble Administrator's Garden has been affirmed and recognised.

## Conclusions

The integration of traditional water feature design with modern self-purification technology allows the traditional water feature to retain its historical and cultural values while better adapting to modern requirements for water quality and environmental standards. This integration can not only improve water quality and reduce maintenance costs, but can also serve to enhance ecological conservation.

The implication for future research and design is that more attention needs to be paid to environmental, ecological and sustainable considerations. Future water conservation projects and urban landscape design should focus more on the environmental benefits and ecological effects of water. Using modern technology, traditional waterscape design and ecological management should be combined to achieve natural purification and recycling of water quality through biological purification and comprehensive using water resources to achieve the synergistic enhancement of ecological, landscape, culture, economic and social benefits.

Another important direction for future waterscape design and water resource management is 'water conservation'. While meeting the needs of the city, it is important to promote water-saving habits and to educate and promote water conservation. The focus should be on building awareness of water conservation throughout society and on popularising water knowledge and the application of water conservation techniques, creating a culture and social climate of water conservation in which the general public can participate. Only by vigorously promoting the concept of water conservation can we fundamentally realise the sustainable use of water resources.

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